Powell Tolner & Associates Ltd

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY

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Revision	Date	Description	Prepared	Reviewed
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1 INTRODUCTION

Powell Tolner and Associates Limited (PTA) have been appointed by Gravesham Community Investment Partnership LLP to undertake a Flood Risk Assessment (FRA) and Drainage Strategy (DS) to support the full planning application for the development at Milton Place.

The National Planning Policy Framework (NPPF) states that 'a site-specific FRA is required for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more'. As the site area is over 1 hectare, a site-specific FRA is required.

This FRA investigates both the onsite and offsite flood risk from all sources for the development and sets out mitigation measures within the drainage strategy to ensure the sustainability and safety of the proposed development over its lifetime.

This FRA and drainage strategy has been produced in line with the requirements of the National Planning Policy Framework (NPPF 2021) and the Environment Agency's (EA) Standing Advice.

2 DEVELOPMENT DESCRIPTION

2.1 Location

This site is located on the east side of Milton Place, Gravesend, Kent, DA12 2BT at National Grid reference TQ652740 with an Easting of 565273 and Northing of 174099. The site is bounded by Milton Place running along the west and Ordnance Road south of the site with a footpath located at the north of the site with New Tavern Fort beyond. See Figure 1 and Figure 2 showing the Site location.



Figure 1: Site Location – Extract from Open Street Map

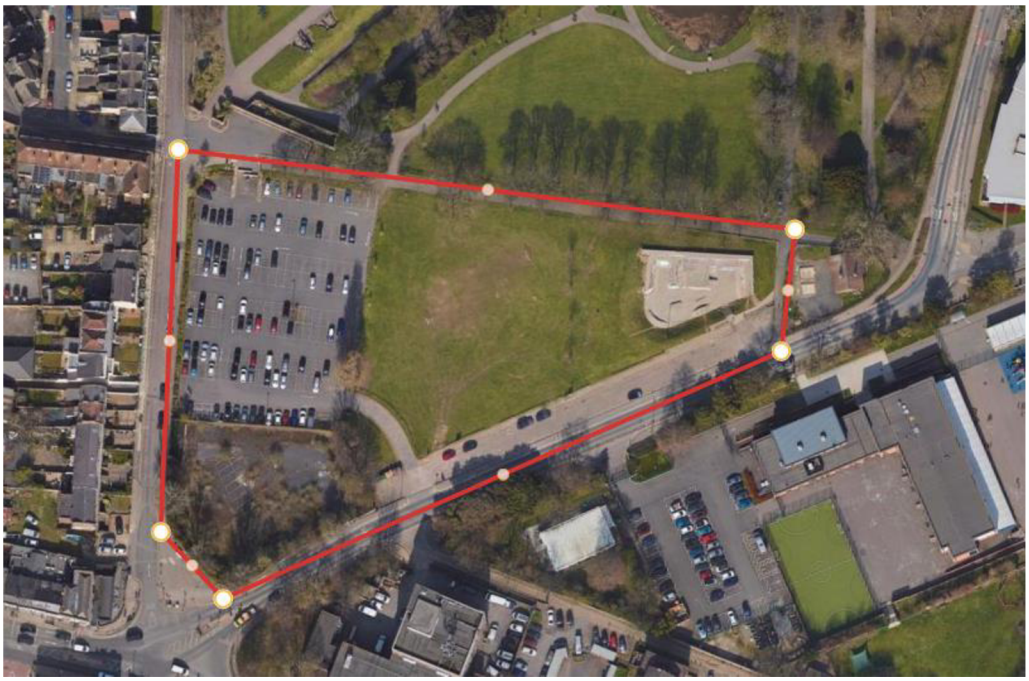


Figure 2: Aerial Photo – Extract from Google Maps

2.2 Existing Site

The existing site is comprised of a car park (currently in use), a skate park and an area of greenfield land.

A Church building was previously situated on the southwest corner of the site, along with a former swimming pool, municipal buildings and the old school. The site was also a former BT depot.

A topographical survey taken by Survey Solutions dated 25/04/2023 is included within Appendix B of this report.

A breakdown of the existing site area can be seen in Table 1 below.

Total Site Area		**14,326 m^2**
Permeable Areas (soft landscaping)		6,096 m^2
Impermeable Area	Hardstanding Areas	8,230 m^2
	Roof Areas	0 m^2
	Total Imp. Area	8,230 m^2

Table 1: Existing Site Areas

2.3 Development Proposals

The proposed development will consist of the construction of 76 units, a split of 15 houses and 61 flats of a 4-storey apartment complex. The entirety of the project will be completed in a single phase.

The existing skatepark will be retained post development with the existing carpark bays being reduced from 148 spaces to 84 spaces.

The proposed site architectural layout is included within Appendix A.

A breakdown of the proposed site area can be seen in Table 2 below.

Total Site Area		**14,326 m^2**
Permeable Areas (soft landscaping)		3,744 m^2
Impermeable Area	Hardstanding Areas	8,575 m^2
	Roof Areas	2,007 m^2
	Total Imp. Area	10,582 m^2

Table 2: Proposed Site Areas

3 FLOOD RISK

3.1 National Planning Policy Framework

The NPPF and the supporting Planning Practice Guidance (PPG) for Flood Risk and Coastal Change Allowance Guidance (EA, 2020) provides guidelines on how flood risk should be considered at all stages of the planning and development process. The NPPF states that the planning system should ensure that new developments are safe and not exposed unnecessarily to the risks associated with flooding. This FRA sets out the planning and wider context within which the development needs to be considered along with the flood risk from all sources in accordance with the NPPF.

3.2 Flood Vulnerability Classification

The EA's flood risk map below shows the entire site is located within Flood Zone 1, which is defined as having a less than 1:1000 (<0.1%) annual probability of flooding from rivers and seas. See extract from the EA's Flood Map for Planning in Figure 3 below.

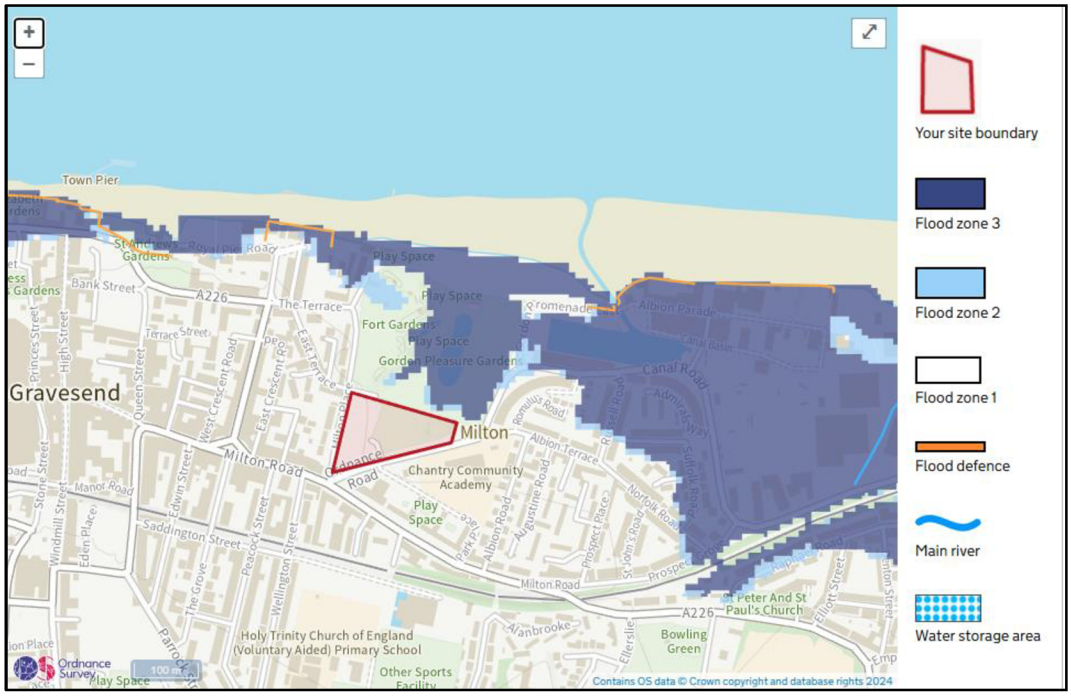


Figure 3: EA's Flood map for planning

3.3 Flood Zone Compatibility

The NPPF's Planning Practice Guidance, provides guidance on the suitability of land for varying uses depending on the flood zone it is located within. NPPF's PPG classifies the vulnerability classification for the proposed sites residential use as 'more vulnerable'.

Consulting Table 3 below, extracted from the NPPF, the proposed land use for the development is deemed appropriate due to being located within flood zone 1, and an exception test is not required, and the sequential tests requirements are met.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Table 3: Flood risk vulnerability and Flood Zone Compatibility

3.4 Flood Risk Sources

In accordance with the NPPF and its Technical Guidance document the risk of flooding from all sources needs to be considered.

3.4.1 Rivers and Tidal

The River Thames (a tidal river) is located approximately 250m north to the site. As the site is located entirely within flood zone 1 there is less than 0.1% annual probability of flooding from rivers, refer to the map shown in Figure 3. Therefore, the site is at a very low risk of flooding from rivers and tides.

3.4.2 Ground Water

The Geo-Environmental Assessment by Create Consulting Engineers, July 2023 states that the groundwater level at 9.0m bgl and based on the site geology can be described as 'static'. An extract of the Geo-Environmental Assessment is included within Appendix C.

Kent County Council's Groundwater Risk Areas map, as seen in Figure 4 below and included in Appendix D, the risk of ground water flooding can be deemed negligible. With this information, as well as the ground water being monitored at 9m bgl as stated in the Geo-Environmental Assessment, the overall flood risk of groundwater can be considered very low.

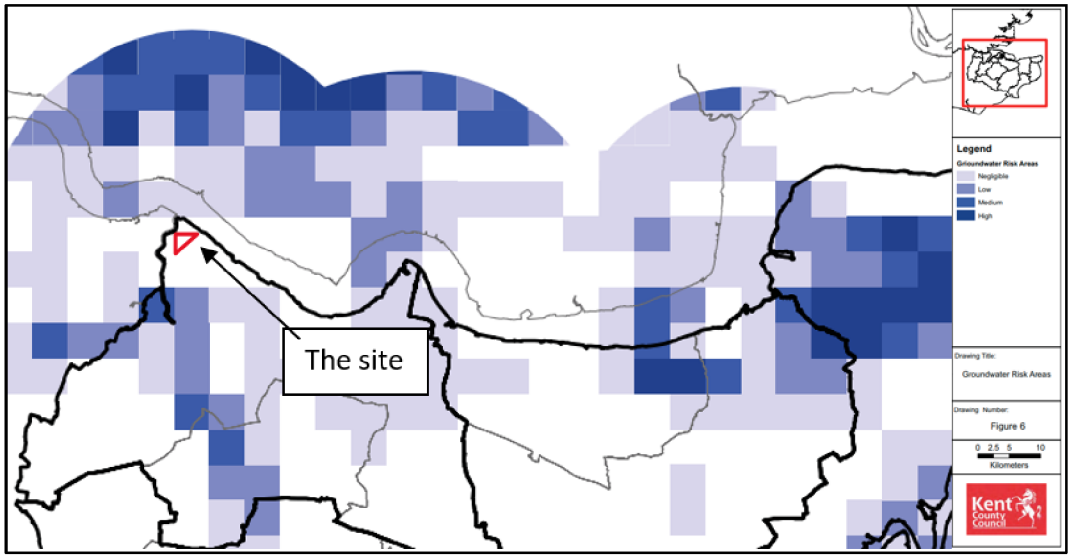


Figure 4: Groundwater Risk Area from Kent County Council's Preliminary flood risk assessment

3.4.3 Overland Flows

The site levels generally fall from the northwest to the southeast from approx. 12.0 mAOD to 7.0 mAOD, refer to the Topographic Survey included in Appendix B for existing levels.

The EA's Surface Water Flood Risk Map, ___**Error! Reference source not found.** below, shows that the Site is predominantly at a very low risk of flooding from surface water with localised areas of low and medium risk to the North of The Site.

The proposed drainage layout and proposed levels are designed to ensure that surface water is directed towards low points away from buildings where gullies/channel drains area located and towards the proposed infiltration pond.

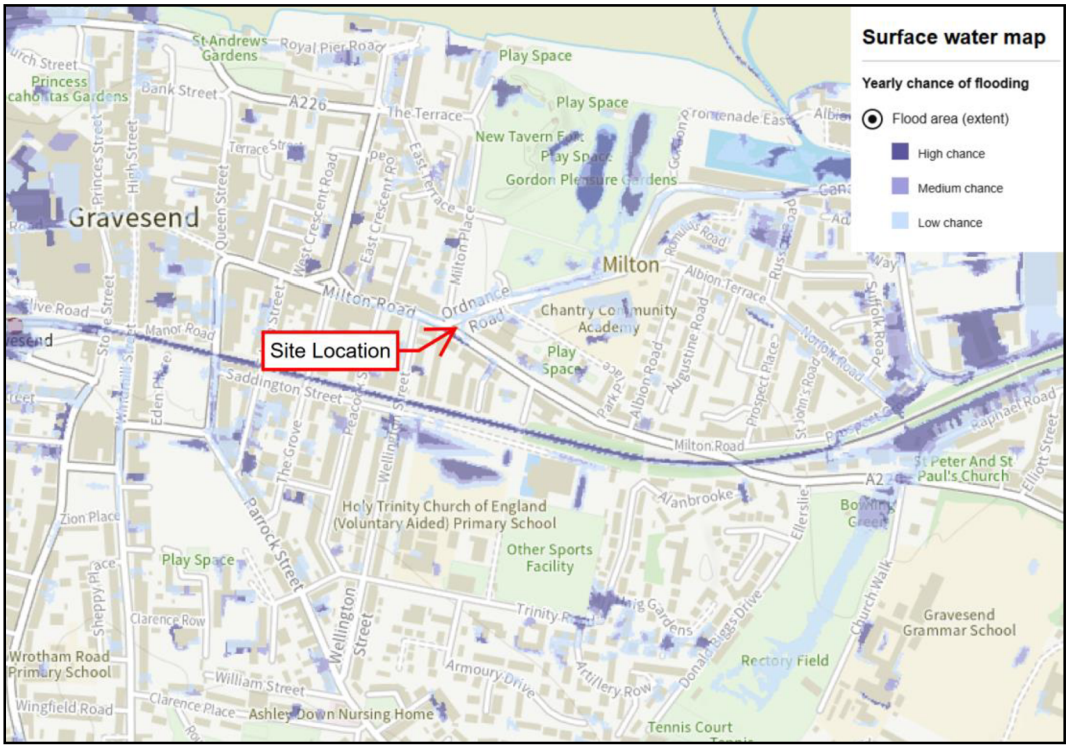


Figure 5: EA Flood Map – Surface Water Flood Risk Map

3.4.4 Sewers

Surface water, foul and combined sewers and manholes are located on the roads North, West and South of the site. A 225mm diameter surface water sewer crosses the site, refer to the existing sewers shown on the Proposed Drainage Layout drawing included in Appendix I.

Refer to Appendix B which includes a topographic survey indicating drainage sewers within the vicinity of The Site, and Appendix E which includes an asset location map from Southern Water.

As explained in Section 3.4.3, the levels around the site would direct overland flows onto roads and locations downstream in the event of the existing sewers beyond the site flooding.

3.4.5 Other Sources

The EA flood map shown in Figure 6 below does not indicate that The Site is at risk of flooding from reservoirs.

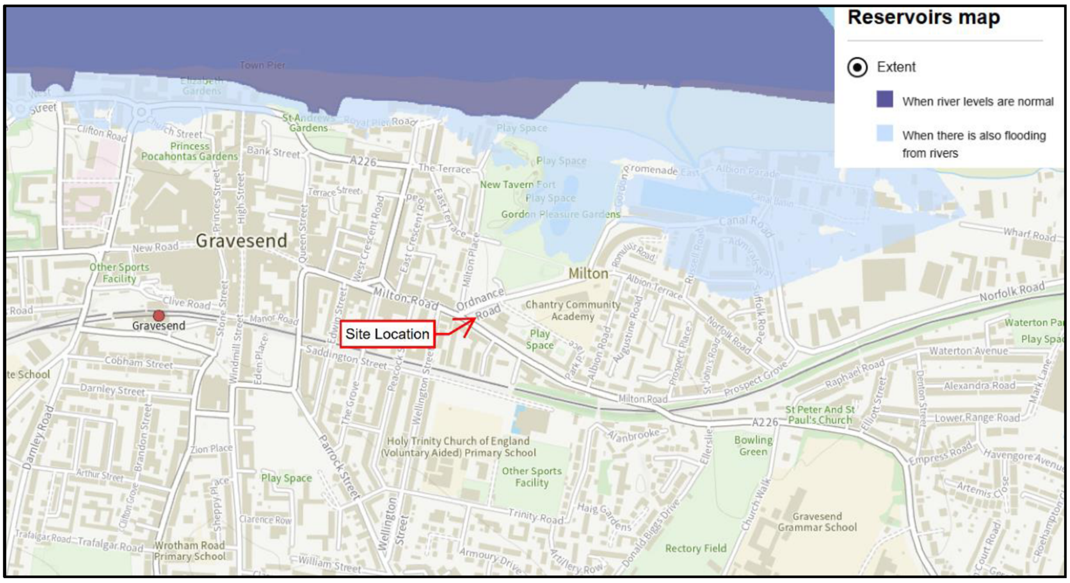


Figure 6: EA Flood Map –Reservoir Flood Risk Map

3.5 Climate Change

The projected effects of climate change are expected to lead to increased rainfall, river flows, raised sea level and tidal fluctuations. The pertinent effects to this development are the increased rainfall, and its effect on drainage systems and river flows.

The increased flood risk from overland flows can be mitigated by designing the development's drainage networks to accommodate the 1 in 100-year storms with an additional 45% climate change allowance without causing onsite or offsite flooding.

3.6 Residual Risk

There are no other known residual flood risks to the development.

4 FLOOD RISK MANAGEMENT

4.1 Existing Surface Water Runoff

The existing site is a mix of open space and brown field sites, the surface water runoff will follow the topographic gradient falling towards Ordnance Road to the southeast of the site.

There are various surface, foul and combined drainage pipes and manholes located just outside the site boundary; these can be seen within the Southern Water Asset Map Included within Appendix D. Existing drainage infrastructure is also shown within the Topographic Survey included within Appendix B.

4.2 Floor Levels

The external floor (ground) levels have been designed to fall away from the buildings to provide flood routes away from the building, this has been done to mitigate flood risk in storms outside the design requirements, or due to burst water mains etc.

4.3 Sustainable Drainage Techniques

The use of various sustainable drainage techniques has been investigated with respect to their potential to be used within the development to control storm water as close to the source as possible and reduce the potential increased flood risk from the development. They are reviewed in order of most to least sustainable based upon the SuDS Hierarchy table from the EA.

	SUDS technique	*Flood Reduction*	*Pollution Reduction*	*Landscape & Wildlife Benefit*
Most Sustainable	**Living roofs**	✔	✔	✔
↑	**Basins and ponds** - Constructed wetlands - Balancing ponds - Detention basins - Retention ponds	✔	✔	✔
	Filter strips and swales	✔	✔	✔
	Infiltration devices - soakaways - infiltration trenches and basins	✔	✔	✔
↓	**Permeable surfaces and filter drains** - gravelled areas - solid paving blocks - porous paviors	✔	✔	
Least Sustainable	**Tanked systems** - over-sized pipes/tanks - storms cells	✔		

Table 4: The SuDS Hierarchy

4.3.1 Living Roofs

Living / Green roofs are not recommended for this development due to severe implications of adopting these systems on the proposed units:

- Structural: Even an extensive green roof system with a 100mmm thick growing media will impose considerable loading and the dwellings proposed are not designed to sustain this extra load that the green roofs would propose.
- Maintenance: Any regular or irregular maintenance to the proposed unit's roofs is likely to require trained personnel. As these dwellings will be private properties, proper maintenance by the owners cannot be guaranteed.
- Damage & leaks: Although these systems are waterproof, extreme weather factors or human error can result in a leak in the roof. In these restricted conditions, finding and repairing such failure in a complex roof system would be a challenging process.

Although a green roof should always be considered, on this development the complexity, and disadvantages of implementing a green roof are far greater than the potential benefits.

4.3.2 Basins and Ponds

An infiltration pond will be used on site, this will help with:

- The pond will act as natural filtration system this will remove pollutants such as oil from runoff before the water enters a larger body of water.
- The pond will produce an increase of biodiversity supporting plants and insects as well as aquatic life.
- The pond will add an aesthetic appeal to the area, and this will add to the recreational value of the area and make it a public amenity.
- This will allow storm water to discharge into the pond and drain into the soil at a rate of 2.82×10^{-4}m/s and thus will reduce the flood risk on site.

4.3.3 Filter Strips and Swales

A largescale open SuDS feature is proposed, therefore filter strips and swales will not be explored further.

4.3.4 Infiltration Devices

The site's infiltration rate has been verified by the Phase 2 Geo-Environmental report, as shown in Appendix C. The soakage test at the location of the proposed pond gives an infiltration rate of 2.82×10^{-4}m/s. As described in 4.3.2 above, an infiltration pond will be implemented.

4.3.5 Permeable Paving

Permeable paving will not be used as the water will be draining into an infiltrating pond on site and so the increase of infiltration using permeable paving is not a necessity.

4.3.6 Tanked Systems

This will not be implemented as the site already has an open landscaped area available that will be used as an infiltration pond instead of a tanked system. This solution is better for the environment and adds value to the area by supplying an amenity. Therefore, this option will not be explored further.

4.4 Surface Water Discharge Hierarchy Assessment

4.4.1 Discharge Through Infiltration

As described above the project will be infiltrating into the soil at a rate of 2.82 x 10^{-4}m/s as verified by the Phase 2 Geo-Environmental report into an infiltration pond volume of 208.7m^3. This pond is located where chalk is present and meets the storge requirement for a 1 in 100 year +45% climate change event.

4.4.2 Discharge into Surface Water Body

The closet surface water body (the River Thames) is approximately 65m north of the site. This has not been considered further as the surface water will be discharging by infiltration, as this is higher on the SuDS hierarchy.

4.4.3 Discharge to Surface Water Sewers

Surface water sewers operated by Southern Water are located East and South to the site, these will not be considered due to the viability of other preferable options for surface water disposal.

4.4.4 Discharge to Combined Sewer

There are no combined sewers in the proximity of the site.

4.5 Proposed Drainage

4.5.1 Kent County Council's LLFA Correspondence

PTA have been in correspondence with Kent County Council's LLFA regarding the approval of the proposed drainage strategy. Correspondence emails are included within Appendix G. The drainage strategy has been designed in accordance with the discussions and advice from the LLFA.

4.5.2 Proposed Surface Water Drainage

The surface water runoff from the development's hardstanding areas and units' roofs will be collected via rainwater pipes, drainage channels and road gullies before being conveyed via underground pipework before out falling into the proposed infiltrating pond in the soft landscaped area of the site.

4.5.3 Drainage Model

Causeway Flow software was used to model the proposed drainage system up to the critical 1 in 100+45% CC storm event. The drainage network has been modelled using the latest FEH-22 rainfall data. The results from the Flow model are included in Appendix H.

The results show that in the more critical storm events some manholes are prone to 'flood risk' however this means that the system is working efficiently by filling up fully.

Refer to Appendix I for the Proposed Drainage Strategy Layout and Appendix H for the Causeway Flow drainage calculations.

4.5.4 Proposed Surface Water Treatment

The proposed development is comprised of residential units with roads, and driveways and is therefore classified as having a low pollution hazard level as defined by the CIRIA SuDS Manual. To adequately treat the surface water runoff from these areas in line with the SuDS Manual's recommendations, the surface water treatment will be required to meet pollution mitigation indices of 0.5, 0.4, 0.4 for total suspended solids (TSS), metals and hydrocarbons respectively.

The proposed infiltration pond will allow for water to drain through its surface, this will mitigate total suspended solids (TSS) metals and hydrocarbons respectively up to 0.7, 0.7, 0.5. According to the SuDS Manual this is higher than the mitigation needed for this low pollution hazard that is required for this project. The location of the pond is shown in the Proposed Drainage Layout included in Appendix I.

4.5.5 Proposed Foul Water Drainage

The foul drainage for this development will flow by gravity in an underground pipe network that runs through the development. This will then discharge into Southern Water's public sewer that exists under Ordnance Road which to the south of the development. Southern Water assets can be seen on the Southern Water asset map included in Appendix E.

Southern Water have responded to a pre-planning enquiry confirming that the sewer located on Ordnance Road does have sufficient capacity for the development's foul water discharge. Correspondence with Southern Water is included in Appendix F.

4.5.6 Drainage Maintenance Strategy

A below ground drainage maintenance plan document has been produced and sets out the required maintenance actions and their frequency for all the drainage components. This has been appended to this report within Appendix J.

5 OFFSITE IMPACT

The proposed redevelopment of this site results in a decrease in impermeable site area and an equivalent decrease in surface water runoff volume.

In addition to this, all surface water is proposed to be discharged via infiltration, mitigating the flood risk to adjacent sewers.

6 CONCLUSION

The FRA has considered the potential flood risk to the proposed development and its potential impact on flood risk:

- The development is located entirely in Flood Zone 1.
- The development has a low risk of flooding from all sources.
- The development drainage system and levels are to be designed to accommodate the 100-year rainfall event with a 45% allowance for climate change.
- On site levels are designed to reduce the risk of surface water entering residential dwellings and convey water away from thresholds during exceedance events.

The drainage strategy aims to collate all surface water runoff from the site via a network of pipes and manholes and discharge into an infiltration pond located on site where the runoff can naturally infiltrate into the ground. `As the surface water is being discharged via infiltration, the drainage strategy conforms to SuDS practises.

The infiltration pond will be designed to attenuate runoff from the hard landscaped areas of the site for a 100-year rainfall event with a 45% climate change allowance.

Therefore, the development has an overall low flood risk both on and offsite.

APPENDIX A – Architectural Site Plan



- 1B2P
- 1B2P M4(3)
- 2B4P_Galloway
- 3B5P_Kings
- 3B5P_Lewis
- 3B6P_Abney
- 3B6P_Walbury
- Cleaners St.
- Cycle Store 1
- Cycle Store 2
- Entrance
- Mech Smoke Shaft
- Natural Smoke Shaft
- Plant
- Refuse
- Riser 1
- Riser 2
- Riser 3
- Riser 4
- Stair 1
- Stair 2
- Wardens Room

Notes

Do not scale from this drawing.
All contractors must visit the site and be responsible for taking and checking dimensions.
All construction information should be taken from figured dimensions only. Any discrepancies between drawings, specifications and site conditions must be brought to the attention of the supervising officer.
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This drawing is prepared for the specific project stage in the Drawing Status section below and it is not intended to be used for any other purpose. Whilst all reasonable efforts are used to ensure drawings are accurate, JTP accept no liability for any reliance placed on, or use made of, this plan by anyone for purposes other than those stated in the Drawing Status below.

- Site Ownership Boundary
- Gun Sight Lines

Independent Living Accommodation Schedule Summary

Name	Count	NIA
1B2P	53	2696.30 m²
1B2P M4(3)	8	500.55 m²
	61	3196.85 m²

Residential Accommodation Schedule Summary

Name	Count	Unit GIA
2B4P_Galloway	2	144.78 m²
3B5P_Kings	1	97.85 m²
3B5P_Lewis	1	99.37 m²
3B6P_Abney	6	662.74 m²
3B6P_Walbury	5	613.64 m²
	15	1618.36 m²

Parking Schedule

Parking Space	Count
Independent Living	8
Public	84
Residential	19
	111

Rev	Date	Description	Drawn	Chkd
D7	14.11.24	Design Freeze Issue. Scheme updated.	SC/LH	MM
D6	29.10.24	Draft issue for acoustic/ans. Apartment block to be updated.	SC/LH	MM
D5	22.10.24	Tree survey added and removed trees highlighted. Wider cycle path added to west of apartment block from site entrance to junction. Plot 11-15 house types updated. Plot 4 position updated. Road position to rear of plots 5-10 adjusted. Path in front of plot 5-10 adjusted. Path connections to Ordnance Rd removed. 2 additional parking spaces added for apartment block. Apartment layouts shown.	SC/LH	MM
D4	15.10.24	Layout updated. Pre-app 2 comments incorporated. Plot 7-10 stepped to suit pre-app comments. Pedestrian connection from car park added to new access road (subject to levels). Updates to apartment block - balconies removed, footprint updated, elevations updated, amount of building stepping up to 5 storeys reduced, additional entrance to apartment block created at SW corner, unit numbers dropped by 4 from 70 to 66 as a result.	SC/LH	MM
D3	19.09.24	Layout updated. House types updated. Schedules updated. Swapped out non-compliant house types to East. Added 3-storey units in the South near the apartment block. 2.5-storey units to the East, being down from SW corner. Adjusted layout for minimum 21m back-to-back distances or 11m to a blank wall. Updated garden depths/areas to meet Design code, noted exceptions on plans. Eastern plots to have parking in rear gardens, improving garden access. Limited parking only plots 1-4 have communal 2 spaces, others have 1 allocated in front gardens. Minor updates to road layout. Units in the South moved 1.1m from the adjacent trees. Adjusted apartment block footprint. Balconies added, reduced terrace at ground floor to east, optimized footprint.	SC	MM
D2	11.09.24	Layout updated. Apartment corner at ground floor + 2 units added to this place. Landscaping to corner updated. Ground floor thirdarie updated. Access road width increased to 6m. Paths added to front of house positions updated to Plots 04/05/11/12. Additional trees removed from corner.	SC	MM
D1	06.09.24	First issue of revised scheme	SC	JRW

Drawing Status
Draft

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Drawing Title
Sitewide GA Plan - Level 00

Drawing No.
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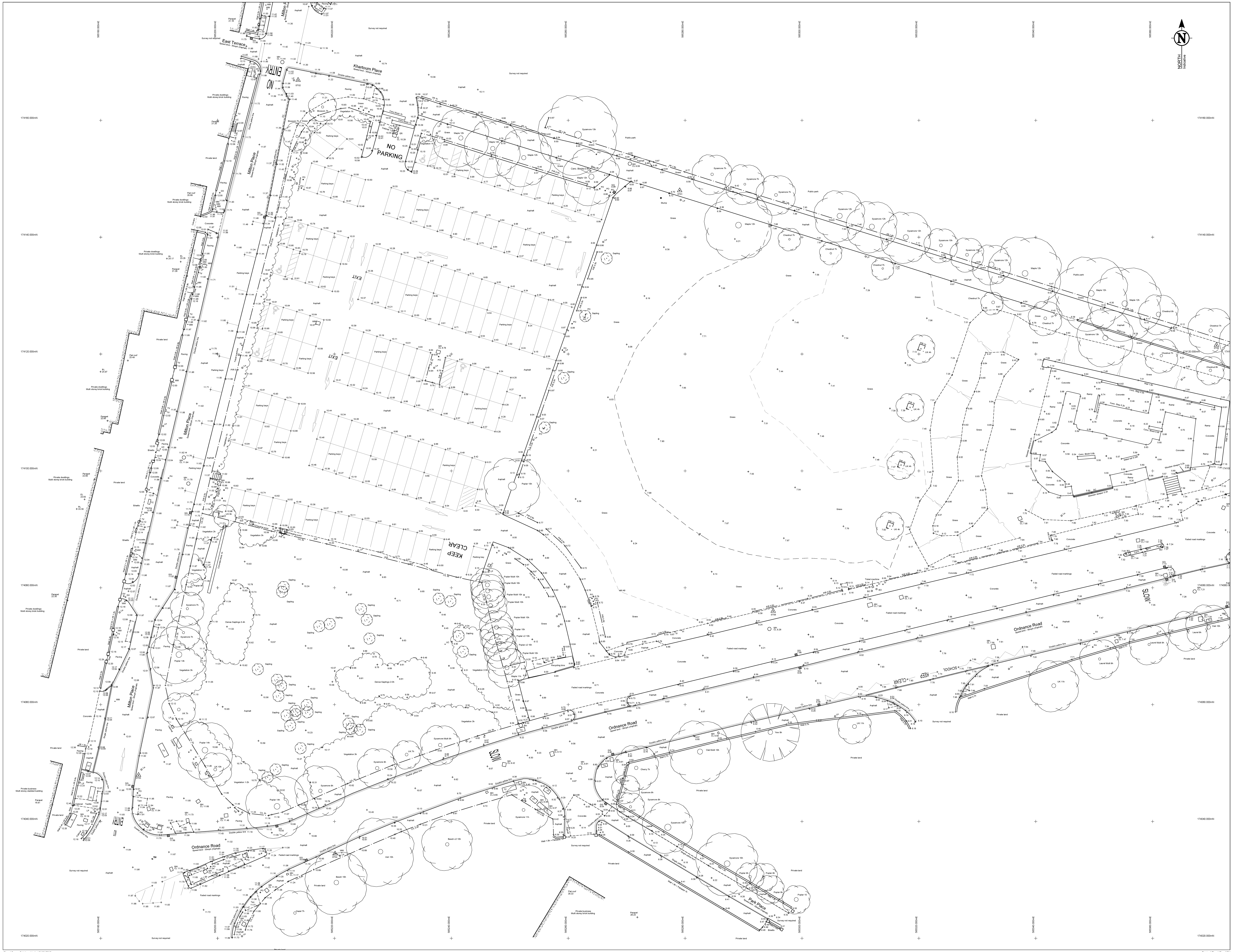
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Scale Bar
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Revision. D7

APPENDIX B – Topographic Survey



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TOPOGRAPHICAL & MEASURED BUILDING SURVEYS

ABBREVIATIONS & SYMBOLS

AH	Arch Head Height	ER	Earth Rod	RSD	Roller Shutter Door
A/B	Air Brick	ET	EP+Transformer	RSJ	Rolled Steel Joist
AR	Assumed Route	FB	Flower Bed	SI	Sign Post
AV	Air Valve	FBD	Floor Board Direction	SP	Arch Spring Point Height
BB	Belisha Beacon	FH	Fire Hydrant	SV	Stop Valve
BH	Bore Hole	FL	Floor Level	SW	Surface Water
BL	Bed Level	FP	Flag Pole	SY	Cable Stay
BO	Bollard	FW	Foul Water	Tac	Tactile Paving
BrP	Brace Post	GG	Gully Grate	TC	Telecom Cover
BS	Bus Stop	GV	Gas Valve	TH	Trial Pit
BU	Bush	HH	Head Height	THL	Threshold Level
B/W	Barbed Wire Fence	IC	Inspection Cover	TL	Traffic Light
BX	Box (Utilities)	IL	Invert Level	ToW	Top of Wall
C/B	Close Board Fence	I/R	Iron Railings	TP	Telegraph Pole
CH	Cill Height	KO	Kerb Outlet	TS	Traffic Signal Cover
CL	Cover Level	LP	Lamp Post	TV	Cable TV Cover
C/L	Chain Link Fence	MH	Manhole	UB	Universal Beam
C-Lev	Ceiling Level	MP	Marker Post	UC	Unknown Cover
Col	Column	NB	Name Board	UK	Unknown Tree
C/P	Chestnut Paling Fence	OHL	Overhead Line (approx)	UMG	Unmade Ground
CR	Cable Riser	Pan	Panel Fence	USB	Under Side Beam
C/W	Chicken Wire	PB	Post Box	UTL	Unable To Lift
DC	Drainage Channel	PM	Parking Meter	UTS	Unable To Survey
DH	Door Head Height	PO	Post	VP	Vent Pipe
Dil.	Dilapidated	P/R	Post & Rail Fence	WB	Waste Bin
DP	Down Pipe	P/W	Post & Wire Fence	WH	Weep Hole
DR	Drain	P/Wall	Partition Wall	WL	Water Level
EBx	Electric Box	RE	Rodding Eye	WM	Water Meter
EC	Electric Supply Cover	RL	Ridge Level	WO	Wash Out
EL	Eaves Level	RP	Reflector Post		Floor to Ceiling Height
EP	Electric Pole	RS	Road Sign	F/C	Floor to False Ceiling Ht
					Survey Control Station

DRAWING NOTES

Topographical Surveys

Trees are drawn to scale showing the average canopy spread. Descriptions and heights should be used as a guide only.

All building names, descriptions, number of storeys, construction type including roof line details are indicative only and taken externally from ground level.

All below ground details including drainage, voids and services have been identified from above ground and therefore all details relating to these features including; sizes, depth, description etc will be approximate only. All critical dimensions and connections should be checked and verified prior to starting work.

Detail, services and features may not have been surveyed if obstructed or not reasonably visible at the time of the survey.

Surveyed physical features may not necessarily represent the legal boundary line.

Measured Building Surveys

Measurements to internal walls are taken to the wall finishes at approx 1m above the floor level and the wall assumed to be vertical.

Cill heights are measured as floor to the cill and head heights are measured from cill to the top of window.

General

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work. Any errors or discrepancies must be notified to Survey Solutions immediately.

The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

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Do not scale from this drawing.

SURVEY CONTROL CO-ORDINATES

STATIONS	EASTINGS	NORTHINGS	LEVEL	DESCRIPTION
ST01	565279.071	174147.986	8.665	PK Nail
ST02	565213.771	174166.881	11.436	PK Nail
ST03	565186.475	174047.928	12.013	PK Nail
ST04	565220.102	174034.465	10.835	PK Nail
ST05	565295.072	174076.007	8.341	PK Nail
ST06	565413.435	174085.702	7.212	PK Nail
ST07	565420.572	174108.169	6.520	PK Nail
ST08	565370.915	174121.519	5.996	PK Nail

SURVEY GRID AND LEVEL DATUM

The coordinate system established for this survey is related to Ordnance Survey (OS) national grid at a single point using Smartnet, then orientated to grid north with a scale factor of 1.000.

The level datum established for this survey is related to Ordnance Survey (OS) using GPS Smartnet.

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REV	DESCRIPTION	DRAWN	APPR	DATE

SURVEY SOLUTIONS

LAND SURVEYING
BUILDING SURVEYING
UNDERGROUND SURVEYING
SITE ENGINEERING
MONITORING

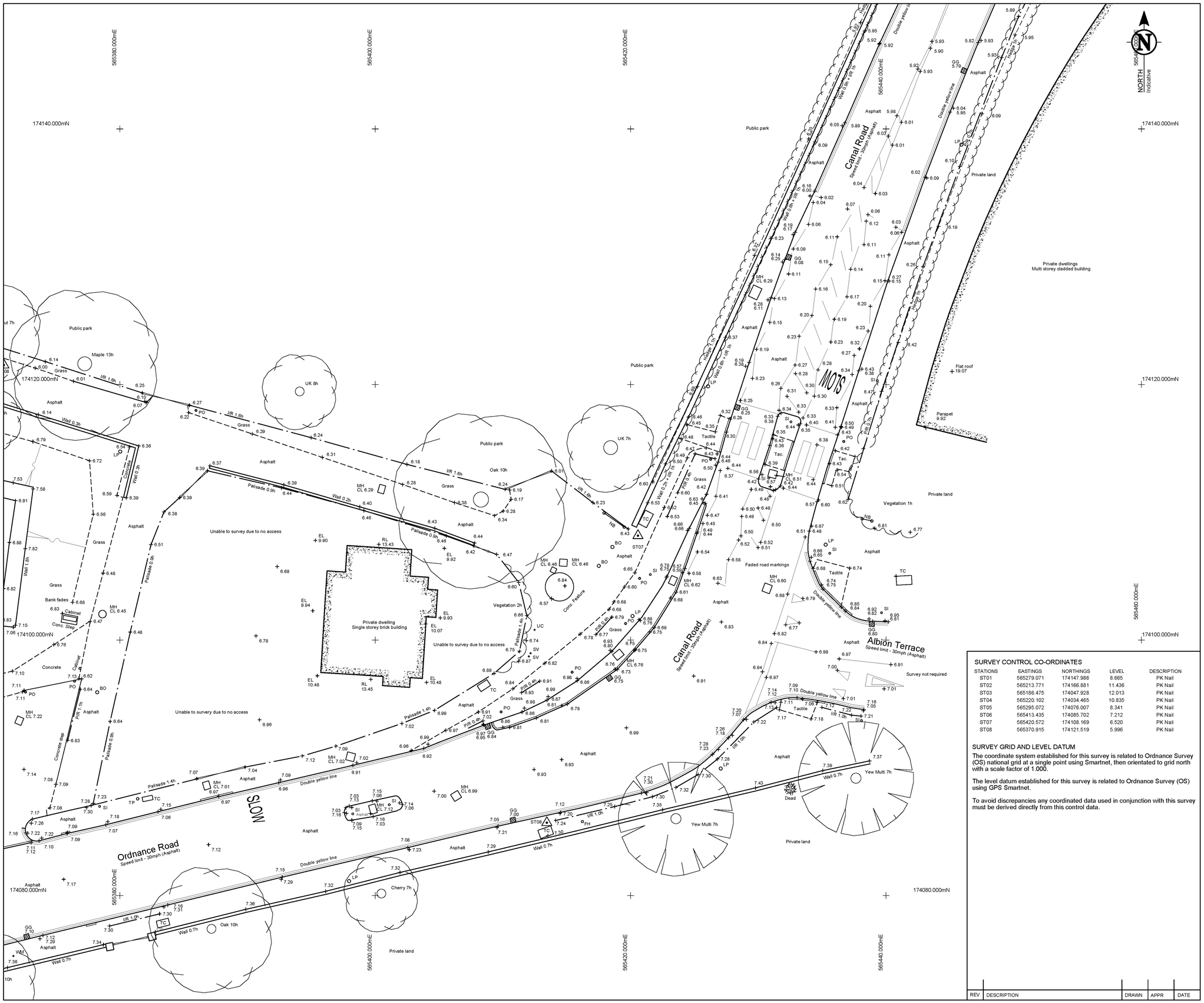
0845 040 5969
survey-solutions.co.uk

IPSWICH BEDFORD COVENTRY GLASGOW LONDON MANCHESTER NORWICH NOTTINGHAM YEOVIL

PROJECT TITLE MILTON PLACE CAR PARK, GRAVESHAM, KENT, DA12 2PQ				
DRAWING DETAIL TOPOGRAPHICAL SURVEY Sheet 1 of 2				
CLIENT THE HILL GROUP				SCALE 1:200
SURVEYOR GB	SURVEY DATE 13/04/2023	CHECKED BY RH	APPROVED BY ADK	DWG STATUS FINAL
DRAWING NUMBER 47661BWLS-01			REVISION	ISSUE DATE 25/04/2023

RICS · chartered ices · THE SURVEY ASSOCIATION · ISO 9001 REGISTERED FIRM · QMS ISO 14001 : 2015 REGISTERED

Original Sheet Size A0H



TOPOGRAPHICAL & MEASURED BUILDING SURVEYS

ABBREVIATIONS & SYMBOLS

AH	Arch Head Height	ER	Earth Rod	RSD	Roller Shutter Door
A/B	Air Brick	ET	EP+Transformer	RSJ	Rolled Steel Joist
AR	Assumed Route	FB	Flower Bed	SI	Sign Post
AV	Air Valve	FBD	Floor Board Direction	SP	Arch Spring Point Height
BB	Belisha Beacon	FH	Fire Hydrant	SV	Stop Valve
BH	Bore Hole	FL	Floor Level	SW	Surface Water
BL	Bed Level	FP	Flag Pole	SY	Cable Stay
BO	Bollard	FW	Foul Water	Tac	Tactile Paving
BrP	Brace Post	GG	Gully Grate	TC	Telecom Cover
BS	Bus Stop	GV	Gas Valve	TH	Trial Pit
BU	Bush	HH	Head Height	THL	Threshold Level
B/W	Barbed Wire Fence	IC	Inspection Cover	TL	Traffic Light
BX	Box (Utilities)	IL	Invert Level	ToW	Top of Wall
C/B	Close Board Fence	I/R	Iron Railings	TP	Telegraph Pole
CH	Cill Height	KO	Kerb Outlet	TS	Traffic Signal Cover
CL	Cover Level	LP	Lamp Post	TV	Cable TV Cover
C/L	Chain Link Fence	MH	Manhole	UB	Universal Beam
C-Lev	Ceiling Level	MP	Marker Post	UC	Unknown Cover
Col	Column	NB	Name Board	UK	Unknown Tree
C/P	Chestnut Paling Fence	OHL	Overhead Line (approx)	UMG	Unmade Ground
CR	Cable Riser	Pan	Panel Fence	USB	Under Side Beam
C/W	Chicken Wire	PB	Post Box	UTL	Unable To Lift
DC	Drainage Channel	PM	Parking Meter	UTS	Unable To Survey
DH	Door Head Height	PO	Post	VP	Vent Pipe
Dil.	Dilapidated	P/R	Post & Rail Fence	WB	Waste Bin
DP	Down Pipe	P/W	Post & Wire Fence	WH	Weep Hole
DR	Drain	P/Wall	Partition Wall	WL	Water Level
EBx	Electric Box	RE	Rodding Eye	WM	Water Meter
EC	Electric Supply Cover	RL	Ridge Level	WO	Wash Out
EL	Eaves Level	RP	Reflector Post	CH	Floor to Ceiling Height
EP	Electric Pole	RS	Road Sign	CH F/C	Floor to False Ceiling Ht

DRAWING NOTES

Topographical Surveys

Trees are drawn to scale showing the average canopy spread. Descriptions and heights should be used as a guide only.

All building names, descriptions, number of storeys, construction type including roof line details are indicative only and taken externally from ground level.

All below ground details including drainage, voids and services have been identified from above ground and therefore all details relating to these features including; sizes, depth, description etc will be approximate only. All critical dimensions and connections should be checked and verified prior to starting work.

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REV	DESCRIPTION	DRAWN	APPR	DATE

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LAND SURVEYING
BUILDING SURVEYING
UNDERGROUND SURVEYING
SITE ENGINEERING
MONITORING

0845 040 5969
survey-solutions.co.uk

IPSWICH BEDFORD COVENTRY GLASGOW LONDON MANCHESTER NORWICH NOTTINGHAM YEOVIL

PROJECT TITLE				
MILTON PLACE CAR PARK, GRAVESHAM, KENT, DA12 2PQ				
DRAWING DETAIL				
TOPOGRAPHICAL SURVEY Sheet 2 of 2				
CLIENT				SCALE
THE HILL GROUP				1:200
SURVEYOR	SURVEY DATE	CHECKED BY	APPROVED BY	DWG STATUS
GB	13/04/2023	RH	ADK	FINAL
DRAWING NUMBER		REVISION		ISSUE DATE
47661BWLS-02				25/04/2023

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Original Sheet Size A2H

PAS 128: 2014 QUALITY LEVEL GUIDE

Q-LEVEL	DESCRIPTION	ACC.	Q-LEVEL	DESCRIPTION
QL-D	Service positions taken from records.	Undefined	QL-B2	Horizontal & vertical location using only one geophysical technique.
QL-C	Visual evidence of service existence but undetectable by geophysical technology.	Undefined	QL-B1	Horizontal & vertical location using multiple geophysical techniques.
QL-B4	Undetectable service present shown as an assumed route. (AR)	H: +/- 500mm V: N/A	QL-A	Horizontal & vertical position verification by open excavation, manholes and/or inspection chambers.
QL-B3	Horizontal location by one geophysical technique but with none or poor depth information.			

DETECTION METHOD

IN ACCORDANCE WITH PAS 128: 2014 SURVEY TYPE B

DRAINAGE SURVEY
All accessible Manholes and Inspection chambers have had their respective covers lifted with pipe sizes, inverts, chamber sizes/types and service data recorded from ground level. All connections from DPs, Gullies, Drains, VP's, RE's and lampholes have been proven wherever possible using audible connections (AC) and/or sonde instrumentation where applicable. Where these methods have proved unsuccessful then assumed (AR) straight line connections will be shown.

CCTV DRAINAGE SURVEY
All accessible Manholes and Inspection chambers have had their respective covers lifted with pipe sizes, inverts, chamber sizes/type and service data recorded from ground level. Pipework has been traced, accessed and collected for post processing. Drainage layout, including manhole covers not located by topographical survey, may be taken from CCTV chainage and will be shown as indicative only.

Electricity
Elec cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

British Telecoms
BT cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required. Due to current laws and legislation protecting all BT apparatus, cabling can only be located remotely. We therefore compare all our telecom findings against record information to produce the final service layout. In some instances, where high amount of cable ducts are present, we may only be able to identify a linear centre peak signal rather than identifying all the individual duct positions. For further information regarding Telecoms apparatus, please contact Openreach directly.

Cable TV & Communications
CTV and/or Com cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

Fibre Optic
FO cables will have been predominantly located using GPR methodology. This is due to the materials used within fibre optic cabling. In some rare instances, tracer cabling or conductible non fibre optic cabling will be present within some or all ducting. When this is the case, both EML and GPR methodology will be combined to identify service network and achieve greater quality levels.

Lighting, Traffic Signal & Security Cables
LC, TS and/or Sec cables will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required.

Gas & Water Inc. Fuel Pipes and Hot Water Pipes
GM/GS and/or WM/WS pipe work will have been attempted and located using both EML & GPR methodology with electronically derived depths shown for the former and depths to crown levels shown for the latter.
When the Gas/Water pipe work is constructed using conductible materials, then we are able to to employ multiple geophysical techniques to identify service network and achieve greater quality levels. When a non conductible material is used, GPR methodology will be employed to locate and plot the final service layout.

Ground Penetrating Radar
GPR methodology is used to identify and locate all non metallic, non conductible piping and cabling. We also employ GPR to obtain a greater accuracy levels on EML located services. The GPR has a greater success rate on pipe or service diameter upward of Ø63mm,C63mm, as size increments increase, so does the chance of detection. The GPR can produces varying results and as such, wouldn't be used as an independent utility surveying instrument.

Unidentified Traces
All UITs will have been predominantly located using EML methodology with electronically derived depths shown. GPR techniques will be employed to achieve greater quality levels as required. Every effort has been made to identify the service but in this instance, is not achievable. We recommend excavation work to determine identity and depth where applicable.

Scarring (QL-C)
Scarring has been identified on site with a potential of an undetectable service present.

Assumed Routes & Taken from Records (QL-B4/D)
Assumed routes (AR) are shown if there is evidence that a service exists but we are unable to trace it whilst on site. The surveyor will attempt to locate various risers/ics/valves/meters (service evidence) etc. around site area to successfully determine an assumed route between these points. If there is little evidence on site but they believe a service is still present, then a common sense approach to an assumed route shall be employed.

Taken from records (TFR) are service routes that are taken from STAT record plans or previous survey information and overlaid onto our drawings.

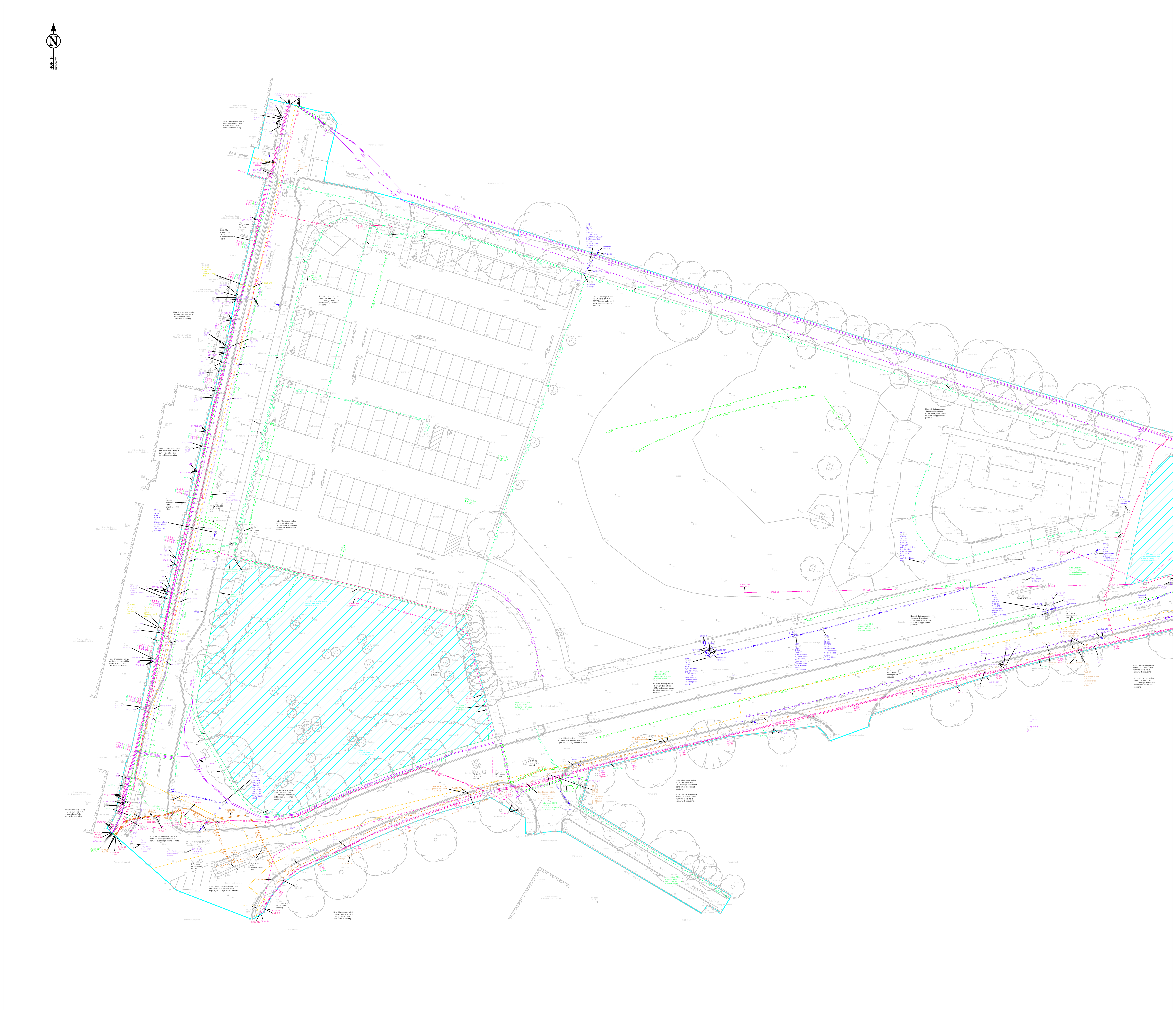
SURVEY RECOMMENDATIONS

The areas of dense vegetation to be cleared to allow access if any of these areas are deemed critical or of high importance.

The sewers with high levels of silt or blockages to be jetted to extend the CCTV drainage survey, if any of these areas are deemed critical or of high importance.

We recommend full statutory record information be obtained to confirm site findings and to position undetectable which may be present.

Due to the geophysical nature of subsurface technology, we always recommend excavation works to be carried out within critical areas for verification and to eliminate the possibility of undetectable services present.



UTILITIES & UNDERGROUND INVESTIGATIONS

ABBREVIATIONS & SYMBOLS

1D 5C	1 Duct 5 Cables	DCr	Depth To Crown	RBC	Rectangular Brick Chamber
Ø	Diameter	DI	Depth To Invert	RCC	Rectangular Conc Chamber
AC	Audible Connection	DS	Depth To Silt	RE	Rodding Eye
AG	Above Ground	DTB	Depth To Base	SA	Survey Abandoned
AR	Assumed Route	DTW	Depth To Water	SL	Silt Level
BL	Base Level	DTS	Depth To Surcharge	SuL	Surcharge Level
CB	Concrete Benching	EBD	External Backdrop	TFR	Taken From Records
CBC	Circular Brick Chamber	EOT	End Of Trace	UTC	Unable To CCTV
CCC	Circular Conc Chamber	IBD	Internal Backdrop	UTDO	Unable To Determine Outfall
CL	Cover Level	IL	Invert Level	UTL	Unable To Lift
CPC	Circ Plastic Chamber	OH	Overhead	UTS	Unable To Survey
CrL	Crown Level	PDR	Poor Depth Response	UTT	Unable To Trace
CU	Camera Under Water	RB	Rest Bend	WL	Water Level

- BT — BT CABLE(S)
- O/BT — OVERHEAD BT CABLE(S)
- COM — COMMUNICATIONS CABLE(S)
- CTV — CABLE TV CABLE(S)
- DUCT — EMPTY DUCT
- E — ELECTRIC CABLE(S)
- O/E — OVERHEAD ELECTRIC CABLE(S)
- FO — FIBREOPTIC CABLE(S)
- FUEL — FUEL PIPE(S)
- GM — GAS MAIN
- GS — GAS SERVICE
- GPR — GROUND PENETRATING RADAR (GPR) TRACE
- HW — HOT WATER PIPE
- LC — LIGHTING CIRCUIT
- OIL — OIL PIPE(S)
- SCAR — VISIBLE SCARRING
- SEC — SECURITY CABLING
- TC — TELECOM CABLE(S)
- TS — TRAFFIC SIGNAL
- UIS — UNIDENTIFIED SERVICE
- UIT — UNIDENTIFIED TRACE
- WM — WATER MAIN
- WS — WATER SERVICE
- CW — COMBINED SEWER
- CW RM — COMBINED WATER RISING MAIN
- EW — EFFLUENT WATER
- FOUL SEWER
- FW RM — FOUL WATER RISING MAIN
- RM — RISING MAIN
- SURFACE WATER SEWER
- SW RM — SURFACE WATER RISING MAIN
- INVESTIGATION EXTENTS

Note: ...... UTILITIES COMMENT BOX (GENERAL NOTES)
d0.37m DEPTH TO SERVICE
??-AC AUDIBLE CONNECTION
??-AG SERVICE ABOVE GROUND
??-CU CAMERA UNDER WATER
??-OH SERVICE OVERHEAD

NORTH Indicative

DRAWING NOTES

All below ground details shown have been identified from above ground without excavation. Survey Solution use electro-magnetic and/or ground penetrating radar (GPR) methods to investigate for underground utilities, services and features. Results using these methods are not infallible and we recommend trial excavations are carried out for verification of positions, depths and identification.

Any areas on the drawing where services or features have not been shown are not necessarily clear of services or features but are an indication that no items have been identified during our investigations. All reasonable care and normal good practice should still be employed during design and construction processes.

Certain types of services such as plastic or concrete pipes, some conduit and ducting where direct access can not be achieved for tracing may not be shown and alternative locating methods should be used.

Survey Solutions has used all reasonable care to research available service records but the completeness or use of the service records supplied to or by Survey Solutions cannot be guaranteed. Therefore Survey Solutions cannot be held responsible for any features annotated as 'taken from records' (TFR).

Depths obtained using electro-magnetic or GPR are effected by ground conditions and should be treated as indicative only. Electro-magnetic depths to utilities and services are generally taken to the centre of a feature, GPR depths to the top of a feature and drainage depth shown to inverts, unless otherwise indicated.

Drainage pipe sizes will be obtained without entering the chamber and therefore should be treated as approximate. Pipe dimensions which have not been obtained visually will be taken from records when available.

All services, drainage and utilities routes are assumed straight between access points, unless otherwise stated. The numbers of cables in runs will not be shown unless specifically requested. All services are below ground unless indicated.

Services, utilities and features may not have been surveyed if obstructed or not reasonably visible or accessible at the time of survey.

Survey Solutions accept no responsibility for the completeness or accuracy of either the topographical survey or base mapping on this project.

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GENERAL SYNOPSIS

This survey has been carried out in accordance with PAS 128: 2014 & our version of the Royal Institution of Chartered Surveyors (RICS) specification for Measured Surveys of Land, Buildings and Utilities. Our survey extents have been agreed and confirmed with formal acceptance of 47661BWUG from THE HILL GROUP. If you have any queries regarding the final services layout, please may we ask you to carefully read all the information within this title block in its entirety before continuing to do so.

TOPOGRAPHICAL/.DWG DRAWING INFORMATION
TOPOGRAPHICAL SURVEY DATE 25/04/2023

SURVEY TYPE	DESCRIPTION	EFFECT ON SURVEY RESULTS
TOPO	Survey Solutions	None
OUTDATED		
OS		
NTS		

GENERAL SITE CONDITIONS
AVERAGE

ADDITIONAL INFORMATION	EFFECT ON SURVEY RESULTS
Busy Highway	Unable to fully survey the road.
Dense vegetation	Unable to fully survey some area's due to vegetation.
Reinforcement	Unable to fully GPR due to reinforced concrete.
Restricted access to building.	Limited survey data going into the building.

DESKTOP UTILITY RECORDS (PAS 128: 2014 SURVEY TYPE D)
PREREQUISITE FOR PAS 128: 2014 SURVEY TYPE B
COMMISSIONED: NO

UTILITY	AVAILABILITY	UTILITY COMPANY PROVIDER
SEWER	NO	N/A
WATER MAIN	NO	N/A
GAS MAIN	PUBLIC	SCOTISA GAS NETWORKS
TELECOM	PUBLIC	BT OPENREACH
CABLE TV	NO	N/A
ELECTRICITY	NO	N/A
OIL PIPES	NO	N/A
OTHER	NO	N/A

REV	DESCRIPTION	DRAWN	CHECKED	APPR	SURVEY DATE

SURVEY SOLUTIONS

LAND SURVEYING
BUILDING SURVEYING
UNDERGROUND SURVEYING
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IPSWICH BEDFORD COVENTRY GLASGOW LONDON MANCHESTER NORWICH NOTTINGHAM YEOVIL

PROJECT TITLE	MILTON PLACE CAR PARK, GRAVESEND, KENT, DA12 2PQ.
DRAWING DETAIL	UTILITIES AND CCTV DRAINAGE SURVEY. SHEET 1 OF 1
CLIENT	THE HILL GROUP
SCALE	1:250

SURVEYOR	SURVEY DATE	CHECKED BY	APPROVED BY	DWG STATUS
SD/RJB	04/05/2023	LJT	GSB	FINAL

DRAWING NUMBER	REVISION	ISSUE DATE
47661BWUG-01		23/05/2023

RICS chartered ices THE SURVEY ASSOCIATION ISO 9001 REGISTERED FIRM QMS ISO 14001 : 2015 REGISTERED

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Original Sheet Size A0H

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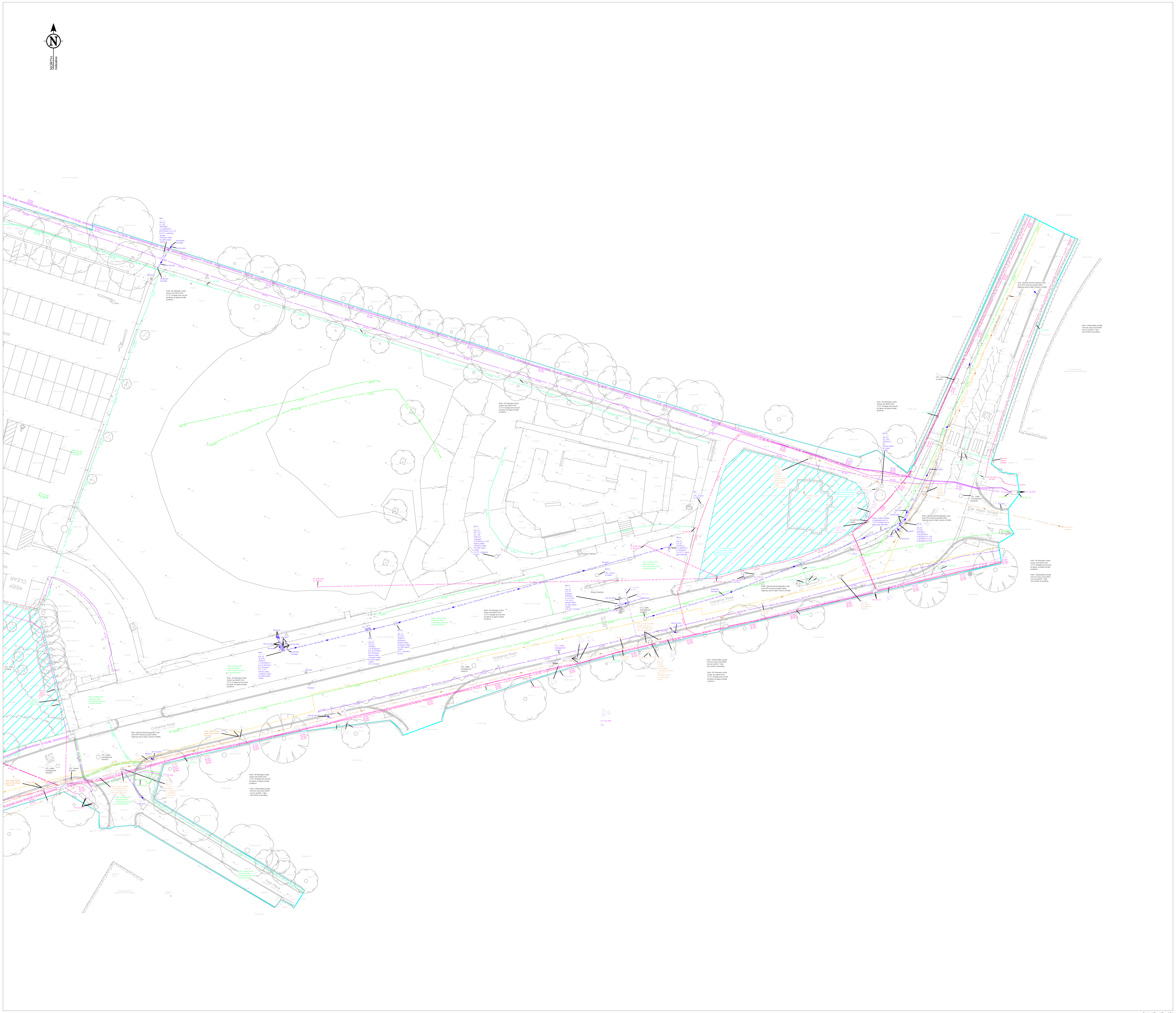
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CPC	Circ Plastic Chamber	OH	Overhead	UTS	Unable To Survey
CrL	Crown Level	PDR	Poor Depth Response	UTT	Unable To Trace
CU	Camera Under Water	RB ●	Rest Bend	WL	Water Level

Code	Service
BT	BT CABLE(S)
O/BT	OVERHEAD BT CABLE(S)
COM	COMMUNICATIONS CABLE(S)
CTV	CABLE TV CABLE(S)
DUCT	EMPTY DUCT
E	ELECTRIC CABLE(S)
O/E	OVERHEAD ELECTRIC CABLE(S)
FO	FIBREOPTIC CABLE(S)
FUEL	FUEL PIPE(S)
GM	GAS MAIN
GS	GAS SERVICE
GPR	GROUND PENETRATING RADAR (GPR) TRACE
HW	HOT WATER PIPE
LC	LIGHTING CIRCUIT
OIL	OIL PIPE(S)
SCAR	VISIBLE SCARRING
SEC	SECURITY CABLING
TC	TELECOM CABLE(S)
TS	TRAFFIC SIGNAL
UIS	UNIDENTIFIED SERVICE
UIT	UNIDENTIFIED TRACE
WM	WATER MAIN
WS	WATER SERVICE
CW	COMBINED SEWER
CW RM	COMBINED WATER RISING MAIN
EW	EFFLUENT WATER
	FOUL SEWER
FW RM	FOUL WATER RISING MAIN
RM	RISING MAIN
	SURFACE WATER SEWER
SW RM	SURFACE WATER RISING MAIN
	INVESTIGATION EXTENTS

Note: .... UTILITIES COMMENT BOX (GENERAL NOTES)
d0.37m DEPTH TO SERVICE
??-AC AUDIBLE CONNECTION
??-AG SERVICE ABOVE GROUND
??-CU CAMERA UNDER WATER
??-OH SERVICE OVERHEAD

NORTH Indicative

DRAWING NOTES

All below ground details shown have been identified from above ground without excavation. Survey Solution use electro-magnetic and/or ground penetrating radar (GPR) methods to investigate for underground utilities, services and features. Results using these methods are not infallible and we recommend trial excavations are carried out for verification of positions, depths and identification.

Any areas on the drawing where services or features have not been shown are not necessarily clear of services or features but are an indication that no items have been identified during our investigations. All reasonable care and normal good practice should still be employed during design and construction processes.

Certain types of services such as plastic or concrete pipes, some conduit and ducting where direct access can not be achieved for tracing may not be shown and alternative locating methods should be used.

Survey Solutions has used all reasonable care to research available service records but the completeness or use of the service records supplied to or by Survey Solutions cannot be guaranteed. Therefore Survey Solutions cannot be held responsible for any features annotated as 'taken from records' (TFR).

Depths obtained using electro-magnetic or GPR are effected by ground conditions and should be treated as indicative only. Electro-magnetic depths to utilities and services are generally taken to the centre of a feature, GPR depths to the top of a feature and drainage depth shown to inverts, unless otherwise indicated.

Drainage pipe sizes will be obtained without entering the chamber and therefore should be treated as approximate. Pipe dimensions which have not been obtained visually will be taken from records when available.

All services, drainage and utilities routes are assumed straight between access points, unless otherwise stated. The numbers of cables in runs will not be shown unless specifically requested. All services are below ground unless indicated.

Services, utilities and features may not have been surveyed if obstructed or not reasonably visible or accessible at the time of survey.

Survey Solutions accept no responsibility for the completeness or accuracy of either the topographical survey or base mapping on this project.

All critical dimensions and measurements should be checked and verified with any errors or discrepancies notified to Survey Solutions immediately. The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work.

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Do not scale from this drawing.

GENERAL SYNOPSIS

This survey has been carried out in accordance with PAS 128: 2014 & our version of the Royal Institution of Chartered Surveyors (RICS) specification for Measured Surveys of Land, Buildings and Utilities. Our survey extents have been agreed and confirmed with formal acceptance of 47661BWUG from THE HILL GROUP. If you have any queries regarding the final services layout, please may we ask you to carefully read all the information within this title block in its entirety before continuing to do so.

TOPOGRAPHICAL/.DWG DRAWING INFORMATION
TOPOGRAPHICAL SURVEY DATE 25/04/2023

SURVEY TYPE	DESCRIPTION	EFFECT ON SURVEY RESULTS
TOPO	Survey Solutions	None
OUTDATED		
OS		
NTS		

GENERAL SITE CONDITIONS
AVERAGE

ADDITIONAL INFORMATION	EFFECT ON SURVEY RESULTS
Busy Highway	Unable to fully survey the road.
Dense vegetation	Unable to fully survey some area's due to vegetation.
Reinforcement	Unable to fully GPR due to reinforced concrete.
Restricted access to building.	Limited survey data going into the building.

DESKTOP UTILITY RECORDS (PAS 128: 2014 SURVEY TYPE D)
PREREQUISITE FOR PAS 128: 2014 SURVEY TYPE B
COMMISSIONED: NO

UTILITY	AVAILABILITY	UTILITY COMPANY PROVIDER
SEWER	NO	N/A
WATER MAIN	NO	N/A
GAS MAIN	PUBLIC	SCOTISA GAS NETWORKS
TELECOM	PUBLIC	BT OPENREACH
CABLE TV	NO	N/A
ELECTRICITY	NO	N/A
OIL PIPES	NO	N/A
OTHER	NO	N/A

REV	DESCRIPTION	DRAWN	CHECKED	APPR	SURVEY DATE

SURVEY SOLUTIONS
LAND SURVEYING
BUILDING SURVEYING
UNDERGROUND SURVEYING
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MONITORING
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PROJECT TITLE MILTON PLACE CAR PARK, GRAVESEND, KENT, DA12 2PQ.				
DRAWING DETAIL UTILITIES AND CCTV DRAINAGE SURVEY. SHEET 1 OF 1				
CLIENT THE HILL GROUP				SCALE 1:250
SURVEYOR SD/RJB	SURVEY DATE 04/05/2023	CHECKED BY LJT	APPROVED BY GSB	DWG STATUS FINAL
DRAWING NUMBER 47661BWUG-02			REVISION	ISSUE DATE 23/05/2023

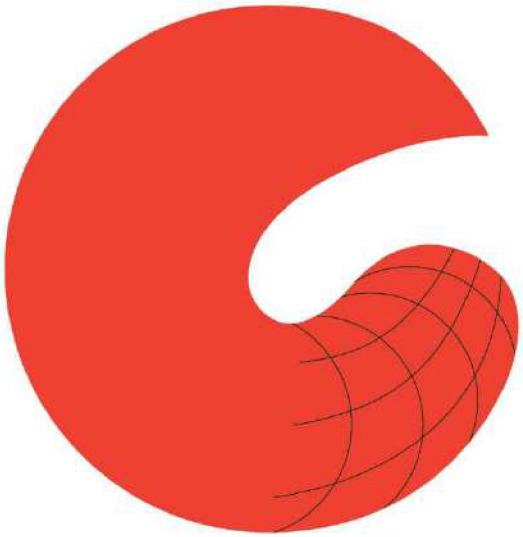
RICS chartered ices THE SURVEY ASSOCIATION ISO 9001 REGISTERED FIRM QMS ISO 14001 : 2015 REGISTERED

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Original Sheet Size A0H

APPENDIX C – Phase 2 Geo-Environmental Assessment

Phase 2 geo-environmental assessment, reference number AW/CS/P23/2862/02 DRAFT, dated: July 2023.



create
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MILTON PLACE, GRAVESEND

Phase 2 Geo-Environmental Assessment

MILTON PLACE, GRAVESEND

Phase 2 Geo-Environmental Assessment

MILTON PLACE, GRAVESEND
Phase 2 Geo-Environmental Assessment - DRAFT

DRAFT

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Approved By: Colin Buchanan BSc (Hons), FGS

Reference: AW/CS/P23/2862/02 DRAFT

Date: July 2023

MILTON PLACE, GRAVESEND
Phase 2 Geo-Environmental Assessment

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4.0 Review of Existing Information
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DRAFT

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F Geotechnical Plots
G Ground Gas Monitoring
H Soakage Test Results
I DCP Test Results

DRAFT

Registration of Amendments

Revision and Date	Amendment Details	Revision Prepared By	Revision Approved By

1.0 INTRODUCTION

Brief

1.1 Create Consulting Engineers Ltd (CCE) was instructed by the Hill Partnerships Ltd to undertake a Phase 2 Geo-Environmental Assessment of land off Milton Place (the 'Site') for residential end-use.

Project Context

1.2 The Client plans to submit a planning application to Gravesham Borough Council for development of the Site with 2No. five-storey and 2No. four-storey apartment blocks and 10No. 2/3-storey houses, with private gardens, associated car parking and areas of soft landscaping.

1.3 The proposed development layout is illustrated in Figure 1.1, below:

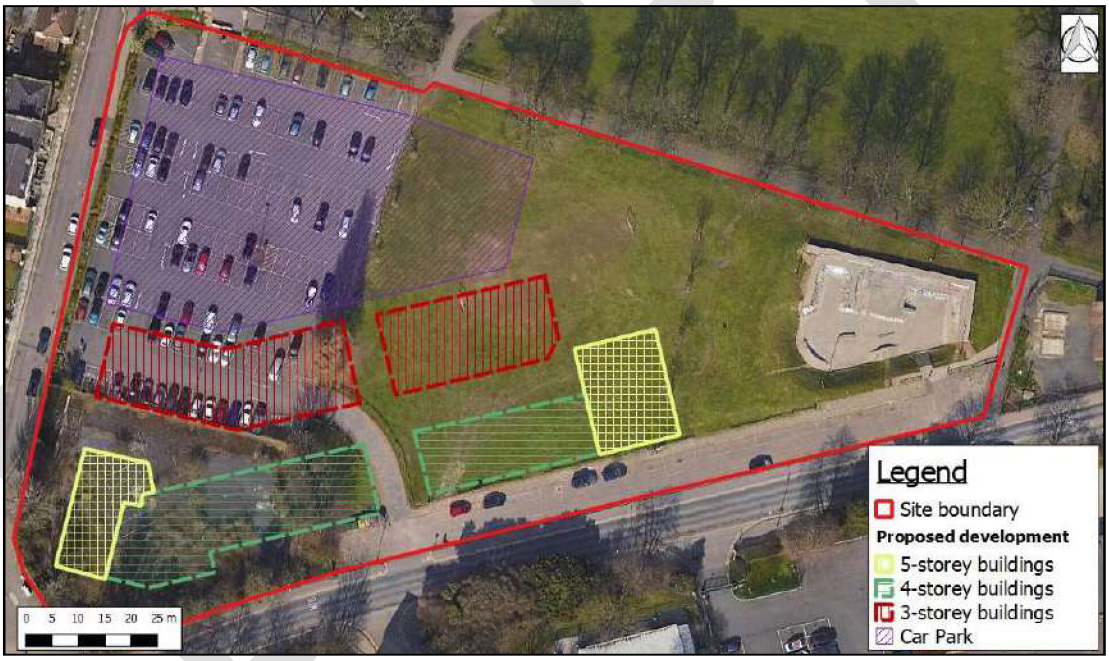


Figure 1.1: Proposed Development Layout

1.4 A Phase 1 Contamination Land Assessment was carried out by CCE in May 2023 (Ref: TB/VL/P23/2863/01) which highlighted a number of issues to be addressed.

Objectives

1.5 The objectives of the site investigation were as follows:

- Undertake a site investigation to quantify the potential source-receptor pollutant pathways as set out in the Phase 1 Contaminated Land Assessment report;

- Provide geotechnical parameters for the proposed development of the Site; and
- Assess the suitability for using soakaways for surface water disposal.

1.6 The geo-environmental investigation works were carried out in accordance with best practice and planning guidance such as that set out in the National Planning Policy Framework (2020), Environment Agency's Land Contamination Risk Management guidance (2021), BS5930:2015+A1:2020 - Code of practice for ground investigations, Eurocode 7: Geotechnical design and NHBC Standards 2011 Chapter 4.1: Land quality – managing ground conditions.

Scope of Work

1.7 The scope of works proposed for this assessment was as follows:

Geo-Environmental Site Investigation

- Drilling of 2No. cable percussive boreholes to 25.45m below ground level (or refusal) with hand-dug excavation pits to 1.0m for each borehole;
- Drilling of 5No. windowless sample boreholes to a maximum depth of 5.45m below ground level (or refusal) with hand-dug excavation pits to 1.0m for each borehole;
- During drilling of the boreholes, *in situ* (SPT) testing and disturbed sampling undertaken for laboratory analysis;
- Standpipes to be installed in the windowless sample boreholes to allow subsequent groundwater level and gas monitoring;
- Excavation 6No. machine excavated trial pits to help determine the potential for sustainable drainage (SUDS) across the Site;
- Excavation of 2No. machine excavated trial pits to help determine the former swimming pool wall location;
- Excavation of 2No. hand dug trial pits to obtain soil samples from areas inaccessible to the machine excavator;
- Undertaking of 3No. dynamic cone penetrometer (DCP) tests across the areas of the Site proposed for future access roads/gar parking to establish the strength profile of the soils;
- Soil samples collected and submitted to UKAS accredited testing laboratory for classification, strength, CBR and aggressiveness to concrete tests;
- Soil samples collected and submitted to an M-CERTS accredited testing laboratory for chemical testing for a standard suite or organic and inorganic parameters;
- Ground Gas and groundwater level monitoring to be undertaken on completion of the site works on 3No. occasions; and
- A summary interpretative report prepared on completion of the works and subsequent laboratory testing.

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Constraints and Limitations

1.8 The copyright of this report is vested in Create Consulting Engineers Limited and the Client, Hill Partnerships Limited. The Client, or their appointed representatives, may copy the report for purposes in connection with the development described herein. It shall not be copied by any other party or used for any other purposes without the written consent of Create Consulting Engineers Limited or the Client.

1.9 Create Consulting Engineers Limited accepts no responsibility whatsoever to other parties to whom this report, or any part thereof, is made known. Any such other parties rely upon the report at their own risk.

1.10 Create Consulting Engineers Limited has endeavoured to assess all information provided to them during this appraisal. Should additional information become available which may affect the opinions expressed in this report, Create Consulting reserves the right to review this information and, if warranted, to modify the opinions presented in the report accordingly.

1.11 The report summarises information from a number of external sources and is unable to offer any guarantees or warranties for the completeness or accuracy of information relied upon. Information from third parties has not been verified by Create Consulting Engineers Limited unless otherwise stated in this report.

1.12 The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

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2.0 SITE LOCATION AND DESCRIPTION

Site Location

2.1 The Site is located approximately 620m east of Gravesend mainline train station and 260m south of the River Thames. The Site can be centred at National Grid reference 565285.3, 174113.5 and the nearest postcode is DA12 2BT.

2.2 The approximate location of the Site is provided as Figure 2.1 below:

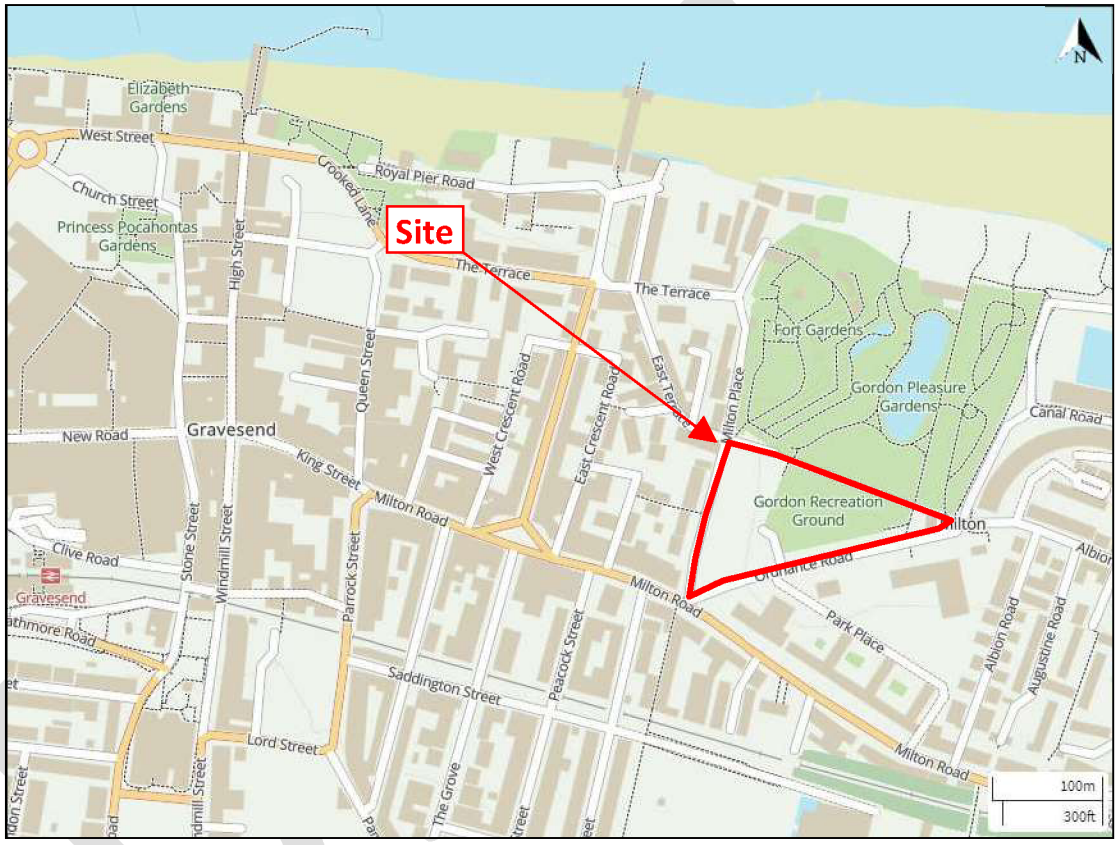


Figure 2.1: Site Location Plan (Geoindex, 2019)

Site Description

2.3 Access to the Site was gained off Ordnance Road to the south, via the strip of hardstanding utilised for car parking within the southern boundary.

2.4 The Site comprised several distinct areas: parking strip within the southern boundary; skate park within the eastern corner; playing field within the central section of the Site, area of mounded earth between the skate park and playing field; recycling bins adjacent to the Site entrance; car park within the northwest section of the Site and fenced area of hardstanding (former car parking) within the southwest corner.

2.5 The Site was generally level. However, the skate park was set approximately 1.0m below Site level. The mounded earth adjacent to the skate park was approximately 1.0m to 1.5m above Site level. The car park within the northwest section of the Site was approximately 0.5m below the level of Milton Road to the west.

2.6 A row of mature sycamore trees were located within the Site's northern boundary. A row of immature sycamore trees were located between the mounded earth and the central playing field. A mature poplar tree was located between the central playing field and the car park and mature trees and shrubs were located around the perimeter of the fenced off area of hardstanding in the southwest corner of the Site.

2.7 The Site was bound to the north by parkland, to the east and west by a residential areas, with a derelict building adjacent to the eastern corner of the Site. High street shops, restaurants and a petrol filling station were located to the southwest. Beyond Ordnance Road to the south were Chantry Community Academy, a nursery (Little Pebbles Childrens Centre) and Gravesend telephone exchange.

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3.0 ENVIRONMENTAL SETTING

Geology

3.1 Reference has been made to the British Geological Survey (BGS) plans of the area (Sheet 271, Dartford, solid and drift edition, dated 1998), which indicates the Site is underlain by superficial deposits of 'Head'. The superficial deposits are indicated to be underlain by solid strata of the Lewis Nodular Chalk Formation.

3.2 Made ground is recorded 40m north of the Site. Superficial deposits of 'Alluvium' are recorded 40m north of the Site. No faults are indicated within influencing distance of the Site.

Hydrogeology

3.3 The Head deposits are classified by the Environment Agency (EA) as A '*Secondary Undifferentiated*', where possible assigned to Category A or B. This an aquifer of varying characteristics, previously designated as either major or minor aquifer.

3.4 The Lewis Nodular Chalk Formation is classed as a '*Principal Aquifer*' with high level of water storage and may support water supply/river base flow on a strategic scale.

3.5 The Site does not fall within a Source Protection Zone with regards to groundwater. A single active potable groundwater abstraction (785m south) was located within a 2km radius of the Site.

Hydrology and Flooding

3.6 The River Thames was located 250m north of the Site. A dock linked to the River Thames was located 190m northeast of the Site. A pond was located 55m north of the Site.

3.7 The EA Flood Maps indicate the Site is at '*moderate to high*' risk of flooding from groundwater, rivers or the sea.

Sensitivity

3.8 The sensitivity of each of the identified receptors is rated depending upon the environmental setting of the Site, the likelihood for pollutant linkages to be present and potential consequence of those potential pollutant linkages. The assessment approach adopted is based on guidance set out in the *Guidance for the Safe Development of Housing on Land Affected by Contamination R&D 66* document.

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3.9 The site sensitivity with regards to groundwater within the superficial Head and bedrock Chalk is designated as **M1 (Moderately High)**, described as a '*Recognised major or minor aquifer, moderately vulnerable, with probable use (either direct or via baseflow to a sensitive watercourse). Within formal protection zone or catchment of authorised abstractions for potable or other high quality uses. Minor, short-term releases of contaminants may be tolerable*'. This reflects the vulnerability of the underlying bedrock aquifer as well as the use of groundwater within influencing distance of the Site.

3.10 The Site sensitivity to surface water is designated as **L1 (Low)**, described as '*Within catchment of and over 250m from generally poor quality watercourse (GQA E or F) that is unlikely to improved by current or foreseeable surface water quality objectives or at distance (over 1000m) from a good quality watercourse with no interconnecting drains or baseflow from fissured strata.*'. This reflects the distance of the Site from the River Thames and potential to influence surface water catchment.

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4.0 REVIEW OF EXISTING INFORMATION

Phase 1 Contaminated Land Assessment, CCE (Ref: TB/VL/P23/2863/01) dated May 2023.

4.1 A Phase 1 Contaminated Land Assessment was carried out by CCE to support a planning proposal for the redevelopment of the Site to residential end-use.

4.2 The environmental sensitivity of the site has been assessed as moderately high with respect to groundwater and low with respect to surface water.

4.3 A number of potential pollutant linkages were identified associated with the proposed end-use. The key potential contamination sources identified in the Conceptual Site Model were:

- Potential poor quality Made Ground from former Site-use (swimming pools/structures including church/school/swimming pool structures);
- Potential for ground gas to be present (infilled former swimming pool);
- Potential for PCBs and hydrocarbons to be present from former substation;
- Potential for off-site sources of contamination (works/garages/smithy/industrial estates);
- Potential presence of Radon Gas; and
- Potential presence of Unexploded Ordnance (UXO) beneath the Site.

4.4 The potential presence of contamination arising from the historical/current use of the Site is considered to be low and to pose a **moderate/low risk** to future end-users and buildings and services (water supply pipes).

4.5 The potential presence of contamination migrating onto Site from historical and current land-use in the surrounding area is considered to be unlikely and to pose a **low risk** to future end-users.

4.6 The risk to end-users from the potential presence of ground gas from underlying poor quality Made Ground present nearby infilled land is considered to be **moderate/low**.

4.7 Any exposure risk to construction workers associated with contamination has been assessed as **low** on the basis that the use of standard PPE would mitigate any exposure risk.

4.8 The risk posed to groundwater and surface water from potential on-site contamination is considered to be **very low** on the basis that there are no identified mobile contaminants on Site and given the historical Site-use.

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4.9 In order to manage the uncertainty associated with these potential ground contamination sources, a site investigation was recommended to include any Made Ground and shallow soils and, depending on the findings, ground gas monitoring.

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5.0 GROUND INVESTIGATION

5.1 Ground investigation works were undertaken at the Site between the 22nd and 25th May 2023, as outlined in the following paragraphs.

5.2 The borehole locations were selected to provide information on ground conditions in each area of the Site as well as to target specific areas of potential ground contamination, as follows:

- To establish the ground conditions beneath each of the former / current car parking areas in the northwest and southwest;
- To establish the nature and extent of Made Ground across the soft landscaped areas in the east;
- Establish the nature and extent of fill materials used to infill the former swimming pool;
- Establish the nature of the mounded material adjacent to the skate park; and
- Establish the ground conditions in the vicinity of the former electricity substation in the eastern corner of the Site.

Description of Fieldwork

5.3 The scope of initial works undertaken was as follows:

- Drilling of 2No. cable percussive boreholes (BH01 and BH02) to a depth of 25.45m bgl to determine ground and groundwater conditions, provide *in situ* soil strength information (SPTs) and enable the collection of soils samples for chemical and geotechnical testing, installation of groundwater and ground gas monitoring standpipe (BH02);
- Drilling of 6No. windowless sample boreholes (WS01, WS01A to WS05) to a maximum depth of 5.45m bgl to determine ground and groundwater conditions, provide *in situ* soil strength information (SPTs), enable the collection of soils samples for chemical and geotechnical testing and the installation of groundwater and ground gas monitoring standpipes (WS01A, WS02 and WS04);
- Excavation 6No. machine excavated trial pits (TP01 to TP06) to help determine the potential for sustainable drainage (SUDS) across the Site;
- Excavation 2No. machine excavated trial pits (TP07 and TP08) to locate the former swimming pool wall;
- Excavation of 2No. hand-dug pits to collect samples for laboratory chemical analysis (HP01 and HP02);
- Undertaking of 3No. dynamic cone penetrometer (DCP) tests across the areas of the Site (TP02, TP04 and TP05) proposed for access roads and car parking;
- Chemical laboratory testing of Made Ground and natural soils beneath the Site;
- Geotechnical laboratory testing of soil samples beneath the Site; and

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- Ground gas monitoring on 3No. occasions (using an infrared gas analyser GA5000 and MiniRae 3000) to assess for the presence of ground gas.

5.4 An Exploratory Hole Location Plan is presented within Appendix A.

5.5 The soil arisings from each borehole and trial pit were logged by a suitably qualified Engineer, in line with the relevant British Standard (BS 5930 and Eurocode 7). The exploratory hole logs are included within Appendix B.

5.6 All works were undertaken in accordance with the CCE Health and Safety Policy and within the framework of a Health and Safety plan.

Environmental Laboratory Testing

5.7 Soil samples were collected from the Made Ground and underlying natural soils at various locations and depths across the site and submitted for chemical and aggressiveness to concrete testing (BRE SD1 Suite – Greenfield) at a UKAS/MCERTS accredited laboratory.

5.8 Samples for contamination analysis were collected in suitable amber glass 250ml jars and 60ml vials as well as 1ltr plastic tubs using clean nitrile gloves to avoid any cross-contamination between samples.

5.9 All samples were transported under chain of custody documentation and tested for a range of inorganic and organic compounds. Cool boxes were kept cool (<4°C) with ice packs during sample collection and subsequent transportation by courier to the testing laboratory.

5.10 The chemical testing comprised (total and leachate testing for a range of organic and inorganic parameters including asbestos, metals, petroleum hydrocarbons (TPH CWG) and speciated polyaromatic hydrocarbons (PAHs). In addition, two samples of made ground (outside the infilled swimming pool) were submitted for Waste Acceptance Criteria (WAC) testing.

5.11 The laboratory test certificates are included as Appendix D.

Geotechnical Laboratory Testing

5.12 Selected soil samples were subjected to testing within a UKAS accredited geotechnical laboratory. The results of this testing, along with laboratory certificates are included as Appendix E. Testing included:

- Moisture content;
- Plasticity index;
- Point load index;
- Saturation moisture content;

- Intact dry density; and
- California Bearing Ratio (CBR).

Ground Gas Monitoring

5.13 On completion of the fieldwork, a ground gas monitoring visit was undertaken on 3No. occasions to determine the presence of ground gas at the Site and to assess whether the deeper infilled ground of the former swimming pool had the potential to generate ground gas.

5.14 Measurements of methane, carbon dioxide, oxygen as well as gas flow were taken from each monitoring well using a GA5000 infra-red gas analyser with flow pod.

5.15 Following measurement of ground gas concentration and flow levels, standing groundwater levels and the total depth of selected monitoring wells were recorded using a dipmeter.

5.16 The ground gas monitoring and groundwater level measurements are presented in Appendix G and discussed in Section 7.

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6.0 GROUND CONDITIONS

6.1 The encountered ground conditions are summarised below and provided in detail within the exploratory hole logs (Appendix B), photographs of exploratory holes (Appendix C) laboratory geotechnical test results (Appendix E) and geotechnical plots (Appendix F).

General

6.2 The ground investigation comprised a total of 18No. exploratory holes (BH01 and BH02, WS01, WS01A to WS05, TP01 to TP08 and HP01 to HP02), formed in accessible locations across the Site and targeting the proposed development. An exploratory hole location plan (drawing ref. P23-2863-10) is presented within Appendix A.

6.3 The ground investigation was designed to provide a general indication of ground conditions across the Site, collect samples for laboratory geotechnical and chemical testing, undertake soakage testing to assess the potential for sustainable drainage (TP01, TP04 and TP06) and permeable paving (TP02, TP03 and TP05) and install monitoring standpipes to enable ground gas and groundwater monitoring (BH02, WS01A, WS02 and WS04).

6.4 The following paragraphs provide a summary of ground conditions encountered during the ground investigation.

Hardstanding

6.5 Tarmacadam hardstanding was encountered during the formation of 2No. exploratory holes: BH02 and WS02 to depths of 0.10m and 0.05m below ground level (m bgl), respectively.

Topsoil

6.6 Within areas of soft landscaping, Topsoil was recorded to a maximum depth of 0.15m bgl, but generally to 0.10m bgl. The base of the Topsoil was marked with a layer of brown fine to medium sand.

Made Ground

6.7 Made Ground was recorded across the Site to depths of between 0.20m and 3.45m bgl, but generally to depths of less than 1.0m bgl. The Made Ground was generally described as '*brown slightly silty slightly sandy angular to subrounded fine to medium flint and chalk gravel with concrete and brick. Trace ash'*. Brick and glass were also encountered in the shallow Made Ground in the centre of the Site (TP01, TP02 and WS04).

6.8 A total of 4No. *in situ* SPT test were carried out within the Made Ground recording N-values in the range of N = 16 to N= 54, as detailed in the SPT depth plot, Appendix F.

6.9 Laboratory geotechnical tests undertaken on recovered Made Ground samples included 3No. CBRs, 3No. bulk density tests, 4No. moisture content tests, 1No. saturation moisture content (SMC) tests and 1No. dry density tests, as summarised in Table 6.1, below.

Table 6.1: Summary of Laboratory Geotechnical Testing – Made Ground

Laboratory test	No. of Tests	Result Range
Moisture Content	4	17% to 23%
Dry Density (Chalk material)	1	1.51Mg/m^3
Saturation Moisture Content (Chalk material)	1	29%
Bulk Density	3	1.81Mg/m^3, 1.89Mg/m^3 and 2.04Mg/m^3
CBR	3	2.4%, 3.2% and 7.1%
Ph	8	6.1 to 11
SO_4	8	15mg/l to 140mg/l

Former Swimming Pool

6.10 The former swimming pool was located within the central section of the Site, see Constraints Plan (P23-2863-11, Appendix A). Exploratory holes WS01, WS01A were used to determine the depth to base of the former pool, while exploratory holes TP07 and TP08 were positioned to determine whether the former pool walls remained in place.

6.11 Exploratory hole WS01 refused on reinforced concrete at 0.40m bgl, possibly the former swimming pool wall, see Plate P1, Appendix C.

6.12 Exploratory hole WS01A recorded backfill material to 2.90m bgl, where a flat concrete surface was encountered, interpreted as being the base of the former pool. WS01A recorded a refusal at 3.45m bgl, within the Made Ground.

6.13 TP07 did not locate the pool wall. Hence, TP08 was undertaken, encountering concrete at 0.50m, which stepped down, as detailed in Plate P2, Appendix C.

6.14 The Made Ground within the infilled swimming pool predominantly comprised demolition materials, presumably the former municipal building material formerly surveyed on the Site when the swimming pool was operational. The infilled material generally comprised fine to coarse gravel sized concrete and brick fragments with further cobbles and boulders of concrete in a brown silty sandy matrix. The deeper materials comprised brown red and back chalk, brick and concrete fragments with trace ash and dark grey clay horizons.

Head

6.15 Soils considered to represent Head were recorded to depths of between 0.35m and 2.40m bgl, within the central and southern sections of the Site. These deposits increased in depth towards the eastern half of the Site.

6.16 The Head deposits were generally described as '*soft brown silty clay, with occasional fine to medium flint subrounded gravel*'. A total of 3No. in-situ SPT strength tests were undertaken within the Head, recording N-values in the range of N=3 to N=11, confirming the very soft to soft nature of the material.

6.17 Laboratory geotechnical testing of Head samples included 3No. moisture content and 3No. plasticity tests, as summarised in Table 6.2, below.

Table 6.2: Summary of Laboratory Geotechnical Testing – Head Deposits

Laboratory test	No. of Tests	Result Range
Moisture Content	3	16.4% to 18.1%
Modified Plasticity	3	17% to 24%
Ph	1	8.1
SO_4	1	12mg/l

Lewis Nodular Chalk Formation

6.18 The Made Ground / Head deposits were underlain by the Lewis Nodular Chalk Formation, across the Site, to the maximum extent of the boreholes (25.45m bgl). The Chalk was generally described as a *'structureless Chalk, recovered as cream, mottled white, silty subrounded to angular fine to coarse flint and Chalk gravel. With occasional cobbles of flint.'*. Light brown silt infill of fissures was noted to depths of between 2.0m and 3.90m bgl.

6.19 A total of 46No. SPT tests were undertaken within the Chalk, with corrected SPT N-values in the range of N_{60} = 7 to N_{60} = 63, but were generally greater than N=10 and were seen to increase in strength with depth, as detailed in the SPT depth plot, Appendix F.

6.20 Laboratory geotechnical test results of Site won Lewis Nodular Chalk Formation are summarised in Table 6.1, below, with laboratory test certificates presented in Appendix E.

Table 6.3: Summary of Laboratory Geotechnical Testing – Chalk

Laboratory test	No. of Tests	Result Range
Moisture Content	8	27.1% to 35.6%
Dry Density (Chalk material)	8	1.42Mg/m^3 to 1.57Mg/m^3
Saturation Moisture Content	8	27% to 33%
Point Load Index $I_{\delta(50)}$	9	0.06MPa to 0.14MPa
Ph	9	8.1 to 9.8
SO_4	9	10mg/l to 43mg/l

6.21 The laboratory geotechnical test results indicate the Chalk is of '**low density**', becoming medium dense at depths of greater than twenty metres below ground level.

Groundwater

6.22 During exploratory hole groundwater strikes were recorded within the Chalk from 7.0m bgl. Subsequent monitoring of installed standpipes, on 3No. occasions, recorded standing groundwater levels at a depth of approximately 9.0m bgl.

Visual and Olfactory Observations of Contamination

6.23 No visual or olfactory evidence of contamination was identified during exploratory hole formation across the Site.

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7.0 CONTAMINATION ASSESSMENT

Soil Contamination

7.1 The soil characteristics have been assessed with reference to Land Quality Management (LQM)/Chartered Institute of Environmental Health (CIEH) 'Suitable 4 Use Levels' (S4ULs) for human health risk assessment 2015). In the case of lead a DEFRA Category 4 Screening Level has been adopted.

7.2 A Tier 1 (semi-quantitative) risk assessment has been undertaken comparing soil chemical testing results against current and appropriate published guidelines for residential end-use with home grown produce and as a conservative measure, using the minimum soil organic matter (SOM) result (minimum recorded value from across the Site was 0.6%) for quantifying the assessment criteria for organic components. In the case of heavy metals, the 1.0% SOM criteria has been utilised.

7.3 This assessment, along with the laboratory test certificates, are provided in Appendix D.

Tier 1 Human Health Assessment

7.4 All of the contaminants of concern underlying the Site were confirmed as being less than the assessment criteria (SSAC) in the samples collected and tested, with the exception of the following a concentration of Lead within the infilled swimming pool materials. No asbestos was detected within any of the samples collected and tested.

7.5 A more detailed assessment of the ground conditions in each area are provide below.

Soft Landscaped Area (East)

7.6 Made Ground encountered across the soft landscaped area in the east of the Site generally comprised reworked natural ground materials Head and Chalk) along with anthropogenic materials such as brick and concrete fragments. However, fragments of glass and metals were encountered in the shallow Made Ground in the western part of this area (TP01, TP02 and WS04).

7.7 All of the contaminants of concern underlying this area of the Site were confirmed as being less than SSACs and asbestos was not detected within any of the samples collected and tested. Trace concentrations of Polyaromatic Hydrocarbons were identified in the Made Ground materials.

7.8 A hand pit (HP01) was formed in the mounded area to the west of the skate park and identified the material as reworked natural ground materials (gravelly sandy silt with chalk gravel) with

brick fragments. All of the contaminants of concern were confirmed as being less than SSACs and asbestos was not detected in the sample collected from this material.

7.9 A hand pit (HP02) was formed in the vicinity of the former electrical substation in the eastern corner of the Site. The Made Ground material present comprised reworked natural ground materials (gravelly sandy silt with chalk gravel) with brick and clinker fragments. The ample collected was submitted for Total Petroleum Hydrocarbons and Polychlorinated Biphenyls and neither were detected above laboratory detection limits.

Hard Landscaped Parking Areas (West)

7.10 Made Ground across the current / former car parking areas in the west of the Site generally brick / limestone gravel hard core over reworked Made Ground. Borehole BH02, located in the centre of the southwest area, encountered deeper Made Ground and cobbles of brick, limestone and concrete to a depth of 2m bgl. It is likely that this represents remnant foundations of the old church formerly present in this area.

7.11 All of the contaminants of concern were confirmed as being less than SSACs and asbestos was not detected in the sample collected from this material. No evidence of Total Petroleum Hydrocarbons were identified and only trace concentrations of Polyaromatic Hydrocarbons were detected.

Infilled Swimming Pool

7.12 The below ground swimming pool formerly occupying the central area of the Site was visibly still present through die back of the grass that now covers this area. A number of exploratory holes were formed across the area (WS01, WS101A, TP07 and TP08) and confirmed that the structure remains in-situ with a depth of at least 3m.

7.13 The Made Ground materials identified within the of the structure generally comprised demolition material (presumably the former municipal buildings present at the time of the swimming pool across this area) comprising concrete and brick fragments, cobbles and boulders in a brown sandy silty soil matrix. Traces of ash and clay lenses were also encountered.

7.14 All of the contaminants of concern identified within this infilled material were less than the assessment criteria (SSAC) in the sample collected and tested from this material, with the exception of Lead. Lead was present at a concentration of 550 mg/kg, which exceeds the residential end-use SSAC of 200 mg/kg. In addition, elevated concentrations of Petroleum Hydrocarbons (Aromatic & Aliphatic, C12-C35) were identified (300 mg/kg) although not at concentrations that exceeded the respective SSACs.

7.15 No asbestos was detected within the sample collected and tested from this material. However, the buildings formerly present on this Site were constructed in c. 1950s and would likely have incorporated asbestos-containing materials (ACMs). If these buildings are the origin of the demolition materials currently present in the swimming pool structure, it is considered likely that they will contain ACMs.

Controlled Water Health Assessment

7.16 A sample collected from the general Made Ground (BH01) encountered across the Site and the infill materials identified within the former swimming pool structure (WS01A) were submitted for soil leachate testing for a range of organic and inorganic determinants.

7.17 A GQRA has been undertaken comparing the soil leachate chemical testing results against current and appropriate published guidelines for Water Supply (Water Quality) Regulations, 2000 and this is provided in Appendix D.

7.18 Neither of the samples collected exceeded the respective SSACs available with the exception of Petroleum Hydrocarbons (Aliphatic C5-C8) which was present at a concentration of 820µg/l and exceeded the drinking water standard of 300µg/l. This represents petrol range hydrocarbons, and although not the same sample depth is different to the hydrocarbons identified in the soil total test which was heavier chain hydrocarbons (C12-C35).

7.19 Negligible / trace leachable concentrations of Polyaromatic Hydrocarbons were confirmed to be present in the sample tested.

Waste Acceptance Criteria

7.20 Waste acceptance criteria (WAC) testing was undertaken on 2No. samples of general Made Ground across the Site, collected from TP04 and WS04.

7.21 A slightly elevated percentage of total organic carbon (3.2%) was recorded on one of the samples, which exceeds the limit value of 3.0% and would classify this as Stable Non-Reactive Hazardous Waste (SNRHW). However, the other sample was confirmed to be 1.6%.

7.22 Prior to off-site disposal, further test results should be presented to the receiving landfill of all the materials including the swimming pool infill materials and confirming the waste classification. It is considered likely, however, that most materials would be classified as either Inert or SNRHW.

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Ground Gas Monitoring

7.23 On the basis of the Conceptual Site Model prepared in the Phase 1 Assessment, a low to moderate potential ground gas risk was identified related potential poor quality Made Ground across the Site.

7.24 Historical records indicate the former swimming pool was backfilled by 1982. Exploratory hole WS01A located within the former swimming pool recorded Made Ground to a depth of 3.40m bgl, terminating due to a refusal, still within the Made Ground. No organic material was recorded within exploratory holes formed within the former swimming pool.

7.25 Outwith the former swimming pool, BH02 encountered foundations associated with the former Church, recording Made Ground to 2.0m bgl. Generally, Made Ground soils were recorded to depths of less than 1.0m bgl across the Site.

7.26 Ground gas monitoring visit was undertaken between 9th and 29th June 2023, to provide an assessment of the ground gas at the Site.

7.27 The ground gas monitoring recorded the following:

- Methane (CH_4) recorded at 0.0% by volume;
- Carbon dioxide (CO_2) recorded at between 0.2% and 2.3% by volume;
- Oxygen (O_2) recorded at 20.3% to 17.7% by volume; and
- Gas flows recorded from 0.0l/hr to 0.3l/hr.

7.28 The results of the ground gas monitoring visits are provided in Appendix G.

Ground Gas Risk Assessment

7.29 The assessment of gas risk uses the gas concentrations present and the flow rate measured, which gives a gas screening value (GSV). Using this method and the worst-case measurements (Ref: BS 8485: 2015+A1:2019), the GSV for the areas identified across this Site have been established and a gas risk rating assigned in accordance with the 'traffic light' system outlined in the NHBC Guidance on Evaluation of Development Proposals on sites where Methane and Carbon Dioxide are present (March 2007).

7.30 The 'traffic light' system enables the assessment of derived GSVs against pre-determined gas screening values, as well as consideration to typical maximum concentrations, for methane and carbon dioxide. The screening values and typical maximum concentrations along with the gas protection measures required are outlined in Table 1 and 2 in Appendix G.

7.31 The worst case GSVs have been determined using the highest gas concentrations detected and the highest gas flow measured (0.3l/hr) on the site using the monitoring results and the worst case GSVs are:

- Methane (0.0%) x gas flow (0.3l/hr) gives a GSV of 0.00; and
- Carbon Dioxide (2.3%) x gas flow (0.3l/hr) gives a GSV of 0.0069.

7.32 These GSVs, which represent the worst-case ground gas risk on the Site, indicate an NHBC 'green' classification (and Characteristic Situation 1, BS 8485:2019) with the GSVs an order of magnitude lower than the triggers for ground gas protection measures (Amber 1/Characteristic Situation 2), see Table 1 in Appendix G.

7.33 Current guidance for ground gas monitoring is to provide a minimum of 6No. measurements over a period of three months, with at least one of the visits undertaken during low (<1005mb) or falling atmospheric conditions to establish ground gas regime. However, with very low flows and negligible concentrations of ground gas recorded, it is considered that no further gas monitoring is required and that ground gas protections are not required for this development.

Updated Conceptual Site Model

7.34 Based on the intrusive investigation and subsequent contamination sampling and ground gas monitoring undertaken at the Site, the Conceptual Site Model from the Phase 1 Contaminated Land Assessment can be updated with proven pollutant linkages, as per Table 7.1, below with risk tables included in Appendix D.

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Table 7.1: Updated Conceptual Site Model

Source	Pollutant	Pathway	Receptor	Likelihood of Occurrence	Consequence (severity)	Potential Risk	Comment	Further action
Historical and current site-use (School/ Church/Swimming Pools/Substation/ Recreation Ground) and earth mounds	Poor quality Made Ground (asbestos metals, hydrocarbons, volatiles etc.).	Possible direct contact with contaminated soils and accidental ingestion/inhalation of contaminated dust or volatile vapours. Plant uptake in residential garden areas.	Future residential end-users	Likely	Medium	Moderate	Elevated concentration of lead recorded within infill materials within swimming pool. Glass fragments identified in shallow Made Ground materials present on Site. No asbestos fibres identified, although given likely origin of demolition material in swimming pool, ACMs likely to be present. Further investigation and / or remediation will be required to mitigate exposure risk.	Yes
		Direct contact and ingestion of contamination in shallow soils during enabling works. Exposure likely to be short term.	Construction, demolition and ground workers	Unlikely	Mild	Very Low	Standard PPE during construction process would mitigate any potential exposure risk.	-
		Migration of any contaminants within infill materials via leaching/lateral migration down hydraulic gradient.	Controlled waters (groundwater and surface water)	Low likelihood	Mild	Very Low	Leachable concentration of petrol range hydrocarbons identified in swimming pool infill materials evidence. Controlled water receptors not considered sensitive in historical/current surrounding area land-use context. No action necessary.	-
		Direct contact. Permeation of mobile contaminants through water supply pipes	Buildings and services (water supply)	Low Likelihood	Medium	Moderate/ Low	Trace concentrations of hydrocarbons recorded in Made Ground during Site investigation works. Barrier pipe and/or clean corridors may be required to mitigate permeation risk to water supply pipes	Yes
	Polychlorinated Biphenyls (PCBs) from electrical substation	Possible direct contact with contaminated soils and accidental ingestion/inhalation of contaminated dust or volatile vapours. Plant uptake in residential garden areas.	Future residential end-users	Unlikely	Medium	Low	Testing of soils adjacent to sub-station did not record any PCBs.	-
	Ground gas (methane and carbon dioxide)	Possible lateral migration of ground gas contaminants onto Site and inhalation of harmful (asphyxiant) ground gases or accumulation of explosive gases.	Future residential end-users	Low Likelihood	Medium	Moderate/ Low	No elevated concentrations of ground gas recorded.	-
Nearby historical/ current industrial site uses (Sawmill, Tanks, Chemical Works, Garages, Smithy, Industrial Estates)	Asbestos, metals, hydrocarbons, VOCs	Possible lateral migration of volatile contaminants onto Site and inhalation of harmful (asphyxiant) volatile vapours or accumulation of explosive gases at ground floor level.	Future residential end-users	Unlikely	Medium	Low	Groundwater confirmed at depth (9 metres below ground level), negligible exposure risk potential by on-site migrating volatile contamination.	-
			Construction, demolition and ground workers	Unlikely	Mild	Very Low		-
Radon Gas	Radon	Possible harm from radon gas.	Future residential end-users	Unlikely	Medium	Low	Site not in a Radon affected area, no action required.	-
WW2 Bombs	UXO	Risk from unexploded ordnance	Future residential end-users	Unlikely	Severe	Low	No action necessary.	-

Source	Pollutant	Pathway	Receptor	Likelihood of Occurrence	Consequence (severity)	Potential Risk	Comment	Further action
			Construction, demolition and ground workers	Unlikely	Severe	Low / Moderate	Detailed UXO risk assessment confirmed low/moderate UXO risk and UXO Risk Management Plan and Awareness briefings prepared for below ground works.	Yes

8.0 GEOTECHNICAL APPRAISAL

General

8.1 This section of the report should be read in conjunction with Section 6.0 (Ground Conditions), which indicates the Site is directly underlain by Made Ground soils, superficial deposits of Head and solid geology of the Lewis Nodular Chalk Formation. Groundwater levels were recorded at 9.0m bgl.

8.2 It is understood the proposed development is to include:

- 2No. 5-storey apartment blocks;
- 2No. 4-storey apartment blocks;
- 10No. 2/3-storey houses;
- private gardens;
- hardstanding for access and car parking; and
- areas of soft landscaping

Ground Model

8.3 Based on the material descriptions, *in situ* strength tests and geotechnical laboratory test results, the following ground model has been determined. Design parameters used for geotechnical analysis are presented in Table 8.1, below:

Table 8.1: Geotechnical design parameters

Material	Depth to base (m bgl)	Υ (kN/m^3)	Design N-value	Φ (°)	I_p (%)	C_u (kN/m^2)
Made Ground	0.50	19	-	1	-	1
Head	1.0	17†	N=7	20†	20	20
Low-Density Chalk	>25.5	19.3	N=10 to N=40	-	-	-
Groundwater	9.0m bgl					

† - BS8002

Shallow Strip Foundations

8.4 Shallow strip foundations are feasible for the low-rise (2-3 storey) residential dwellings outwith the area of the former swimming pool (see Constraints Drawing P23/2863/11, Appendix A), where low density Chalk bedrock was encountered at depths of between 0.35m and 0.60m bgl.

8.5 Following the guidance of CIRIA guidance 'Engineering in Chalk', C574, a low-density chalk of Grade B and C, will have the following parameters:

Table 8.2: Low-density Chalk design parameters

Element	Low Density
E_s (secant modulus)	200MN/m^2
q_y (yield stress)	250kN/m^2
E_y (yield modulus)	15MN/m^2
q_u (ultimate bearing capacity)	1.5MN/m^2

8.6 Foundations should be a minimum of 1.20m bgl, with a minimum embedment of 350mm within the Chalk. With a conventional factor of safety of 3, an allowable bearing pressure of **83kN/m²** is calculated. Were the allowable bearing pressure insufficient and result in unacceptably large foundations or a piled foundation solution, a more precise estimate of settlements can be calculated following plate load bearing tests at formation level.

8.7 Formation level should be proof-rolled and soft spots should be excavated out and backfilled to a suitable earthworks specification.

8.8 Foundations constructed on this basis would limit settlements to approximately 25mm.

Piles

8.9 For buildings located within areas of deep Made Ground (former swimming pool and former church areas) and where the depth to Chalk head is greater than 1.50m (4-5 storey buildings) and for buildings where shallow foundations are not suitable, a piled foundation solution is recommended. Pile resistances have been calculated following the guidance of Engineering in Chalk (C574), ref. XVII, as outlined in the following paragraphs.

8.10 It is recommended piles are taken to a maximum of 8.0m bgl, 1.0m above the water table. Table 8.3 details resistances of 8.0m bored, continuous flight auger (CFA) and large displacement (closed end tubes and all pre-cast concrete, as per BS8004, 1986) piles.

Table 8.3 Total Pile Resistances: 8.0m bgl

	Bored piles	CFA piles	Large displacement piles (PL)
200mm diameter	**157kN/m²**	**132kN/m²**	**201kN/m²**
300mm diameter	**282kN/m²**	**258kN/m²**	**358kN/m²**

Pile Considerations

Bored piles

- little or no vibration;
- only noise of rig power pack;
- base difficult to clean;
- boring through thick superficial deposits will require extensive casing; and

- boring under water may require drilling mud, which can penetrate into dissolution features.

Continuous Flight Auger

- full base resistance can be assumed;
- little or no vibration;
- comparatively quiet;
- neither casing nor drilling mud required;
- impossible to judge solution feature penetrated during construction;

Driven cast-in-place

- high shaft resistance in chalk;
- full base resistance can be assumed;
- causes strong ground vibrations;
- noisy; and
- driven temporary casing restricts length.

Driven pre-formed

- higher base resistances possible by driving to hard layers;
- pile length can be increased by adding segmental sections;
- unaffected by superficial deposits or high water table;
- low shaft resistance;
- causes ground vibrations; and
- noisy.

Floor Slabs

8.11 Based on the ground conditions recorded, slabs should be suspended.

Pavements

8.12 A total of 3No. samples were subject to soaked CBR testing and a total of 3No. *in situ* Dynamic Cone Penetrometer (DCP) tests were undertaken during the Site investigation works.

8.13 The DCP tests were carried out according to the methodology set out in the Design Manual for Roads and Bridges (2008), where a CBR value for the soil profile is calculated by:

$$CBR\ (\%) = 10^{(2.48 - 1.057 \times Log_{10}P)}$$

Where:

P = The penetration rate in mm per blow (average)

8.14 The subgrade surface modulus is calculated by:

$$E = 17.6(CBR)^{0.64}$$

8.15 Where calculated CBR values are below 10%, the accuracy of this relationship is reduced. The interpreted DCP results are provided in Appendix I. A summary of the *in situ* DCP and laboratory CBR tests is provided in Table 8.4, below:

Table 8.4: *In situ* and Laboratory DCP Results

DCP Location	Laboratory Test Result		DCP Test Result	
	CBR (%)	Subgrade Surface Modulus (MPa)	CBR (%)	Subgrade Surface Modulus (MPa)
TP02 / DCP02	3.2	37	21.2	124
TP04 / DCP04	2.4	30	8.8	70
DCP05			18.6	114
WS04	7.1	61		

8.16 The high DCP results of DCP02 and DCP05 are attributed to grain sizes >20mm, which will result in an artificially high CBR value. Also, both of these tests recorded refusals before the full test was completed.

8.17 Using the laboratory test results and following the guidance of CD 255 Design for new pavement foundations, Revision 1 (April, 2020), the laboratory test results do not meet the minimum subgrade surface modulus requirement of 50MPa. Therefore, some form of ground improvement will be required prior to pavement construction.

8.18 Ground improvement may take the form of lime/cement stabilization or the use of a geogrid in proposed areas of pavement. Following ground improvement, it is recommended a series of in-situ CBRs are undertaken to inform pavement design.

Excavations and Earthworks

8.19 In general, shallow cohesive soils should remain freestanding over the short to medium term. Where granular soils are encountered, shoring should be used.

8.20 The constraints drawing (ref. P23-2863-11, Appendix A) details the proposed development in relation to former Site structures. Foundations associated with former Site structures: swimming pool (TP08, WS01 and WS01A) and church (BH02) were encountered during the ground investigation. Further remnant below ground structures / foundations may also be

present associated with other historical buildings on the Site, as identified in the constraints drawing, These will need to be grubbed out prior to development.

8.21 Were earthworks required, a site specific earthworks specification should be prepared and should include details of earthworks validation and testing.

Buried Concrete

8.22 Design/mix of buried concrete should be undertaken in accordance with the appropriate ACEC classification, of BRE Special Digest 1: 2005 (Concrete in Aggressive Ground). On this basis the Site is deemed to classify as "greenfield" and on the basis of the Site history, the geological setting, and observations during the formation of exploratory holes, the Site is not considered to be one that may contain pyrite (i.e. sulphide).

8.23 A total of 18No. samples from the Made Ground and natural deposits were subject to pH and SO_4 analysis. Results indicate soluble sulphate concentrations in soil samples of 10mg/l to 140mg/l, with the mean of the highest 20% (4No. results) calculated as 90mg/l. On the basis of these chemical test results, the Design Sulphate Class for the Site is considered to be "DS-1".

8.24 Based on the Site geology, the groundwater conditions can be described as 'static'. Recorded soil pH values were in the range of 6.1 to 11.0. On this basis, the "Aggressive Chemical Environment for Concrete (ACEC)" class for concrete in the ground is indicated to be AC-1s. Design/mix of buried concrete should be undertaken in accordance with these classifications.

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9.0 SOAKAGE ASSESSMENT

9.1 A total of 6No. test pits were excavated to establish the potential for using soakaways for surface water drainage with 3No. shallow soakage tests (TP02, TP03 and TP05) and 3No. deeper soakage tests (TP01, TP04 and TP06).

9.2 The soakage test results are presented in full in Appendix H and the Trial Pit logs are provided in Appendix B. The results of the soakage testing are summarised in Table 9.1, below:

Table 9.1 Summary of permeable paving soakage test results

Loc.	Pass / Fail	Lithology	Test Range (m bgl)	Soil infiltration rate (ms^{-1})
TP02	Pass	Chalk	0.40m to 1.00m	3.64E-04 4.35E-04 2.82E04
TP03	Pass	Chalk	0.40m to 1.00m	8.11E-06 8.29E-06 7.89E-06
TP05	Pass	Made Ground: gravelly silt. Gravel of brick and concrete. With cobbles of brick.	0.40m to 1.00m	3.80E-06 3.89E-06 3.14E-06

Table 9.2 Summary of sustainable drainage soakage test results

Loc.	Pass / Fail	Lithology	Test Range (depth, m)	Soil infiltration rate (ms^{-1})
TP01	Pass	Chalk	0.60m to 1.60m	3.94E-04 4.31E04 4.59E-04
TP04	Pass	Chalk	1.00m to 2.00m	5.14E-04 4.48E-04 2.95E-04
TP06	Fail	Head: slightly silty Clay	1.00m to 2.00m	-

9.3 A general requirement for soakaway/infiltration testing is that the excavation should drain half the volume over a period of 24 hours. This was not achieved at TP06, where the test horizon comprised Head deposits. The test results indicate permeable paving and sustainable drainage are feasible where the drainage medium comprises Chalk. Outwith the areas of former buildings and swimming pool, the depth to Chalk increases to the east of the Site, with Head deposits at TP06 recorded to >1.90m.

9.4 Where SUDS are positioned within the Chalk, there is the potential to create solution features. Therefore, all SUDS should be located away from proposed structures.

10.0 CONCLUSIONS & RECOMMENDATIONS

Conclusions

10.1 A Phase 2 Geo-Environmental Assessment of land off Ordnance Road and Milton Place was undertaken to support the development for residential end-use.

10.2 The site investigation comprised 22No. exploratory holes to establish the ground conditions and determine the potential for ground, groundwater and ground gas contamination across the Site.

10.3 The ground conditions generally comprise hardstanding/Topsoil, underlain by Made Ground generally to 1.0m. However, deeper areas of Made Ground were recorded within the footprint of the former church structure (2.0m bgl) and former swimming pool (c. 3.45m bgl). The Made Ground generally comprised reworked natural deposits with brick and concrete fragments although metal and glass fragments were encountered in the central area of the Site. The structure of the former swimming pool was confirmed to remain in-situ and the infill materials comprised predominantly demolition waste, likely arising from the demolition of the buildings formerly present on the Site and associated with the former swimming pool.

10.4 The Made Ground was locally underlain by cohesive deposits of Head, which were seen to increase in thickness within the eastern section of the Site. The Made Ground and Head deposits were underlain by solid strata of the Lewis Nodular Chalk Formation. Standing groundwater was recorded at a depth of 9.0m bgl.

10.5 Chemical testing identified an elevated concentration of Lead within the infill materials in the former swimming pool structure in the centre of the Site (WS01A), which exceeded residential end-use criteria with home grown produce. No other human health exceedances were identified across the Site although the shallow Made Ground in the central areas (TP01, TP02 and WS04) included fragments of glass and metal.

10.6 No other concentrations of heavy metals, polyaromatic or petroleum hydrocarbons were recorded in shallow soils that exceeded the residential end-use criteria with home grown although elevated concentrations of Petroleum Hydrocarbons (C12-C35) were identified within the infill materials within the former swimming pool. No asbestos was detected within Site soils or Made Ground, although it is likely that ACMs are present within the infill material within the swimming pool given the likely origin of this material (c.1950s constructed municipal buildings).

10.7 No leachable concentrations of contaminants exceeded available SSACs except for Petroleum Hydrocarbons (C5-C8, Aliphatic) present within the infill materials within the former swimming pool structure. This marginally exceeds the drinking water standard, although is not

considered to pose a risk given its current containment within a concrete below ground structure and low sensitivity of groundwater in this former industrial area.

10.8 The general Made Ground soils destined for off-site disposal are likely to be classified as either Inert or Stable Non-Reactive Hazardous Waste although chemical test results should be presented to the receiving landfill prior to disposal.

10.9 Ground gas monitoring confirmed no detectable presence of methane and very low concentrations of carbon dioxide (max 2.3% by volume) although with low/negligible gas flow rates of (0.3l/hr). On the basis of the calculated worst case gas screening values, and low/negligible gas flows, it is considered that there is a low ground gas risk and no ground gas protection measures are necessary for this development.

10.10 Shallow strip foundations should be taken down to 1.20m and a minimum of 350mm into the Chalk, which will give an allowable bearing pressure of **83kN/m^2**. Where ground conditions result in deeper foundations or where a higher allowable bearing pressure is required, a pile foundation solution is recommended.

10.11 The piling process destroys and remoulds the Chalk as the pile is advanced, resulting in a shear surface along the length of the pile. Consequently, resistances from piles within Chalk are predominantly end bearing. Piles taken below the water table result in a higher factor of safety. Therefore, if sufficient resistances are achievable, it is recommended piles are taken down to a maximum of 8.0m, 1.0m above the water table.

10.12 Based on the ground conditions recorded, slabs should be suspended.

10.13 For any proposed new pavements, due to the low subgrade surface modulus results obtained, some form of ground improvement is required. This may take the form of cement/lime stabilization or the use of a geogrid. Following ground improvement, it is recommended a series of in-situ CBR tests are undertaken to guide pavement design.

10.14 Buried concrete should be classified as DS-1, with an ACEC classification of AC-1s.

10.15 Shallow excavations within cohesive soils may offer short to medium-term stability. Were earthworks required as part of the proposed development, an earthworks strategy, including validation testing should be prepared.

10.16 Soakage testing indicates permeable paving and sustainable drainage are feasible in areas of Chalk. However, the Head deposits are not a suitable drainage medium. In addition, with the potential to create solution features within the Chalk, any SUDS should be located a suitable distance from any proposed structures, in accordance with current guidance.

Recommendations

10.17 Based on the findings of the site investigation works undertaken, we would recommend the following:

- Given the presence of demolition materials, contaminants of concern (Lead and Petroleum Hydrocarbons) and the likely presence of asbestos-containing materials within the former swimming pool structure, further site investigation should be undertaken to determine the nature and extent of any deleterious materials and contamination present. This should include sufficient information to enable quantitative risk assessment to support the retention of this material on site (if appropriate) or to classify the material for off-site disposal, if required.
- If the material is to be retained, remediation works will be required to mitigate exposure risk to future site residents, particularly in private gardens and soft landscaped areas. Remediation works would also need to address areas of the site where further deleterious materials were encountered in shallow Made Ground (in the form of glass and metal fragments).
- A Remediation Method Statement will need to be prepared to detail the proposed remediation works and outline the validation process to render the Site suitable for residential end-use.
- Some form of ground improvement in areas of proposed hardstanding may be required, in the form lime/cement stabilisation or the use of a geogrid.
- On removal of any below ground structures, if significant earthworks are required, targeted laboratory geotechnical testing would be recommended and a detailed earthworks specification prepared.

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11.0 REFERENCES

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APPENDICES

APPENDIX A

DRAWINGS



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Legend

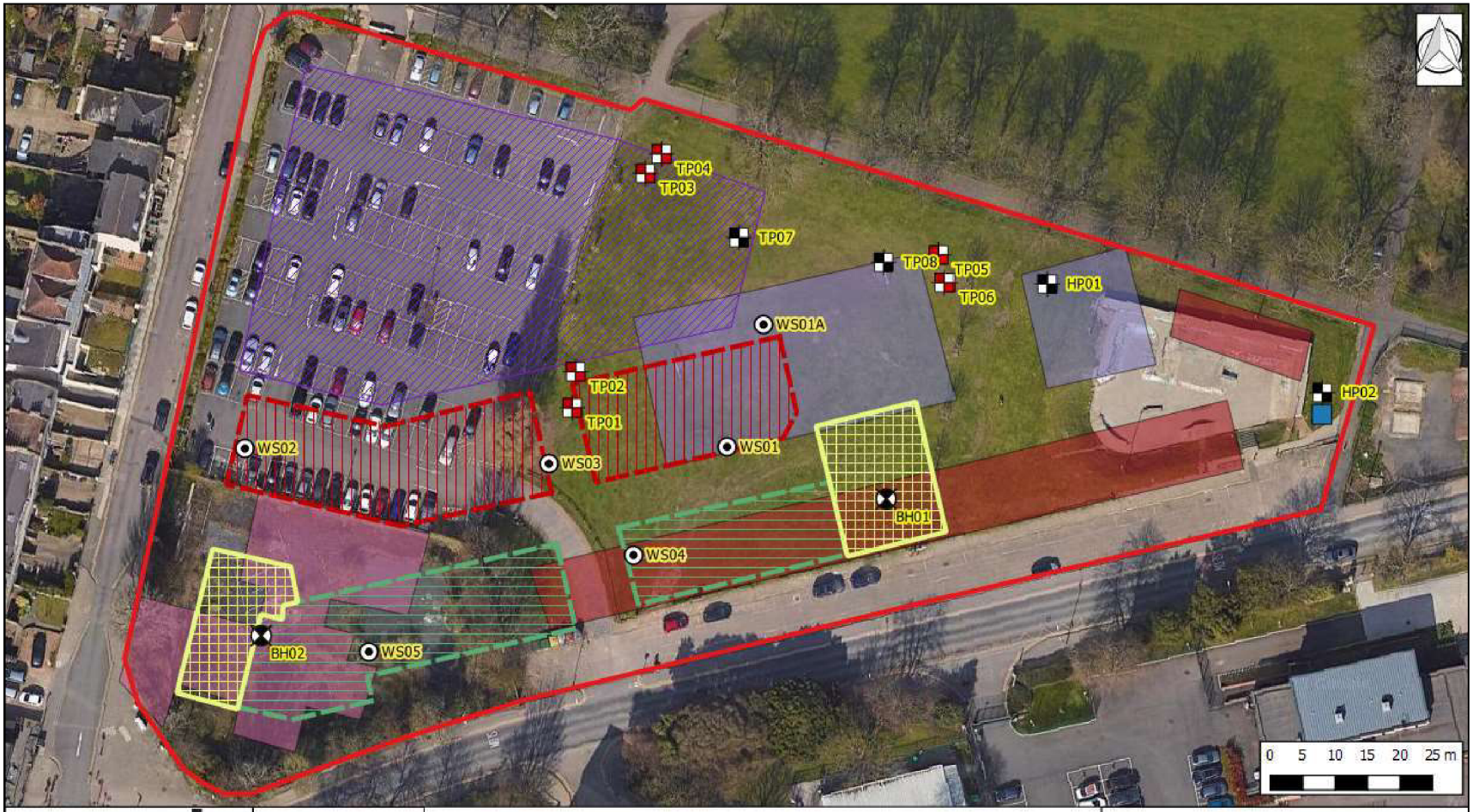
- Site boundary
- CP Borehole
- WS Borehole
- Trial Pit

Project: Milton Place, Gravesend

Drawing Title: Exploratory Hole Locatin Plan

Drawing No.: P23-2863-10

Date: 05/07/2023



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Legend

- Site boundary
- CP Borehole
- WS Borehole
- Trial Pit

Proposed Development

- 5-storey buildings
- 4-storey buildings
- 3-storey buildings

Historic Development

- Swimming pools
- Church and school
- Municipal buildings
- El. Sub Station

Project: Milton Place, Gravesend

Drawing Title: Exploratory Hole Locatin and Constraints Plan

Drawing No.: P23-2863-11

Date: 05/07/2023

APPENDIX B

EXPLORATORY HOLE LOGS

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Trial Pit Log

Trial Pit No. **HP01**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565330.97 N174119.80 Level: 8.75m AoD	Date 24/05/2023
Location: Gravesend		Dimensions (m): 0.30 Depth: 0.45 0.30	Scale 1:20
Client: Hill Partnerships			Logged TB

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.20 - 0.30	ES		0.45	8.30		Grass over brown gravelly very sandy silt. Gravel is subangular to subrounded fine to coarse flint and subangular fine to medium chalk. With frequent fragments of brick. MADE GROUND.
							End of Trial Pit at 0.45m

1
2
3
4

Remarks
1. TP01 terminated at 0.45m target depth.
2. No groundwater encountered.

Stability : Stable

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Trial Pit Log

Trial Pit No. **HP02**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565378.52 N174103.10 Level: 7.80m AoD	Date 24/05/2023
Location: Gravesend		Dimensions (m): 0.30 Depth: 0.50 0.30	Scale 1:20
Client: Hill Partnerships			Logged TB

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
							Grass over brown slightly gravelly silty fine to coarse sand. Gravel is angular to subrounded fine to coarse flint with fragments of brick. MADE GROUND.
	0.30 - 0.40	ES		0.20	7.60		Brown mottled dark brown slightly sandy gravelly clay. Gravel is subangular fine to coarse flint and subanguar to subrounded fine to medium chalk. With fragments of brick and clinker. MADE GROUND.
				0.50	7.30		End of Trial Pit at 0.50m

Remarks
1. TP01 terminated at 0.50m target depth.
2. No groundwater encountered.

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP01**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565262.00 N174102.90 Level: 8.30m AoD	Date 22/05/2023
Location: Gravesend		Dimensions (m): 1.60	Scale 1:20
Client: Hill Partnerships		Depth: 1.60 / 0.30	Logged TB

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.05 - 0.10	ES					Grass over dark brown slightly gravelly silty fine to medium sand. Gravel is subangular to rounded fine to medium flint with fragments of glass and brick. MADE GROUND.
				0.13	8.17		
				0.20	8.10		Yellow brown slightly silty gravelly fine to medium sand. Gravel is subangualr to rounded fine to medium flint. MADE GROUND.
				0.35	7.95		Brown mottled light brown friable slightly sandy slightly gravelly silty CLAY. Gravel is subrounded fine to coarse flint and subangular fine to medium chalk. HEAD.
				0.70	7.60		Structureless CHALK recovered as cream mottled white gravelly SILT. Gravel is subrounded fine to coarse flint and subangular fine chalk. With occasional subrounded flint cobbles. UNDIFFERENTIATED CHALK.
							...becoming white mottled orange
				0.90	7.40		*...becoming white silty GRAVEL. Gravel is subangular to subrounded fine to coarse chalk and subrounded fine to coarse flint. Grade Dc*
	1.00 - 1.50	D					
				1.60	6.70		End of Trial Pit at 1.60m

Remarks
1. TP01 terminated at 1.6m target depth.
2. No groundwater encountered.

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP02**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565262.60 N174108.30 Level: 8.30m AoD	Date 22/05/2023
Location: Gravesend		Dimensions (m): 1.40	Scale 1:20
Client: Hill Partnerships		Depth: 1.00 (0.30)	Logged TB

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.12	8.18		Grass over dark brown slightly gravelly silty fine to medium sand. Gravel is subangular to rounded fine to medium flint with half and whole bricks and fragments of brick, metal and glass. MADE GROUND.
				0.30	8.00		Yellow brown slightly silty gravelly fine to medium sand. Gravel is subangualr to rounded fine to medium flint. MADE GROUND.
	0.40 - 0.70	B		0.40	7.90		Brown mottled light brown friable slightly sandy slightly gravelly silty CLAY. Gravel is subrounded fine to coarse flint and subangular fine to medium chalk. HEAD.
							Structureless CHALK recovered as cream mottled white gravelly SILT. Gravel is subrounded fine to coarse flint and subangular fine chalk. With occasional subrounded flint cobbles. UNDIFFERENTIATED CHALK.
				0.90	7.40		*...becoming white silty GRAVEL. Gravel is subangular to subrounded fine to coarse chalk and subrounded fine to coarse flint. Grade Dc*
				1.00	7.30		End of Trial Pit at 1.00m

Remarks
1. TP02 terminated at 1.0m target depth.
2. No groundwater encountered.

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP03**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565273.30 N174139.20 Level: 8.50m AoD	Date 22/05/2023
Location: Gravesend		Dimensions (m): 1.30 Depth: 1.00 0.30	Scale 1:20
Client: Hill Partnerships			Logged AW

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.10	8.40		Grass over brown slightly gravelly silty fine to medium sand. Gravel is subangular to rounded fine to medium flint. TOPSOIL
				0.15	8.35		Buff-brown fine sand. MADE GROUND.
							Brown silt. Trace gravel of subangular fine to medium brick. MADE GROUND.
				0.40	8.10		Structureless CHALK recovered as cream mottled white gravelly SILT. Gravel is very weak subrounded fine to coarse flint and subangular fine chalk. With occasional subrounded flint cobbles. UNDIFFERENTIATED CHALK.
				1.00	7.50		End of Trial Pit at 1.00m

Remarks
1. TP03 terminated at 1.0m target depth.
2. No groundwater encountered.

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP04**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565275.80 N174142.40 Level: 8.50m AoD	Date 22/05/2023
Location: Gravesend		Dimensions (m): 1.70 Depth: 2.00 0.30	Scale 1:20
Client: Hill Partnerships			Logged AW

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.15	8.35		Grass over brown slightly gravelly silty fine to medium sand. Gravel is subangular to rounded fine to medium flint. TOPSOIL
				0.20	8.30		Buff-brown fine sand. MADE GROUND.
	0.50 0.50	B ES		0.60	7.90		Brown slightly gravelly silt. Gravel is subrounded fine chalk and brick. Trace clay. MADE GROUND.
	1.80	B		2.00	6.50		Structureless CHALK recovered as cream mottled white gravelly SILT. Gravel is very weak subrounded fine to coarse flint and subangular fine chalk. With occasional subrounded flint cobbles. UNDIFFERENTIATED CHALK.
							End of Trial Pit at 2.00m

1 2 3 4

Remarks
1. TP04 terminated at 2.0m target depth.
2. No groundwater encountered.

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP05**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565318.30 N174126.80 Level: 7.25m AoD	Date 22/05/2023
Location: Gravesend		Dimensions (m): 1.70 Depth: 1.00 0.30	Scale 1:20
Client: Hill Partnerships			Logged AW

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.10	7.15		Grass over brown slighty gravelly silty fine to medium sand. Gravel is subangular to subrounded fine to medium flint. TOPSOIL.
				0.20	7.05		Buff-brown fine sand. MADE GROUND.
				0.20	7.05		Brown slightly gravelly silt. Gravel is angular to subrounded fine to coarse concrete and brick. With cobbles of brick. With boulders of concrete. Trace clay. MADE GROUND.
							...with 5-10mm roots to 0.80m
				1.00	6.25		End of Trial Pit at 1.00m

1
2
3
4

Remarks
1. TP05 terminated at 1.0m target depth.
2. No groundwater encountered.

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP06**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565319.30 N174122.40 Level: 7.25m AoD	Date 22/05/2023
Location: Gravesend		Dimensions (m): 1.70 Depth: 1.90 0.30	Scale 1:20
Client: Hill Partnerships			Logged AW

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.10	7.15		Grass over brown slighty gravelly silty fine to medium sand. Gravel is subangular to subrounded fine to medium flint. TOPSOIL.
				0.20	7.05		Buff-brown fine sand. MADE GROUND.
	0.30	ES					Brown silty subangular to subrounded fine to coarse brick concrete and chalk gravel. With cobbles of brick. With boulders of concrete. MADE GROUND.
				0.40	6.85		
	0.50	B		0.40	6.85		White silty subrounded fine to medium chalk gravel. MADE GROUND.
							...with <5mm roots to 1.50m
				0.70	6.55		Soft brown slightly silty CLAY. Trace rounded fine to medium flint gravel. HEAD.
				1.90	5.35		End of Trial Pit at 1.90m

Remarks
1. TP06 terminated at 1.9m target depth.
2. No groundwater encountered.

Stability : Stable

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Trial Pit Log

Trial Pit No. **TP07**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565287.60 N174129.70 Level: 7.60m AoD	Date 25/05/2023
Location: Gravesend		Dimensions (m): Depth: 0.70	Scale 1:20
Client: Hill Partnerships			Logged AW

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.15	7.45		Grass over brown slighty gravelly silty fine to medium sand. Gravel is subangular to subrounded fine to medium flint. TOPSOIL.
				0.20	7.40		Buff-brown fine sand. MADE GROUND.
				0.60	7.00		Brown silty subangular to subrounded fine to coarse brick concrete and chalk gravel. With cobbles of concrete. MADE GROUND.
				0.70	6.90		White silty subrounded fine to medium chalk gravel. MADE GROUND.
							End of Trial Pit at 0.70m

Remarks
1. TP07 terminated at 0.70m target depth.
2. No groundwater encountered.

Stability :

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Trial Pit Log

Trial Pit No. **TP08**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565310.00 N174125.60 Level: 7.40m AoD	Date 25/05/2023
Location: Gravesend		Dimensions (m): Depth: 1.50	Scale 1:20
Client: Hill Partnerships			Logged AW

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.10	7.30		Grass over brown slighty gravelly silty fine to medium sand. Gravel is subangular to subrounded fine to medium flint. TOPSOIL.
				0.20	7.20		Buff-brown fine sand. MADE GROUND.
				0.30	7.10		Very soft brown silty clay. MADE GROUND.
				0.50	6.90		Brown slightly silty slightly sandy subangular to subrounded fine to coarse concrete and brick. Trace clay. With cobbles fo concrete. With boulders of concrete. MADE GROUND.
				1.50	5.90		Brown white slightly gravelly slightly silty sand. Gravel is angular to subrounded fine to coarse flint chalk brick and concrete. With cobbles of concrete and brick. With horizons of clay. MADE GROUND.
							End of Trial Pit at 1.50m

1
2
3
4

Remarks
1. TP08 terminated at 1.5m target depth.
2. No groundwater encountered.

Stability :

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Borehole Log

Borehole No.
WS01
Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565287.00 N174102.00	Hole Type WS
Location: Gravesend		Level: 7.50m aOD	Scale 1:40
Client: Hill Partnerships		Date: 24/05/2023	Logged AW

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.10	7.40		Grass over brown slighty gravelly silty fine to medium sand. Gravel is subangular to subrounded fine to medium flint. TOPSOIL.
					0.40	7.10		Brown silty subangular to subrounded fine to coarse brick and concrete gravel. With cobbles of brick. MADE GROUND.
								End of Borehole at 0.40m

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks
1. WS01 terminated at 0.40m, due to refusal.
2. No groundwater encountered.

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Borehole Log

Borehole No. **WS01A**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565291.50 N174115.70	Hole Type WS
Location: Gravesend		Level: 7.50m aOD	Scale 1:40
Client: Hill Partnerships		Date: 24/05/2023	Logged AW

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.05	7.45		Grass over brown slighty gravelly silty fine to medium sand. Gravel is subangular to subrounded fine to medium flint. TOPSOIL.
					0.10	7.40		Buff-brown fine sand. MADE GROUND.
					0.70	6.80		Brown slightly silty slightly sandy subangular to subrounded fine to coarse concrete and brick. Trace clay. With cobbles fo concrete. With boulders of concrete. MADE GROUND.
		1.00	SPT	N=29 (4,5/5,10,8,6)				Brown red black subangular to subrounded fine to coarse chalk brick and concrete. Trace ash. MADE GROUND.
		1.50	ES		1.40	6.10		*1.40m - ...with horizons of firm dark grey clay*
		2.00	SPT	N=22 (5,5/5,3,4,10)				
					2.90	4.60		Brown very weak concrete. MADE GROUND.
		3.00	SPT	N=54 (6,9/9,8,13,24)	2.90	4.60		*2.90m - ...flat concrete surface identified, possible base of swimming pool*
					3.00	4.50		Black silty subangular fine flint gravel. MADE GROUND.
					3.45	4.05		End of Borehole at 3.45m

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks

1. WS01A terminated at 3.45m, due to refusal.
2. No groundwater encountered.

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Borehole Log

Borehole No. **WS02**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565211.60 N1744096.80	Hole Type WS
Location: Gravesend		Level: 9.60m aOD	Scale 1:40
Client: Hill Partnerships		Date: 24/05/2023	Logged AW

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.05	9.55		MACADAM.
					0.25	9.35		Brown black silty subangular fine to coarse brick concrete limestone gravel. With cobbles of brick. MADE GROUND.
		0.50	ES		0.60	9.00		Brown black silty subangular fine to coarse brick concrete gravel. With bands of black clay. MADE GROUND.
		1.00 - 1.45 1.00	D SPT	N=15 (6,7/5,4,3,3)				Structureless CHALK recovered as brown white gravelly SILT. Gravel is very weak subrounded fine to coarse flint and subangular medium chalk. Brown silt infill of fissures. UNDIFFERENTIATED CHALK.
					1.30	8.30		Structureless CHALK recovered as cream mottled white gravelly SILT. Gravel is very weak subrounded fine to coarse flint and subangular fine chalk. With occasional subrounded flint cobbles. UNDIFFERENTIATED CHALK.
		2.00 - 2.45 2.00	D SPT	N=8 (2,2/2,2,2,2)				
		3.00 - 3.45 3.00	D SPT	N=17 (3,3/4,4,4,5)				
		4.00 - 4.45 4.00	D SPT	N=16 (3,2/4,4,3,5)				
		5.00 - 5.45 5.00	D SPT	N=11 (2,2/2,3,3,3)				
					5.45	4.15		End of Borehole at 5.45m

1 2 3 4 5 6 7 8

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks

1. WS02 terminated at 5.45m, target depth.
2. No groundwater encountered.

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Borehole Log

Borehole No. **WS03**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565258.50 N174094.30	Hole Type WS
Location: Gravesend		Level: 8.50m aOD	Scale 1:40
Client: Hill Partnerships		Date: 24/05/2023	Logged AW

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.10	8.40		Grass over brown slighty gravelly silty fine to medium sand. Gravel is subangular to subrounded fine to medium flint. TOPSOIL.
		0.40	ES		0.50	8.00		Brown slightly sandy slightly gravelly silt. Gravel is subangular to subrounded fine to medium flint and brick. Trace clay. Trace ash. MADE GROUND.
		0.80	D					Structureless CHALK recovered as brown white gravelly SILT. Gravel is very weak subrounded fine to coarse flint and subangular medium chalk. Brown silt infill of fissures. UNDIFFERENTIATED CHALK.
		1.00 - 1.45 1.00	D SPT	N=10 (3,4/3,3,2,2)				
					1.30	7.20		Structureless CHALK recovered as brown white slightly silty slightly gravelly CLAY. Gravel is very weak subrounded fine to medium chalk. UNDIFFERENTIATED CHALK.
					1.50	7.00		Structureless CHALK recovered as brown white gravelly SILT. Gravel is very weak subrounded fine to coarse flint and subangular medium chalk. Brown silt infill of fissures. UNDIFFERENTIATED CHALK.
		2.00 - 2.45 2.00	D SPT	N=8 (2,2/2,2,2,2)	2.00	6.50		Structureless CHALK recovered as white slightly silty slightly gravelly CLAY. Gravel is very weak subrounded fine to medium chalk. UNDIFFERENTIATED CHALK.
		3.00 - 3.45 3.00	D SPT	N=17 (3,3/4,4,4,5)				
		4.00 - 4.45 4.00	D SPT	N=25 (7,7/6,7,6,6)				
		5.00 - 5.45 5.00	D SPT	N=11 (3,2/2,2,3,4)				
					5.45	3.05		End of Borehole at 5.45m

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks

1. WS03 terminated at 5.45m, target depth.
2. No groundwater encountered.

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Borehole Log

Borehole No. **WS04**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565271.40 N174080.20	Hole Type WS
Location: Gravesend		Level: 8.40m aOD	Scale 1:40
Client: Hill Partnerships		Date: 24/05/2023	Logged AW

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.12	8.28		Grass over brown slighty gravelly silty fine to medium sand. Gravel is subangular to subrounded fine to medium flint. TOPSOIL.
					0.20	8.20		Buff-brown fine sand. MADE GROUND.
		0.40	B					
		0.60	ES		0.50	7.90		Brown white gravelly silt. Gravel is very weak subrounded fine to medium chalk. MADE GROUND.
		1.00	SPT	N=7 (1,1/2,2,1,2)				Soft brown slightly silty clay. Trace subangular fine brick. Trace glass. MADE GROUND.
					1.30	7.10		Soft brown slightly silty CLAY. Trace rounded fine to medium flint gravel. HEAD.
		1.50	D					
		2.00	SPT	N=63 (3,4/7,12,18,26)	2.00	6.40		Structureless CHALK recovered as brown white gravelly SILT. Gravel is very weak subrounded fine to coarse flint and subangular medium chalk. Brown silt infill of fissures. UNDIFFERENTIATED CHALK.
		2.30 - 2.45	D		2.30	6.10		
					2.45	5.95		Structureless CHALK recovered as white slightly silty slightly gravelly CLAY. Gravel is very weak subrounded fine to medium chalk. UNDIFFERENTIATED CHALK.
								End of Borehole at 2.45m

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks

1. WS04 terminated at 2.45m due to refusal.
2. No groundwater encountered.

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Borehole Log

Borehole No. **WS05**

Sheet 1 of 1

Project: Milton Place	Project No: P23-2863	Co-ords: E565226.90 N174066.00	Hole Type WS
Location: Gravesend		Level: 9.70m aOD	Scale 1:40
Client: Hill Partnerships		Date: 24/05/2023	Logged AW

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.25	9.45		Brown silty subangular fine to coarse brick and concrete gravel. With cobbles of brick. MADE GROUND.
					0.50	9.20		Brown white slightly sandy slightly silty subangular to subrounded chalk and concrete gravel. MADE GROUND.
		0.80	D					Soft to firm brown silty CLAY. Trace subangular fine to medium flint gravel. HEAD.
		1.00 - 1.40	D					
		1.00	SPT	N=11 (1,2/1,2,3,5)				
					1.40	8.30		Structureless CHALK recovered as brown white silty very weak subrounded medium chalk gravel. Brown silt infill of fissures. UNDIFFERENTIATED CHALK.
		1.60	D					
		2.00 - 2.30	D					
		2.00	SPT	N=54 (9,12/13,13,12,16)				
					2.30	7.40		Structureless CHALK recovered as white silty very weak subrounded medium chalk gravel. Silt infill of fissures. UNDIFFERENTIATED CHALK.
					2.45	7.25		End of Borehole at 2.45m

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks

1. WS05 terminated at 2.45m due to refusal.
2. No groundwater encountered.

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Borehole Log

Borehole No. **BH01**

Sheet 1 of 3

Project: Milton Place	Project No: P23-2863	Co-ords: E565310.40 N174088.80	Hole Type BH
Location: Gravesend		Level: 7.20m aOD	Scale 1:50
Client: Hill Partnerships		Date: 22/05/2023 - 23/05/2023	Logged AW

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10	7.10		Grass over brown slighty gravelly silty fine to medium sand. Gravel is subangular to subrounded fine to medium flint. TOPSOIL.
		0.30	B		0.20	7.00		Buff-brown fine sand. MADE GROUND.
		0.50	ES					Brown slightly silty slightly sandy angular to subrounded fine to medium flint concrete and brick gravel. MADE GROUND.
		0.80	B					
		1.00	ES					
					1.10	6.10		Soft brown white slightly gravelly silty clay. Gravel is subrounded fine to medium brick and chalk. MADE GROUND.
		1.20	D		1.30	5.90		Soft brown silty CLAY. Trace rounded fine to medium flint gravel. HEAD.
		1.40	D					
		1.50 - 1.95	D					
		1.50	SPT	N=3 (1,0/0,1,1,1)				
		2.00 - 2.45	D					
					2.40	4.80		Structureless CHALK recovered as brown white gravelly SILT. Gravel is very weak subrounded fine to coarse flint and subangular medium chalk. Brown silt infill of fissures. UNDIFFERENTIATED CHALK.
		2.50 - 3.00	B					
		2.50	SPT	N=36 (6,7/9,8,9,10)				
		3.50	D					
		3.50	SPT	N=27 (3,5/6,7,7,7)				
					3.90	3.30		Structureless CHALK recovered as cream mottled white silty subrounded fine to coarse flint and subangular fine chalk GRAVEL. With occasional subangular flint cobbles. UNDIFFERENTIATED CHALK.
		4.00	D					
		4.00 - 4.45	B					
		4.50 - 4.95	D					
		4.50	SPT	N=9 (1,2/2,3,2,2)				
		5.50	D					
		6.00 - 6.45	D					
		6.00	SPT	N=11 (2,3/3,2,3,3)				
	▼	7.00 - 7.45	D		7.00	0.20		
		7.50	SPT	N=26 (4,6/7,6,6,7)				
		8.50	D					
		9.00 - 9.45	D					
		9.00	SPT	N=19 (3,3/4,4,5,6)				
		10.00	D					

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks

1. BH01 terminated at 25.45m, target depth.
2. Groundwater strikes from 7.50m.

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Borehole Log

Borehole No. **BH01**

Sheet 2 of 3

Project: Milton Place	Project No: P23-2863	Co-ords: E565310.40 N174088.80	Hole Type BH
Location: Gravesend		Level: 7.20m aOD	Scale 1:50
Client: Hill Partnerships		Date: 22/05/2023 - 23/05/2023	Logged AW

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.50 - 10.95	D					Structureless CHALK recovered as cream mottled white silty subrounded fine to coarse flint and subangular fine chalk GRAVEL. With occasional subangular flint cobbles. UNDIFFERENTIATED CHALK.
		10.50	SPT	N=19 (3,4/4,5,5,5)				
		11.50	D					
		12.00 - 12.45	D					
		12.00	SPT	N=18 (3,4/4,4,5,5)				
		13.00	D					
		13.50 - 13.95	D					
		13.50	SPT	N=18 (2,4/4,5,5,4)				
		14.50	D					
		15.00 - 15.95	D					
		15.00	SPT	N=21 (3,5/5,5,5,6)				
		16.00	D					
		16.50 - 16.95	D					
		16.50	SPT	N=21 (4,4/5,5,5,6)				
		17.50	D					
		18.00 - 18.45	D					
		18.00	SPT	N=28 (7,6/6,7,7,8)				
		19.00	D					
		19.50 - 19.95	D					
		19.50	SPT	N=31 (6,7/6,7,9,9)				

11 12 13 14 15 16 17 18 19 20

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks

1. BH01 terminated at 25.45m, target depth.
2. Groundwater strikes from 7.50m.

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Borehole Log

Borehole No. **BH01**

Sheet 3 of 3

Project: Milton Place	Project No: P23-2863	Co-ords: E565310.40 N174088.80	Hole Type BH
Location: Gravesend		Level: 7.20m aOD	Scale 1:50
Client: Hill Partnerships		Date: 22/05/2023 - 23/05/2023	Logged AW

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.50	D					Structureless CHALK recovered as cream mottled white silty subrounded fine to coarse flint and subangular fine chalk GRAVEL. With occasional subangular flint cobbles. UNDIFFERENTIATED CHALK.
		21.00 - 21.45	D					
		21.00	SPT	N=36 (6,7/8,9,9,10)				
		22.00	D					
		22.50 - 22.95	D					
		22.50	SPT	N=37 (7,8/8,9,10,10)				
		23.00	D					
		24.00	SPT	N=42 (6,6/8,8,13,13)				
		24.50 - 24.95	D					
		25.00	D					
		25.00	SPT	N=39 (6,8/9,9,9,12)				
		25.10 - 25.45	D		25.45	-18.25		End of Borehole at 25.45m

21 22 23 24 25 26 27 28 29 30

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks

1. BH01 terminated at 25.45m, target depth.
2. Groundwater strikes from 7.50m.

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Borehole Log

Borehole No. **BH02**

Sheet 1 of 3

Project: Milton Place	Project No: P23-2863	Co-ords: E565214.10 N174067.80	Hole Type BH
Location: Gravesend		Level: 10.20m aOD	Scale 1:50
Client: Hill Partnerships		Date: 23/05/2023 - 24/05/2023	Logged AW

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10	10.10		MACADAM.
		0.40	B					Brown slightly silty slightly sandy angular to subrounded fine to coarse concrete and brick gravel. With cobbles of brick and concrete. MADE GROUND.
					0.60	9.60		Brown grey subangular fine to coarse slightly sandy slightly clayey brick and concrete gravel. With cobbles of brick concrete and limestone. MADE GROUND.
		0.90	B					
		1.50 - 1.95	D					
		1.50	SPT	N=16 (9,12/4,4,4,4)				
		1.55 - 2.00	B		2.00	8.20		Structureless CHALK recovered as brown white gravelly SILT. Gravel is very weak subrounded fine to coarse flint and subangular medium chalk. Trace subangular fine to coarse flint gravel. Brown silt infill of fissures. UNDIFFERENTIATED CHALK.
		2.50 - 2.95	D					
		2.50	SPT	N=9 (2,2/2,3,2,2)				
		3.00 - 3.50	B		3.00	7.20		Structureless CHALK recovered as cream mottled white silty subrounded fine to coarse flint and subangular fine chalk GRAVEL. With occasional subangular flint cobbles. UNDIFFERENTIATED CHALK.
		3.50 - 3.95	D					
		3.50	SPT	N=7 (1,2/1,2,2,2)				
		4.00	D					
		4.50 - 4.95	D					
		4.50	SPT	N=11 (1,2/3,3,2,3)				
		5.50	D					
		6.00 - 6.45	D					
		6.00	SPT	N=11 (2,3/3,2,3,3)				
		7.00	D					
		7.50 - 7.95	D					
		7.50	SPT	N=14 (2,3/3,3,4,4)				
		8.50	D					
		9.00 - 9.45	D					
		9.00	SPT	N=15 (3,3/3,4,4,4)				
	▼				9.80	0.40		
		10.00	D					

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks

1. BH02 terminated at 25.45m, target depth.
2. Groundwater strikes from 7.0m.

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Borehole Log

Borehole No. **BH02**

Sheet 2 of 3

Project: Milton Place	Project No: P23-2863	Co-ords: E565214.10 N174067.80	Hole Type BH
Location: Gravesend		Level: 10.20m aOD	Scale 1:50
Client: Hill Partnerships		Date: 23/05/2023 - 24/05/2023	Logged AW

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 - 10.95	D					Structureless CHALK recovered as cream mottled white silty subrounded fine to coarse flint and subangular fine chalk GRAVEL. With occasional subangular flint cobbles. UNDIFFERENTIATED CHALK.	
		10.50	SPT	N=20 (3,4/4,5,5,6)					
		11.00	D						11
		12.00 - 12.45	D						
		12.00	SPT	N=17 (3,4/3,4,4,6)					12
		13.00	D						13
		13.50 - 13.95	D						
		13.50	SPT	N=20 (3,4/5,5,5,5)					14
		14.50	D						
		15.00 - 15.95	D						15
		15.00	SPT	N=29 (4,9/10,6,6,7)					
		16.00	D						16
		16.50 - 16.95	D						
		16.50	SPT	N=22 (4,4/5,6,5,6)					
		17.00	D						17
		18.00 - 18.45	D						
		18.00	SPT	N=20 (4,4/7,6,5,2)					18
		19.00	D						19
		19.50 - 19.95	D						
		19.50	SPT	N=25 (4,6/7,6,6,6)					20

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks

1. BH02 terminated at 25.45m, target depth.
2. Groundwater strikes from 7.0m.

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Borehole Log

Borehole No. **BH02**

Sheet 3 of 3

Project: Milton Place	Project No: P23-2863	Co-ords: E565214.10 N174067.80	Hole Type BH
Location: Gravesend		Level: 10.20m aOD	Scale 1:50
Client: Hill Partnerships		Date: 23/05/2023 - 24/05/2023	Logged AW

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		20.50	D					Structureless CHALK recovered as cream mottled white silty subrounded fine to coarse flint and subangular fine chalk GRAVEL. With occasional subangular flint cobbles. UNDIFFERENTIATED CHALK.
		21.00 - 21.45	D					
		21.00	SPT	N=26 (4,6/6,6,7,7)				
		22.00	D					
		22.10 - 22.45	D					
		22.50	SPT	N=27 (4,5/6,7,7,7)				
		23.00	D					
		24.00	SPT	N=26 (5,6/4,8,8,6)				
		24.10 - 24.45	D					
		25.00	D					
		25.00	SPT	N=31 (8,6/7,7,8,9)				
		25.10 - 25.45	D					
					25.45	-15.25		End of Borehole at 25.45m

21 22 23 24 25 26 27 28 29 30

Borehole Diameter		Casing Diameter		Chiselling		
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration

Remarks

1. BH02 terminated at 25.45m, target depth.
2. Groundwater strikes from 7.0m.

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KEY SHEET

SAMPLING

D	**Small disturbed sample**
B	**Bulk disturbed sample**
ES	**Environmental sample***
HVR	**Hand Shear Vane Test (KPa)**

TESTING

N=*x*	**SPT blow count 'N' given as the sum of the blows required to drive the sampler across the test length (300mm)**
(*x,x/y,y,y,y*)	**Blows per increment during the standard penetration test (SPT). The initial two readings, '*x*' relate to the seating drive (150mm of test) whilst the remaining blows, '*y*', relate to the number of blows per 75mm increment of the test length (total of 300mm)**
***x* (*x,x for z*)**	**Incomplete SPT test where seating drive blow count (x) totals 50 for length of seating drive (*z*) (penetration in mm)**
***x* (*x,x/y for z*)**	**Incomplete SPT test where seating drive was completed but full test length could not be achieved (*z*) (penetration in mm).**

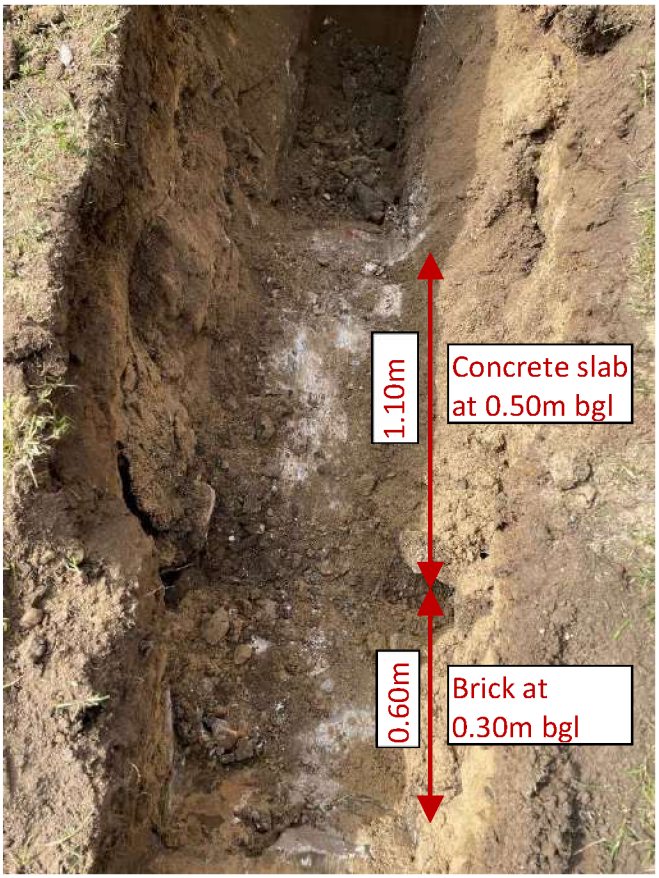
All measurements are given in metres (m), unless otherwise specified

* Sample comprises: 1ltr plastic tub, 250ml amber glass vial and 60ml amber glass vial

APPENDIX C

PHOTOGRAPHS

Create Consulting Engineers Limited,
109-112 Temple Chambers, 3-7 Temple Avenue, London, EC4Y 0HP
Tel: 01603 877010
Email: enquiries@createconsultingengineers.co.uk

Plate 1: WS01 – refusal on possible reinforced concrete wall of former swimming pool	Plate 2: TP08 – concrete at 0.50m steps down
	

APPENDIX D

CHEMICAL LABORATORY TEST CERTIFICATES

COMPARISON OF RESULTS AGAINST SSAC

Certificate of Analysis

Certificate Number 23-12673 *Issued:* 15-Jun-23

Client Create Consulting Engineers LTD
15 Princess Street
Norwich
NR3 1AF

Our Reference 23-12673

Client Reference P23-2863

Order No PO5086

Contract Title Milton Place, Gravesend

Description 21 Soil samples, 4 Leachate samples.

Date Received 30-May-23

Date Started 30-May-23

Date Completed 15-Jun-23

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Kirk Bridgewood
General Manager

2139

Summary of Chemical Analysis
Soil Samples

Our Ref 23-12673
Client Ref P23-2863
Contract Title Milton Place, Gravesend

			Lab No	2178417	2178418	2178419	2178420	2178421	2178422
			.Sample ID	TP06	BH01	BH01	BH02	BH02	WS01A
			Depth	0.30	0.50	1.00	10.00	21.00	0.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/05/2023	22/05/2023	22/05/2023	23/05/2023	23/05/2023	24/05/2023
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	8.4	11				7.5
Barium	DETSC 2301#	1.5	mg/kg	68	65				310
Beryllium	DETSC 2301#	0.2	mg/kg	0.7	0.4				0.3
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.7	0.5				1.0
Cadmium	DETSC 2301#	0.1	mg/kg	0.3	0.2				0.5
Chromium	DETSC 2301#	0.15	mg/kg	14	15				14
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0				< 1.0
Copper	DETSC 2301#	0.2	mg/kg	24	16				76
Lead	DETSC 2301#	0.3	mg/kg	61	37				540
Mercury	DETSC 2325#	0.05	mg/kg	0.11	0.07				< 0.05
Nickel	DETSC 2301#	1	mg/kg	17	15				11
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5				< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	42	30				24
Zinc	DETSC 2301#	1	mg/kg	56	51				280
Inorganics									
pH	DETSC 2008#		pH	8.5	10.5	10.1	9.8	8.1	11.0
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1	0.2				< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1	0.1				< 0.1
Organic matter	DETSC 2002#	0.1	%	1.6	1.6				0.6
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	42	79	89	31	43	140
Sulphide	DETSC 2024*	10	mg/kg	43	31				35
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.07	0.14				0.82
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	0.10	< 0.01				< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01				< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01				< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5				< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2				14
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5				85
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4				48
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10				150
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01				< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01				< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01				< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9				< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5				4.4
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6				66
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4				64
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10				130
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10				280

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 23-12673
Client Ref P23-2863
Contract Title Milton Place, Gravesend

			Lab No	2178417	2178418	2178419	2178420	2178421	2178422
			.Sample ID	TP06	BH01	BH01	BH02	BH02	WS01A
			Depth	0.30	0.50	1.00	10.00	21.00	0.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	23/05/2023	22/05/2023	22/05/2023	23/05/2023	23/05/2023	24/05/2023
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03				< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03				0.04
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03				< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03				< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.11	0.13				0.47
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03				0.16
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.30	0.17				0.68
Pyrene	DETSC 3303#	0.03	mg/kg	0.27	0.14				0.55
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.12	0.08				0.28
Chrysene	DETSC 3303	0.03	mg/kg	0.09	0.06				0.15
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.14	0.11				0.24
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.03	< 0.03				0.06
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.12	0.09				0.19
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.04	0.04				0.17
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03				0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.05	0.05				0.50
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	1.3	0.87				3.6
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg						
PCB 52	DETSC 3401#	0.01	mg/kg						
PCB 101	DETSC 3401#	0.01	mg/kg						
PCB 118	DETSC 3401#	0.01	mg/kg						
PCB 153	DETSC 3401#	0.01	mg/kg						
PCB 138	DETSC 3401#	0.01	mg/kg						
PCB 180	DETSC 3401#	0.01	mg/kg						
PCB 7 Total	DETSC 3401#	0.01	mg/kg						
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	0.4				< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 23-12673
Client Ref P23-2863
Contract Title Milton Place, Gravesend

			Lab No	2178423	2178424	2178425	2178426	2178427	2178428
			.Sample ID	WS01A	WS02	WS03	WS03	WS03	WS03
			Depth	3.00-3.45	0.50	0.80	1.00-1.45	3.00-3.45	4.00-4.45
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	24/05/2023	24/05/2023	24/05/2023	24/05/2023	24/05/2023	24/05/2023
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg		8.2				
Barium	DETSC 2301#	1.5	mg/kg		77				
Beryllium	DETSC 2301#	0.2	mg/kg		0.4				
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg		0.9				
Cadmium	DETSC 2301#	0.1	mg/kg		0.4				
Chromium	DETSC 2301#	0.15	mg/kg		14				
Chromium, Hexavalent	DETSC 2204*	1	mg/kg		< 1.0				
Copper	DETSC 2301#	0.2	mg/kg		33				
Lead	DETSC 2301#	0.3	mg/kg		110				
Mercury	DETSC 2325#	0.05	mg/kg		0.57				
Nickel	DETSC 2301#	1	mg/kg		12				
Selenium	DETSC 2301#	0.5	mg/kg		< 0.5				
Vanadium	DETSC 2301#	0.8	mg/kg		27				
Zinc	DETSC 2301#	1	mg/kg		71				
Inorganics									
pH	DETSC 2008#		pH	6.1	9.1	9.2	8.9	8.9	8.7
Cyanide, Total	DETSC 2130#	0.1	mg/kg		0.1				
Cyanide, Free	DETSC 2130#	0.1	mg/kg		< 0.1				
Organic matter	DETSC 2002#	0.1	%		2.1				
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	51	52	19	24	13	15
Sulphide	DETSC 2024*	10	mg/kg		31				
Sulphate as SO4, Total	DETSC 2321#	0.01	%		0.10				
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg		< 0.01				
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg		< 0.01				
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg		< 0.01				
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg		< 1.5				
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg		< 1.2				
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg		< 1.5				
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg		< 3.4				
Aliphatic C5-C35	DETSC 3072*	10	mg/kg		< 10				
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg		< 0.01				
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg		< 0.01				
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg		< 0.01				
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg		< 0.9				
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg		< 0.5				
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg		< 0.6				
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg		< 1.4				
Aromatic C5-C35	DETSC 3072*	10	mg/kg		< 10				
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg		< 10				

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Summary of Chemical Analysis
Soil Samples

Our Ref 23-12673
Client Ref P23-2863
Contract Title Milton Place, Gravesend

	Lab No	2178423	2178424	2178425	2178426	2178427	2178428
	.Sample ID	WS01A	WS02	WS03	WS03	WS03	WS03
	Depth	3.00-3.45	0.50	0.80	1.00-1.45	3.00-3.45	4.00-4.45
	Other ID						
	Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampling Date	24/05/2023	24/05/2023	24/05/2023	24/05/2023	24/05/2023	24/05/2023
	Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**				
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg		< 0.03		
Acenaphthylene	DETSC 3303#	0.03	mg/kg		< 0.03		
Acenaphthene	DETSC 3303#	0.03	mg/kg		< 0.03		
Fluorene	DETSC 3303	0.03	mg/kg		< 0.03		
Phenanthrene	DETSC 3303#	0.03	mg/kg		0.47		
Anthracene	DETSC 3303	0.03	mg/kg		0.12		
Fluoranthene	DETSC 3303#	0.03	mg/kg		0.97		
Pyrene	DETSC 3303#	0.03	mg/kg		0.89		
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg		0.48		
Chrysene	DETSC 3303	0.03	mg/kg		0.32		
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg		0.67		
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg		0.17		
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg		0.62		
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg		0.20		
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg		0.04		
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg		0.29		
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg		5.2		
PCBs							
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg				
PCB 52	DETSC 3401#	0.01	mg/kg				
PCB 101	DETSC 3401#	0.01	mg/kg				
PCB 118	DETSC 3401#	0.01	mg/kg				
PCB 153	DETSC 3401#	0.01	mg/kg				
PCB 138	DETSC 3401#	0.01	mg/kg				
PCB 180	DETSC 3401#	0.01	mg/kg				
PCB 7 Total	DETSC 3401#	0.01	mg/kg				
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg		< 0.3		

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Summary of Chemical Analysis
Soil Samples

Our Ref 23-12673
Client Ref P23-2863
Contract Title Milton Place, Gravesend

			Lab No	2178429	2178430	2178432	2178433	2178434	2178435
			.Sample ID	WS03	WS03	WS04	WS05	WS05	HP01
			Depth	5.00-5.45	2.00-2.45	1.50	0.30	1.60	0.20-0.30
			Other ID						
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	24/05/2023	24/05/2023	24/05/2023	24/05/2023	24/05/2023	24/05/2023
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg				5.6		9.4
Barium	DETSC 2301#	1.5	mg/kg				47		81
Beryllium	DETSC 2301#	0.2	mg/kg				0.3		0.6
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg				< 0.2		0.7
Cadmium	DETSC 2301#	0.1	mg/kg				0.2		0.4
Chromium	DETSC 2301#	0.15	mg/kg				9.8		18
Chromium, Hexavalent	DETSC 2204*	1	mg/kg				< 1.0		< 1.0
Copper	DETSC 2301#	0.2	mg/kg				13		31
Lead	DETSC 2301#	0.3	mg/kg				130		82
Mercury	DETSC 2325#	0.05	mg/kg				0.11		0.23
Nickel	DETSC 2301#	1	mg/kg				8.9		15
Selenium	DETSC 2301#	0.5	mg/kg				< 0.5		< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg				18		32
Zinc	DETSC 2301#	1	mg/kg				30		82
Inorganics									
pH	DETSC 2008#		pH	8.7	8.8	8.1	6.9	8.3	8.6
Cyanide, Total	DETSC 2130#	0.1	mg/kg				< 0.1		0.2
Cyanide, Free	DETSC 2130#	0.1	mg/kg				< 0.1		< 0.1
Organic matter	DETSC 2002#	0.1	%				0.7		2.2
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	15	15	12	15	< 10	31
Sulphide	DETSC 2024*	10	mg/kg				51		12
Sulphate as SO4, Total	DETSC 2321#	0.01	%				0.05		0.06
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg				0.13		< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg				< 0.01		< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg				< 0.01		< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg				< 1.5		< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg				< 1.2		< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg				< 1.5		< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg				< 3.4		< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg				< 10		< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg				< 0.01		< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg				< 0.01		< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg				< 0.01		< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg				< 0.9		< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg				< 0.5		< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg				< 0.6		< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg				< 1.4		< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg				< 10		< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg				< 10		< 10

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Summary of Chemical Analysis
Soil Samples

Our Ref 23-12673
Client Ref P23-2863
Contract Title Milton Place, Gravesend

	Lab No	2178429	2178430	2178432	2178433	2178434	2178435
	.Sample ID	WS03	WS03	WS04	WS05	WS05	HP01
	Depth	5.00-5.45	2.00-2.45	1.50	0.30	1.60	0.20-0.30
	Other ID						
	Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Sampling Date	24/05/2023	24/05/2023	24/05/2023	24/05/2023	24/05/2023	24/05/2023
	Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg				< 0.03		< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg				< 0.03		< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg				< 0.03		< 0.03
Fluorene	DETSC 3303	0.03	mg/kg				< 0.03		< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg				< 0.03		0.17
Anthracene	DETSC 3303	0.03	mg/kg				< 0.03		< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg				0.04		0.49
Pyrene	DETSC 3303#	0.03	mg/kg				0.04		0.44
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg				0.03		0.21
Chrysene	DETSC 3303	0.03	mg/kg				< 0.03		0.16
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg				0.04		0.27
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg				< 0.03		0.07
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg				< 0.03		0.22
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg				< 0.03		0.08
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg				< 0.03		< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg				< 0.03		0.09
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg				0.12		2.2
PCBs									
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg						
PCB 52	DETSC 3401#	0.01	mg/kg						
PCB 101	DETSC 3401#	0.01	mg/kg						
PCB 118	DETSC 3401#	0.01	mg/kg						
PCB 153	DETSC 3401#	0.01	mg/kg						
PCB 138	DETSC 3401#	0.01	mg/kg						
PCB 180	DETSC 3401#	0.01	mg/kg						
PCB 7 Total	DETSC 3401#	0.01	mg/kg						
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg				< 0.3		< 0.3

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Summary of Chemical Analysis
Soil Samples

Our Ref 23-12673
Client Ref P23-2863
Contract Title Milton Place, Gravesend

Lab No	2178436
.Sample ID	HP02
Depth	0.30-0.40
Other ID	
Sample Type	SOIL
Sampling Date	24/05/2023
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Arsenic	DETSC 2301#	0.2	mg/kg	
Barium	DETSC 2301#	1.5	mg/kg	
Beryllium	DETSC 2301#	0.2	mg/kg	
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	
Cadmium	DETSC 2301#	0.1	mg/kg	
Chromium	DETSC 2301#	0.15	mg/kg	
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	
Copper	DETSC 2301#	0.2	mg/kg	
Lead	DETSC 2301#	0.3	mg/kg	
Mercury	DETSC 2325#	0.05	mg/kg	
Nickel	DETSC 2301#	1	mg/kg	
Selenium	DETSC 2301#	0.5	mg/kg	
Vanadium	DETSC 2301#	0.8	mg/kg	
Zinc	DETSC 2301#	1	mg/kg	
Inorganics				
pH	DETSC 2008#		pH	
Cyanide, Total	DETSC 2130#	0.1	mg/kg	
Cyanide, Free	DETSC 2130#	0.1	mg/kg	
Organic matter	DETSC 2002#	0.1	%	
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	
Sulphide	DETSC 2024*	10	mg/kg	
Sulphate as SO4, Total	DETSC 2321#	0.01	%	
Petroleum Hydrocarbons				
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10
TPH Ali/Aro Total C5-C35	DETSC 3072*	10	mg/kg	< 10

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Summary of Chemical Analysis
Soil Samples

Our Ref 23-12673
Client Ref P23-2863
Contract Title Milton Place, Gravesend

Lab No	2178436
.Sample ID	HP02
Depth	0.30-0.40
Other ID	
Sample Type	SOIL
Sampling Date	24/05/2023
Sampling Time	n/s

Test	Method	LOD	Units	
PAHs				
Naphthalene	DETSC 3303#	0.03	mg/kg	
Acenaphthylene	DETSC 3303#	0.03	mg/kg	
Acenaphthene	DETSC 3303#	0.03	mg/kg	
Fluorene	DETSC 3303	0.03	mg/kg	
Phenanthrene	DETSC 3303#	0.03	mg/kg	
Anthracene	DETSC 3303	0.03	mg/kg	
Fluoranthene	DETSC 3303#	0.03	mg/kg	
Pyrene	DETSC 3303#	0.03	mg/kg	
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	
Chrysene	DETSC 3303	0.03	mg/kg	
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	
PCBs				
PCB 28 + PCB 31	DETSC 3401#	0.01	mg/kg	< 0.01
PCB 52	DETSC 3401#	0.01	mg/kg	< 0.01
PCB 101	DETSC 3401#	0.01	mg/kg	< 0.01
PCB 118	DETSC 3401#	0.01	mg/kg	< 0.01
PCB 153	DETSC 3401#	0.01	mg/kg	< 0.01
PCB 138	DETSC 3401#	0.01	mg/kg	< 0.01
PCB 180	DETSC 3401#	0.01	mg/kg	< 0.01
PCB 7 Total	DETSC 3401#	0.01	mg/kg	< 0.01
Phenols				
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	

Summary of Chemical Analysis
Leachate Samples

Our Ref 23-12673
Client Ref P23-2863
Contract Title Milton Place, Gravesend

			Lab No	2178439	2178440
			.Sample ID	BH01	WS01A
			Depth	1.00	1.50
			Other ID		
			Sample Type	LEACHATE	LEACHATE
			Sampling Date	22/05/2023	24/05/2023
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Preparation					
BS EN 12457 10:1	DETSC 1009*			Y	N
Metals					
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	1.1	3.2
Barium, Dissolved	DETSC 2306	0.26	ug/l	7.5	6.7
Beryllium, Dissolved	DETSC 2306*	0.1	ug/l	< 0.1	< 0.1
Boron, Dissolved	DETSC 2306*	12	ug/l	< 12	< 12
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	< 0.03	< 0.03
Chromium, Dissolved	DETSC 2306	0.25	ug/l	5.3	2.2
Chromium, Hexavalent	DETSC 2203	0.007	mg/l	< 0.007	< 0.007
Copper, Dissolved	DETSC 2306	0.4	ug/l	4.7	1.3
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.81	0.64
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.01	0.02
Nickel, Dissolved	DETSC 2306	0.5	ug/l	0.8	< 0.5
Selenium, Dissolved	DETSC 2306	0.25	ug/l	0.26	< 0.25
Vanadium, Dissolved	DETSC 2306	0.6	ug/l	4.9	13
Zinc, Dissolved	DETSC 2306	1.3	ug/l	3.3	< 1.3
Inorganics					
pH	DETSC 2008		pH	10.9	8.6
Cyanide, Total	DETSC 2130	40	ug/l	< 40	< 40
Cyanide, Free	DETSC 2130	20	ug/l	< 20	< 20
Cyanide, Complex	DETSC 2130*	40	ug/l	< 40	< 40
Sulphate as SO4	DETSC 2055	0.1	mg/l	4.4	5.1
Sulphide	DETSC 2208	10	ug/l	32	36
Total Organic Carbon	DETSC 2085	1	mg/l	3.8	4.0
Petroleum Hydrocarbons					
Aliphatic C5-C6	DETSC 3322	0.1	ug/l	< 0.1	800
Aliphatic C6-C8	DETSC 3322	0.1	ug/l	< 0.1	12
Aliphatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aliphatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C35-C40	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aliphatic C5-C40	DETSC 3072*	10	ug/l	< 10	820
Aromatic C5-C7	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C7-C8	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C8-C10	DETSC 3322	0.1	ug/l	< 0.1	< 0.1
Aromatic C10-C12	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C12-C16	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C16-C21	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C21-C35	DETSC 3072*	1	ug/l	< 1.0	< 1.0

Key: * -not accredited. n/s -not supplied.

Summary of Chemical Analysis
Leachate Samples

Our Ref 23-12673
Client Ref P23-2863
Contract Title Milton Place, Gravesend

			Lab No	2178439	2178440
			.Sample ID	BH01	WS01A
			Depth	1.00	1.50
			Other ID		
			Sample Type	LEACHATE	LEACHATE
			Sampling Date	22/05/2023	24/05/2023
			Sampling Time	n/s	n/s
Test	**Method**	**LOD**	**Units**		
Aromatic C35-C40	DETSC 3072*	1	ug/l	< 1.0	< 1.0
Aromatic C5-C40	DETSC 3072*	10	ug/l	< 10	< 10
TPH Ali/Aro C5-C40	DETSC 3072*	10	ug/l	< 10	820
EPH (C10-C35)	DETSC 3311	10	ug/l	34	74
PAHs					
Naphthalene	DETSC 3304	0.05	ug/l	0.05	< 0.05
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Acenaphthene	DETSC 3304	0.01	ug/l	0.01	0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.02	0.02
Anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.01	< 0.01
Pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(a)anthracene	DETSC 3304*	0.01	ug/l	< 0.01	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
Benzo(g,h,i)perylene	DETSC 3304	0.01	ug/l	< 0.01	< 0.01
PAH Total	DETSC 3304	0.2	ug/l	< 0.20	< 0.20
Phenols					
Phenol - Monohydric	DETSC 2130	100	ug/l	< 100	< 100

Key: * -not accredited. n/s -not supplied.

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 23-12673
Client Ref P23-2863
Contract Title Milton Place, Gravesend
Sample Id TP04 0.50

Sample Numbers 2178416 2178437
Date Analysed 09/06/2023

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	3.2	3	5	6
DETSC 2003# Loss On Ignition	%	5.5	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# TPH (C10 - C40)	mg/kg	12.0	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	3.8	100	n/a	n/a
DETSC 2008# pH	pH Units	8.0	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0	n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l 10:1	Amount Leached* mg/kg LS10	WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
DETSC 2306 Arsenic as As	0.75	< 0.01	0.5	2	25
DETSC 2306 Barium as Ba	34	0.34	20	100	300
DETSC 2306 Cadmium as Cd	< 0.030	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	3	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	3.4	0.034	2	50	100
DETSC 2306 Mercury as Hg	0.025	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	18	0.18	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.50	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	7.3	0.07	0.5	10	50
DETSC 2306 Antimony as Sb	0.31	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	1.4	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	15	0.15	4	50	200
DETSC 2055 Chloride as Cl	1300	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	240	2.4	10	150	500
DETSC 2055 Sulphate as SO4	31000	310	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	47000	470	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 1	1	n/a	n/a
DETSC 2085 Dissolved Organic Carbon	2200	< 50	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	9.1
DETSC 2009 Conductivity uS/cm	66.7
* Temperature*	18.0

Mass of Sample Kg*	0.110
Mass of dry Sample Kg*	0.096

Stage 1

Volume of Leachant L2*	0.947
Volume of Eluate VE1*	0.9

Disclaimer: *The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.*

V.2.06 ** DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.*

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 23-12673
Client Ref P23-2863
Contract Title Milton Place, Gravesend
Sample Id WS04 0.60

Sample Numbers 2178431 2178438
Date Analysed 08/06/2023

Test Results On Waste

Determinand and Method Reference	Units	Result	WAC Limit Values: Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	1.6	3	5	6
DETSC 2003# Loss On Ignition	%	4.7	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311# TPH (C10 - C40)	mg/kg	11.0	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	3.7	100	n/a	n/a
DETSC 2008# pH	pH Units	8.3	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0	n/a	TBE	TBE

Test Results On Leachate

Determinand and Method Reference	Conc in Eluate ug/l 10:1	Amount Leached* mg/kg LS10	WAC Limit Values (Limit values for LS10 Leachate): Inert Waste	SNRHW	Hazardous Waste
DETSC 2306 Arsenic as As	0.77	< 0.01	0.5	2	25
DETSC 2306 Barium as Ba	7	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	< 0.030	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	< 0.25	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	1.1	< 0.02	2	50	100
DETSC 2306 Mercury as Hg	< 0.010	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	1.2	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	< 0.50	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	0.46	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	0.58	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	< 0.25	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	1.4	0.014	4	50	200
DETSC 2055 Chloride as Cl	1100	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	< 100	< 0.1	10	150	500
DETSC 2055 Sulphate as SO4	2600	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	45000	450	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 1	1	n/a	n/a
DETSC 2085 Dissolved Organic Carbon	3700	< 50	500	800	1000

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive Hazardous Waste

Additional Information

DETSC 2008 pH	8.7
DETSC 2009 Conductivity uS/cm	64.0
* Temperature*	18.0

Mass of Sample Kg*	0.110
Mass of dry Sample Kg*	0.096

Stage 1

Volume of Leachant L2*	0.949
Volume of Eluate VE1*	0.9

Disclaimer: *The WAC limit values are provided for guidance only. DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.*

V.2.06 ** DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.*

Summary of Asbestos Analysis
Soil Samples

Our Ref 23-12673
Client Ref P23-2863
Contract Title Milton Place, Gravesend

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2178417	TP06 0.30	SOIL	NAD	none	Josh Best
2178418	BH01 0.50	SOIL	NAD	none	Josh Best
2178422	WS01A 0.30	SOIL	NAD	none	Josh Best
2178424	WS02 0.50	SOIL	NAD	none	Josh Best
2178433	WS05 0.30	SOIL	NAD	none	Josh Best
2178435	HP01 0.20-0.30	SOIL	NAD	none	Josh Best

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 23-12673
Client Ref P23-2863
Contract Milton Place, Gravesend

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
2178416	TP04 0.50 SOIL	23/05/23	GJ 250ml, PT 1L		BTEX
2178417	TP06 0.30 SOIL	23/05/23	GJ 250ml, PT 1L		BTEX
2178418	BH01 0.50 SOIL	22/05/23	GJ 250ml, PT 1L	pH + Conductivity (7 days)	BTEX
2178419	BH01 1.00 SOIL	22/05/23	GJ 250ml, PT 1L	pH + Conductivity (7 days)	
2178420	BH02 10.00 SOIL	23/05/23	PG		
2178421	BH02 21.00 SOIL	23/05/23	PG		
2178422	WS01A 0.30 SOIL	24/05/23	GJ 250ml, PT 1L		BTEX
2178423	WS01A 3.00-3.45 SOIL	24/05/23	PG		
2178424	WS02 0.50 SOIL	24/05/23	GJ 60ml x2, PT 1L		
2178425	WS03 0.80 SOIL	24/05/23	PG		
2178426	WS03 1.00-1.45 SOIL	24/05/23	PG		
2178427	WS03 3.00-3.45 SOIL	24/05/23	PG		
2178428	WS03 4.00-4.45 SOIL	24/05/23	PG		
2178429	WS03 5.00-5.45 SOIL	24/05/23	PG		
2178430	WS03 2.00-2.45 SOIL	24/05/23	PG		
2178431	WS04 0.60 SOIL	24/05/23	GJ 60ml x2, PT 1L x2		
2178432	WS04 1.50 SOIL	24/05/23	PG		
2178433	WS05 0.30 SOIL	24/05/23	GJ 250ml, PT 1L		BTEX
2178434	WS05 1.60 SOIL	24/05/23	PG		
2178435	HP01 0.20-0.30 SOIL	24/05/23	GJ 250ml, PT 1L		BTEX
2178436	HP02 0.30-0.40 SOIL	24/05/23	GJ 250ml, PT 1L		BTEX
2178437	TP04 0.50 LEACHATE	23/05/23	GJ 250ml, PT 1L		
2178438	WS04 0.60 LEACHATE	24/05/23	GJ 60ml x2, PT 1L x2		
2178439	BH01 1.00 LEACHATE	22/05/23	GJ 250ml, PT 1L		
2178440	WS01A 1.50 LEACHATE	24/05/23	GJ 250ml, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub G-Bag

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

End of Report

Milton Place, Gravesend

Comparison of Samples vs Site Specific Assessment Criteria

Scenario:	**Residential with plant uptake (2.5% SOM)**										
			Sample ID	TP06	BH01	BH01	BH02	BH02	WS01A	WS01A	WS02
LoD	**Metals (Based on 6% SOM)**	**SSAC**	**Depth**	0.30	0.50	1.00	10.00	21.00	0.30	3.00-3.45	0.50
0.2mg/kg	Arsenic	**37**		8.4	11				7.5		8.2
1.5mg/kg	Barium	-		68	65				310		77
0.2mg/kg	Beryllium	**1.7**		0.7	0.4				0.3		0.40
0.2mg/kg	Boron, Water Soluble	**290**		0.7	0.5				1		0.90
0.1mg/kg	Cadmium	**11**		0.3	0.2				0.5		0.40
0.15mg/kg	Chromium	**910**		14	15				14		14
1mg/kg	Chromium, Hexavalent	**6**		1	1				1		1.0
0.2mg/kg	Copper	**2400**		24	16				76		33
0.3mg/kg	Lead	**200**		61	37				**540**		110
0.05mg/kg	Mercury	**40**		0.11	0.07				< 0.05		0.57
1mg/kg	Nickel	**130**		*17*	*15*				*11*		*12*
0.5mg/kg	Selenium	**250**		< 0.5	< 0.5				< 0.5		< 0.5
0.8mg/kg	Vanadium	**410**		42	30				24		27
1mg/kg	Zinc	**3700**		56	51				280		71
	Inorganics										
	pH	-		8.5	10.5	10.1	9.8	8.1	11	6.1	9.1
0.1mg/kg	Cyanide, Total	-		0.1	0.2				0.1		0.10
0.1mg/kg	Cyanide, Free*	**34**		0.1	0.1				0.1		0.10
0.50%	Total Organic Carbon	-									
0.10%	Organic matter	-		1.6	1.6				0.6		2.1
10mg/l	Sulphate Aqueous Extract as SO4	-		42	79	89	31	43	140	51	52
10mg/kg	Sulphide	-		43	31				35		31
0.01%	Sulphate as SO4, Total	-		0.07	0.14				0.82		0.10
	Petroleum Hydrocarbons										
0.01mg/kg	Aliphatic C5-C6	**78**		0.10	0.01				0.01		0.01
0.01mg/kg	Aliphatic C6-C8	**230**		0.01	0.01				0.01		0.01
0.01mg/kg	Aliphatic C8-C10	**65**		0.01	0.01				0.01		0.01
1.5mg/kg	Aliphatic C10-C12	**330**		1.50	1.50				1.50		1.5
1.2mg/kg	Aliphatic C12-C16	**2400**		1.20	1.20				14.00		1.2
1.5mg/kg	Aliphatic C16-C21	**92000**		1.50	1.50				85.00		1.5
3.4mg/kg	Aliphatic C21-C35	**92000**		3.40	3.40				48.00		3.4
10mg/kg	Aliphatic C5-C35	-		10.00	10.00				150.00		10
0.01mg/kg	Aromatic C5-C7	**140**		0.01	0.01				0.01		0.01
0.01mg/kg	Aromatic C7-C8	**290**		0.01	0.01				0.01		0.01
0.01mg/kg	Aromatic C8-C10	**83**		0.01	0.01				0.01		0.01
0.9mg/kg	Aromatic C10-C12	**180**		0.90	0.90				0.90		0.90
0.5mg/kg	Aromatic C12-C16	**330**		0.5	0.50				4.40		0.50
0.6mg/kg	Aromatic C16-C21	**540**		0.6	0.60				66.00		0.60
1.4mg/kg	Aromatic C21-C35	**1500**		1.4	1.40				64.00		1.4
10mg/kg	Aromatic C5-C35	-		10	10.00				130.00		10
10mg/kg	TPH Ali/Aro Total	-		10	10.00				280.00		10
10mg/kg	EPH (C10-C35)	-									
10mg/kg	TPH (C10-C40)	-									
	PAHs										
0.03mg/kg	Naphthalene	**5.6**		0.03	0.03				0.03		0.03
0.03mg/kg	Acenaphthylene	**420**		0.03	0.03				0.04		0.03
0.03mg/kg	Acenaphthene	**510**		0.03	0.03				0.03		0.03
0.03mg/kg	Fluorene	**400**		0.03	0.03				0.03		0.03
0.03mg/kg	Phenanthrene	**220**		0.11	0.13				0.47		0.47
0.03mg/kg	Anthracene	**5400**		0.03	0.03				0.16		0.12
0.03mg/kg	Fluoranthene	**560**		0.3	0.17				0.68		0.97
0.03mg/kg	Pyrene	**1200**		0.27	0.14				0.55		0.89
0.03mg/kg	Benzo(a)anthracene	**11**		0.12	0.08				0.28		0.48
0.03mg/kg	Chrysene	**22**		0.09	0.06				0.15		0.32
0.03mg/kg	Benzo(b)fluoranthene	**3.3**		0.14	0.11				0.24		0.67
0.03mg/kg	Benzo(k)fluoranthene	**93**		0.03	0.03				0.06		0.17
0.03mg/kg	Benzo(a)pyrene	**2.7**		0.12	0.09				0.19		0.62
0.03mg/kg	Indeno(1,2,3-c,d)pyrene	**36**		0.04	0.04				0.17		0.20
0.03mg/kg	Dibenzo(a,h)anthracene	**0.28**		0.03	0.03				0.03		0.04
0.03mg/kg	Benzo(g,h,i)perylene	**340**		0.05	0.05				0.5		0.29
0.10mg/kg	PAH - USEPA 16, Total	**9224**		1.3	0.87				3.6		5.2
	Phenols										
0.3mg/kg	Phenol - Monohydric	**316**		0	0				0		0.30

Key	
xx	At or exceeding the SSAC (Site Specific Assessment Criteria)
xx	Within 90th percentile of SSAC contaminant value
LoD	Laboratory 'Limit of Detection'
*	Based on ATKINS AtRisk Value, 2017

Milton Place, Gravesend

Comparison of Samples vs Site Specific Assessment Criteria

create CONSULTING ENGINEERS LTD

Scenario:	**Residential with plant uptake (2.5% SOM)**											
			Sample ID	WS05	WS05	HP01	HP02					
LoD	**Metals (Based on 6% SOM)**	**SSAC**	**Depth**	0.30	1.60	0.20-0.30	0.30-0.40					
0.2mg/kg	Arsenic	**37**		5.6		9.4						
1.5mg/kg	Barium	-		47		81						
0.2mg/kg	Beryllium	**1.7**		0.30		0.60						
0.2mg/kg	Boron, Water Soluble	**290**		< 0.2		0.70						
0.1mg/kg	Cadmium	**11**		0.20		0.40						
0.15mg/kg	Chromium	**910**		9.8		18						
1mg/kg	Chromium, Hexavalent	**6**		< 1.0		< 1.0						
0.2mg/kg	Copper	**2400**		13		31						
0.3mg/kg	Lead	**200**		130		82						
0.05mg/kg	Mercury	**40**		0.11		0.23						
1mg/kg	Nickel	**130**		*8.9*		*15*						
0.5mg/kg	Selenium	**250**		< 0.5		< 0.5						
0.8mg/kg	Vanadium	**410**		18		32						
1mg/kg	Zinc	**3700**		30		82						
	Inorganics											
	pH	-		6.9	8.3	8.6						
0.1mg/kg	Cyanide, Total	-		< 0.1		0.20						
0.1mg/kg	Cyanide, Free*	**34**		< 0.1		< 0.1						
0.50%	Total Organic Carbon	-		0.70		2.2						
0.10%	Organic matter	-		15	10	31						
10mg/l	Sulphate Aqueous Extract as SO4	-		51		12						
10mg/kg	Sulphide	-		0.05		0.06						
0.01%	Sulphate as SO4, Total	-										
	Petroleum Hydrocarbons											
0.01mg/kg	Aliphatic C5-C6	**78**		0.13		0.01	0.01					
0.01mg/kg	Aliphatic C6-C8	**230**		0.01		0.01	0.01					
0.01mg/kg	Aliphatic C8-C10	**65**		0.01		0.01	0.01					
1.5mg/kg	Aliphatic C10-C12	**330**		1.5		1.5	1.5					
1.2mg/kg	Aliphatic C12-C16	**2400**		1.2		1.2	1.2					
1.5mg/kg	Aliphatic C16-C21	**92000**		1.5		1.5	1.5					
3.4mg/kg	Aliphatic C21-C35	**92000**		3.4		3.4	3.4					
10mg/kg	Aliphatic C5-C35	-		10		10	10					
0.01mg/kg	Aromatic C5-C7	**140**		0.01		0.01	0.01					
0.01mg/kg	Aromatic C7-C8	**290**		0.01		0.01	0.01					
0.01mg/kg	Aromatic C8-C10	**83**		0.01		0.01	0.01					
0.9mg/kg	Aromatic C10-C12	**180**		0.90		0.90	0.90					
0.5mg/kg	Aromatic C12-C16	**330**		0.50		0.50	0.50					
0.6mg/kg	Aromatic C16-C21	**540**		0.60		0.60	0.60					
1.4mg/kg	Aromatic C21-C35	**1500**		1.4		1.4	1.4					
10mg/kg	Aromatic C5-C35	-		10		10	10					
10mg/kg	TPH Ali/Aro Total	-		10		10	10					
10mg/kg	EPH (C10-C35)	-										
10mg/kg	TPH (C10-C40)	-										
	PAHs											
0.03mg/kg	Naphthalene	**5.6**		0.03		0.03						
0.03mg/kg	Acenaphthylene	**420**		0.03		0.03						
0.03mg/kg	Acenaphthene	**510**		0.03		0.03						
0.03mg/kg	Fluorene	**400**		0.03		0.03						
0.03mg/kg	Phenanthrene	**220**		0.03		0.17						
0.03mg/kg	Anthracene	**5400**		0.03		0.03						
0.03mg/kg	Fluoranthene	**560**		0.04		0.49						
0.03mg/kg	Pyrene	**1200**		0.04		0.44						
0.03mg/kg	Benzo(a)anthracene	**11**		0.03		0.21						
0.03mg/kg	Chrysene	**22**		0.03		0.16						
0.03mg/kg	Benzo(b)fluoranthene	**3.3**		0.04		0.27						
0.03mg/kg	Benzo(k)fluoranthene	**93**		0.03		0.07						
0.03mg/kg	Benzo(a)pyrene	**2.7**		0.03		0.22						
0.03mg/kg	Indeno(1,2,3-c,d)pyrene	**36**		0.03		0.08						
0.03mg/kg	Dibenzo(a,h)anthracene	**0.28**		0.03		0.03						
0.03mg/kg	Benzo(g,h,i)perylene	**340**		0.03		0.09						
0.10mg/kg	PAH - USEPA 16, Total	**9224**		0.12		2.2						
	Phenols											
0.3mg/kg	Phenol - Monohydric	**316**		0.30		0.30						

Key	
xx	At or exceeding the SSAC (Site Specific Assessment Criteria)
xx	Within 90th percentile of SSAC contaminant value
LoD	Laboratory 'Limit of Detection'
*	Based on ATKINS AtRisk Value, 2017

Milton Place, Gravesend

Comparison of Samples vs Site Specific Assessment Criteria

create CONSULTING ENGINEERS LTD

Criteria: **PoCWTest 2 (Groundwater Impact in Surface Water) - Maximum**

			Sample ID	BH01	WS01A
LoD	**Metals**	**SSAC**	**Depth**	1.00	1.50
0.16ug/l	Arsenic, Dissolved	**199**		1.1	3.2
0.26ug/l	Barium, Dissolved	-		7.5	6.7
0.1ug/l	Beryllium, Dissolved	-		< 0.1	< 0.1
12ug/l	Boron	-		< 12	< 12
0.03ug/l	Cadmium, Dissolved	**1.1**		< 0.03	< 0.03
0.25ug/l	Chromium, Dissolved	**27.6**		5.3	2.2
0.007ug/l	Chromium, Hexavalent	-		< 0.007	< 0.007
0.4ug/l	Copper, Dissolved	**57.8**		4.7	1.3
0.09ug/l	Lead, Dissolved	**39.8**		0.81	0.64
0.01ug/l	Mercury, Dissolved	-		0.01	0.02
0.5ug/l	Nickel, Dissolved	**116**		*0.80*	< 0.5
0.25ug/l	Selenium, Dissolved	-		0.26	< 0.25
0.6ug/l	Vanadium, Dissolved	-		4.9	13
1.3ug/l	Zinc, Dissolved	**414**		3.3	< 1.3
	Inorganics				
	pH	-		11	8.6
40ug/l	Cyanide, Total	-		< 40	< 40
20ug/l	Cyanide, Free	-		< 20	< 20
40ug/l	Cyanide, Complex	-		< 40	< 40
0.1mg/l	Sulphate as SO4	-		4.4	5.1
10ug/l	Sulphide	-		32	36
1mg/l	Total Organic Carbon	-		3.8	4.0
	Petroleum Hydrocarbons				
0.1ug/l	Aliphatic C5-C6	-		< 0.1	800
0.1ug/l	Aliphatic C6-C8	-		< 0.1	12
0.1ug/l	Aliphatic C8-C10	-		< 0.1	< 0.1
1ug/l	Aliphatic C10-C12	-		< 1.0	< 1.0
1ug/l	Aliphatic C12-C16	-		< 1.0	< 1.0
1ug/l	Aliphatic C16-C21	-		< 1.0	< 1.0
1ug/l	Aliphatic C21-C35	-		< 1.0	< 1.0
1ug/l	Aliphatic C35-C40			< 1.0	< 1.0
10ug/l	Aliphatic C5-C40			< 10	820.00
0.1ug/l	Aromatic C5-C7	-		< 0.1	< 0.1
0.1ug/l	Aromatic C7-C8	-		< 0.1	< 0.1
0.1ug/l	Aromatic C8-C10	-		< 0.1	< 0.1
1ug/l	Aromatic C10-C12	-		< 1.0	< 1.0
1ug/l	Aromatic C12-C16	-		< 1.0	< 1.0
1ug/l	Aromatic C16-C21	-		< 1.0	< 1.0
1ug/l	Aromatic C21-C35	-		< 1.0	< 1.0
1ug/l	Aromatic C35-C40			< 1.0	< 1.0
10ug/l	Aromatic C5-C40			< 10	< 10
10ug/l	TPH Ali/Aro Total	-		< 10	820
10ug/l	EPH (C10-C35)	-		**34**	**74**
1ug/l	Benzene	**55.2**		-	-
1ug/l	Toluene	**276**		-	-
1ug/l	Ethylbenzene	-		-	-
1ug/l	Xylene	**30.3**		-	-
	PAHs				
0.05ug/l	Naphthalene	**13.2**		0.05	< 0.05
0.01ug/l	Acenaphthylene	-		< 0.01	< 0.01
0.01ug/l	Acenaphthene	-		0.01	0.01
0.01ug/l	Fluorene	-		< 0.01	< 0.01
0.01ug/l	Phenanthrene	-		0.02	0.02
0.01ug/l	Anthracene	**0.55**		< 0.01	< 0.01
0.01ug/l	Fluoranthene	**0.6**		0.01	< 0.01
0.01ug/l	Pyrene	-		< 0.01	< 0.01
0.01ug/l	Benzo(a)anthracene	-		< 0.01	< 0.01
0.01ug/l	Chrysene	-		< 0.01	< 0.01
0.01ug/l	Benzo(b)fluoranthene	-		< 0.01	< 0.01
0.01ug/l	Benzo(k)fluoranthene	-		< 0.01	< 0.01
0.01ug/l	Benzo(a)pyrene	-		< 0.01	< 0.01
0.01ug/l	Indeno(1,2,3-c,d)pyrene	-		< 0.01	< 0.01
0.01ug/l	Dibenzo(a,h)anthracene	-		< 0.01	< 0.01
0.01ug/l	Benzo(g,h,i)perylene	-		< 0.01	< 0.01
0.2ug/l	PAH, Total	-		< 0.20	< 0.20
	Phenols				
100ug/l	Phenol - Monohydric	**82.8**		< 100	< 100

Key	
xx	At or exceeding the SSAC (Site Specific Assessment Criteria)
xx	Within 90th percentile of SSAC contaminant value
LoD	Laboratory 'Limit of Detection'
WSR	Water Supply (Water Quality) Regulations
PoCW	Protection of Controlled Waters

Milton Place, Gravesend

Comparison of Samples vs Site Specific Assessment Criteria

Scenario: Residential with plant uptake (2.5% SOM)

LoD	Metals (Based on 6% SOM)	SSAC	Sample ID	TP06	BH01	BH01	BH02	BH02	WS01A	WS01A	WS02
			Depth	0.30	0.50	1.00	10.00	21.00	0.30	3.00-3.45	0.50
0.2mg/kg	Arsenic	**37**		8.4	11				7.5		8.2
1.5mg/kg	Barium	-		68	65				310		77
0.2mg/kg	Beryllium	**1.7**		0.7	0.4				0.3		0.40
0.2mg/kg	Boron, Water Soluble	**290**		0.7	0.5				1		0.90
0.1mg/kg	Cadmium	**11**		0.3	0.2				0.5		0.40
0.15mg/kg	Chromium	**910**		14	15				14		14
1mg/kg	Chromium, Hexavalent	**6**		<1	<1				<1		<1
0.2mg/kg	Copper	**2400**		24	16				76		33
0.3mg/kg	Lead	**200**		61	37				**540**		110
0.05mg/kg	Mercury	**40**		0.11	0.07				< 0.05		0.57
1mg/kg	Nickel	**130**		*17*	*15*				*11*		*12*
0.5mg/kg	Selenium	**250**		< 0.5	< 0.5				< 0.5		< 0.5
0.8mg/kg	Vanadium	**410**		42	30				24		27
1mg/kg	Zinc	**3700**		56	51				280		71
	Inorganics										
	pH	-		8.5	10.5	10.1	9.8	8.1	11	6.1	9.1
0.1mg/kg	Cyanide, Total	-		0.1	0.2				<0.1		0.10
0.1mg/kg	Cyanide, Free*	**34**		<0.1	0.1				<0.1		<0.1
0.50%	Total Organic Carbon	-									
0.10%	Organic matter	-		1.6	1.6				0.6		2.1
10mg/l	Sulphate Aqueous Extract as SO4	-		42	79	89	31	43	140	51	52
10mg/kg	Sulphide	-		43	31				35		31
0.01%	Sulphate as SO4, Total	-		0.07	0.14				0.82		0.10
	Petroleum Hydrocarbons										
0.01mg/kg	Aliphatic C5-C6	**78**		0.10	<0.01				<0.01		<0.01
0.01mg/kg	Aliphatic C6-C8	**230**		<0.01	<0.01				<0.01		<0.01
0.01mg/kg	Aliphatic C8-C10	**65**		<0.01	<0.01				<0.01		<0.01
1.5mg/kg	Aliphatic C10-C12	**330**		<1.5	<1.5				<1.5		<1.5
1.2mg/kg	Aliphatic C12-C16	**2400**		<1.2	<1.2				14.00		<1.2
1.5mg/kg	Aliphatic C16-C21	**92000**		<1.5	<1.5				85.00		<1.5
3.4mg/kg	Aliphatic C21-C35	**92000**		<3.4	<3.4				48.00		<3.4
10mg/kg	Aliphatic C5-C35	-		<10	<10				150.00		<10
0.01mg/kg	Aromatic C5-C7	**140**		<0.01	<0.01				<0.01		<0.01
0.01mg/kg	Aromatic C7-C8	**290**		<0.01	<0.01				<0.01		<0.01
0.01mg/kg	Aromatic C8-C10	**83**		<0.01	<0.01				<0.01		<0.01
0.9mg/kg	Aromatic C10-C12	**180**		<0.9	<0.9				<0.9		<0.9
0.5mg/kg	Aromatic C12-C16	**330**		<0.5	<0.5				4.40		<0.5
0.6mg/kg	Aromatic C16-C21	**540**		<0.6	<0.6				66.00		<0.6
1.4mg/kg	Aromatic C21-C35	**1500**		<1.4	<1.4				64.00		<1.4
10mg/kg	Aromatic C5-C35	-		<10	<10				130.00		<10
10mg/kg	TPH Ali/Aro Total	-		<10	<10				280.00		<10
10mg/kg	EPH (C10-C35)	-									
10mg/kg	TPH (C10-C40)	-									
	PAHs										
0.03mg/kg	Naphthalene	**5.6**		<0.03	<0.03				<0.03		<0.03
0.03mg/kg	Acenaphthylene	**420**		<0.03	<0.03				0.04		<0.03
0.03mg/kg	Acenaphthene	**510**		<0.03	<0.03				<0.03		<0.03
0.03mg/kg	Fluorene	**400**		<0.03	<0.03				<0.03		<0.03
0.03mg/kg	Phenanthrene	**220**		0.11	0.13				0.47		0.47
0.03mg/kg	Anthracene	**5400**		<0.03	<0.03				0.16		0.12
0.03mg/kg	Fluoranthene	**560**		0.3	0.17				0.68		0.97
0.03mg/kg	Pyrene	**1200**		0.27	0.14				0.55		0.89
0.03mg/kg	Benzo(a)anthracene	**11**		0.12	0.08				0.28		0.48
0.03mg/kg	Chrysene	**22**		0.09	0.06				0.15		0.32
0.03mg/kg	Benzo(b)fluoranthene	**3.3**		0.14	0.11				0.24		0.67
0.03mg/kg	Benzo(k)fluoranthene	**93**		0.03	<0.03				0.06		0.17
0.03mg/kg	Benzo(a)pyrene	**2.7**		0.12	0.09				0.19		0.62
0.03mg/kg	Indeno(1,2,3-c,d)pyrene	**36**		0.04	0.04				0.17		0.20
0.03mg/kg	Dibenzo(a,h)anthracene	**0.28**		<0.03	0.03				0.03		0.04
0.03mg/kg	Benzo(g,h,i)perylene	**340**		0.05	0.05				0.5		0.29
0.10mg/kg	PAH - USEPA 16, Total	**9224**		1.3	0.87				3.6		5.2
	Phenols										
0.3mg/kg	Phenol - Monohydric	**316**		<0.3	0.4				<0.3		<0.3

Key

xx	At or exceeding the SSAC (Site Specific Assessment Criteria)
xx	Within 90th percentile of SSAC contaminant value
LoD	Laboratory 'Limit of Detection'
*	Based on ATKINS AtRisk Value, 2017

Milton Place, Gravesend

Comparison of Samples vs Site Specific Assessment Criteria

Scenario: Residential with plant uptake (2.5% SOM)

LoD	Metals (Based on 6% SOM)	SSAC	Sample ID	WS05	WS05	HP01	HP02
			Depth	0.30	1.60	0.20-0.30	0.30-0.40
0.2mg/kg	Arsenic	**37**		5.6		9.4	
1.5mg/kg	Barium	-		47		81	
0.2mg/kg	Beryllium	**1.7**		0.30		0.60	
0.2mg/kg	Boron, Water Soluble	**290**		< 0.2		0.70	
0.1mg/kg	Cadmium	**11**		0.20		0.40	
0.15mg/kg	Chromium	**910**		9.8		18	
1mg/kg	Chromium, Hexavalent	**6**		< 1.0		< 1.0	
0.2mg/kg	Copper	**2400**		13		31	
0.3mg/kg	Lead	**200**		130		82	
0.05mg/kg	Mercury	**40**		0.11		0.23	
1mg/kg	Nickel	**130**		*8.9*		*15*	
0.5mg/kg	Selenium	**250**		< 0.5		< 0.5	
0.8mg/kg	Vanadium	**410**		18		32	
1mg/kg	Zinc	**3700**		30		82	
	Inorganics						
	pH	-		6.9	8.3	8.6	
0.1mg/kg	Cyanide, Total	-		< 0.1		0.20	
0.1mg/kg	Cyanide, Free*	**34**		< 0.1		< 0.1	
0.50%	Total Organic Carbon	-					
0.10%	Organic matter	-		0.7		2.2	
10mg/l	Sulphate Aqueous Extract as SO4	-		15	10	31	
10mg/kg	Sulphide	-		51		12	
0.01%	Sulphate as SO4, Total	-		0.05		0.06	
	Petroleum Hydrocarbons						
0.01mg/kg	Aliphatic C5-C6	**78**		0.13		<0.01	<0.01
0.01mg/kg	Aliphatic C6-C8	**230**		<0.01		<0.01	<0.01
0.01mg/kg	Aliphatic C8-C10	**65**		<0.01		<0.01	<0.01
1.5mg/kg	Aliphatic C10-C12	**330**		<1.5		<1.5	<1.5
1.2mg/kg	Aliphatic C12-C16	**2400**		<1.2		<1.2	<1.2
1.5mg/kg	Aliphatic C16-C21	**92000**		<1.5		<1.5	<1.5
3.4mg/kg	Aliphatic C21-C35	**92000**		<3.4		<3.4	<3.4
10mg/kg	Aliphatic C5-C35	-		<10		<10	<10
0.01mg/kg	Aromatic C5-C7	**140**		<0.01		<0.01	<0.01
0.01mg/kg	Aromatic C7-C8	**290**		<0.01		<0.01	<0.01
0.01mg/kg	Aromatic C8-C10	**83**		<0.01		<0.01	<0.01
0.9mg/kg	Aromatic C10-C12	**180**		<0.9		<0.9	<0.9
0.5mg/kg	Aromatic C12-C16	**330**		<0.5		<0.5	<0.5
0.6mg/kg	Aromatic C16-C21	**540**		<0.6		<0.6	<0.6
1.4mg/kg	Aromatic C21-C35	**1500**		<1.4		<1.4	<1.4
10mg/kg	Aromatic C5-C35	-		<10		<10	<10
10mg/kg	TPH Ali/Aro Total	-		<10		<10	<10
10mg/kg	EPH (C10-C35)	-					
10mg/kg	TPH (C10-C40)	-					
	PAHs						
0.03mg/kg	Naphthalene	**5.6**		<0.03		<0.03	
0.03mg/kg	Acenaphthylene	**420**		<0.03		<0.03	
0.03mg/kg	Acenaphthene	**510**		<0.03		<0.03	
0.03mg/kg	Fluorene	**400**		<0.03		<0.03	
0.03mg/kg	Phenanthrene	**220**		<0.03		0.17	
0.03mg/kg	Anthracene	**5400**		<0.03		<0.03	
0.03mg/kg	Fluoranthene	**560**		0.04		0.49	
0.03mg/kg	Pyrene	**1200**		0.04		0.44	
0.03mg/kg	Benzo(a)anthracene	**11**		0.03		0.21	
0.03mg/kg	Chrysene	**22**		<0.03		0.16	
0.03mg/kg	Benzo(b)fluoranthene	**3.3**		0.04		0.27	
0.03mg/kg	Benzo(k)fluoranthene	**93**		<0.03		0.07	
0.03mg/kg	Benzo(a)pyrene	**2.7**		<0.03		0.22	
0.03mg/kg	Indeno(1,2,3-c,d)pyrene	**36**		<0.03		0.08	
0.03mg/kg	Dibenzo(a,h)anthracene	**0.28**		<0.03		<0.03	
0.03mg/kg	Benzo(g,h,i)perylene	**340**		<0.03		0.09	
0.10mg/kg	PAH - USEPA 16, Total	**9224**		0.12		2.2	
	Phenols						
0.3mg/kg	Phenol - Monohydric	**316**		0.30		0.30	
0.01mg/kg	Polychlorinated Biphenyls	-					<0.01

Key

xx	At or exceeding the SSAC (Site Specific Assessment Criteria)
xx	Within 90th percentile of SSAC contaminant value
LoD	Laboratory 'Limit of Detection'
*	Based on ATKINS AtRisk Value, 2017

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Milton Place, Gravesend

Comparison of Samples vs Site Specific Assessment Criteria

Criteria: **Water Supply (Water Quality) Regulations, 2000**

			Sample ID	BH01	WS01A
LoD	**Metals**	**SSAC**	**Depth**	1.00	1.50
0.16ug/l	Arsenic, Dissolved	**10**		1.1	3.2
0.26ug/l	Barium, Dissolved	**-**		7.5	6.7
0.1ug/l	Beryllium, Dissolved	**-**		< 0.1	< 0.1
12ug/l	Boron	**1000**		< 12	< 12
0.03ug/l	Cadmium, Dissolved	**5**		< 0.03	< 0.03
0.25ug/l	Chromium, Dissolved	**50**		5.3	2.2
0.007ug/l	Chromium, Hexavalent	**-**		< 0.007	< 0.007
0.4ug/l	Copper, Dissolved	**2000**		4.7	1.3
0.09ug/l	Lead, Dissolved	**10**		0.81	0.64
0.01ug/l	Mercury, Dissolved	**1**		0.01	0.02
0.5ug/l	Nickel, Dissolved	**20**		*0.80*	< 0.5
0.25ug/l	Selenium, Dissolved	**10**		0.26	< 0.25
0.6ug/l	Vanadium, Dissolved	**-**		4.9	13
1.3ug/l	Zinc, Dissolved	**5000**		3.3	< 1.3
	Inorganics				
	pH	**10**			
40ug/l	Cyanide, Total	**50**		< 40	< 40
20ug/l	Cyanide, Free	**50**		< 20	< 20
40ug/l	Cyanide, Complex	**-**		< 40	< 40
0.1mg/l	Sulphate as SO4	**250000**		4.4	5.1
10ug/l	Sulphide	**-**		32	36
1mg/l	Total Organic Carbon	**-**		3.8	4.0
	Petroleum Hydrocarbons				
0.1ug/l	Aliphatic C5-C6	**-**		< 0.1	800
0.1ug/l	Aliphatic C6-C8	**-**		< 0.1	12
0.1ug/l	Aliphatic C8-C10	**-**		< 0.1	< 0.1
1ug/l	Aliphatic C10-C12	**-**		< 1.0	< 1.0
1ug/l	Aliphatic C12-C16	**-**		< 1.0	< 1.0
1ug/l	Aliphatic C16-C21	**-**		< 1.0	< 1.0
1ug/l	Aliphatic C21-C35	**-**		< 1.0	< 1.0
1ug/l	Aliphatic C35-C40			< 1.0	< 1.0
10ug/l	Aliphatic C5-C40			< 10	820.00
0.1ug/l	Aromatic C5-C7	**-**		< 0.1	< 0.1
0.1ug/l	Aromatic C7-C8	**-**		< 0.1	< 0.1
0.1ug/l	Aromatic C8-C10	**-**		< 0.1	< 0.1
1ug/l	Aromatic C10-C12	**-**		< 1.0	< 1.0
1ug/l	Aromatic C12-C16	**-**		< 1.0	< 1.0
1ug/l	Aromatic C16-C21	**-**		< 1.0	< 1.0
1ug/l	Aromatic C21-C35	**-**		< 1.0	< 1.0
1ug/l	Aromatic C35-C40			< 1.0	< 1.0
10ug/l	Aromatic C5-C40			< 10	< 10
10ug/l	TPH Ali/Aro Total	**300**		< 10	**820**
10ug/l	EPH (C10-C35)	**-**		**34**	**74**
1ug/l	Benzene	**1**		-	-
1ug/l	Toluene	**-**		-	-
1ug/l	Ethylbenzene	**-**		-	-
1ug/l	Xylene	**-**		-	-
	PAHs				
0.05ug/l	Naphthalene	**-**		0.05	< 0.05
0.01ug/l	Acenaphthylene	**-**		< 0.01	< 0.01
0.01ug/l	Acenaphthene	**-**		0.01	0.01
0.01ug/l	Fluorene	**-**		< 0.01	< 0.01
0.01ug/l	Phenanthrene	**-**		0.02	0.02
0.01ug/l	Anthracene	**-**		< 0.01	< 0.01
0.01ug/l	Fluoranthene	**-**		0.01	< 0.01
0.01ug/l	Pyrene	**-**		< 0.01	< 0.01
0.01ug/l	Benzo(a)anthracene	**-**		< 0.01	< 0.01
0.01ug/l	Chrysene	**-**		< 0.01	< 0.01
0.01ug/l	Benzo(b)fluoranthene	**0.1**		< 0.01	< 0.01
0.01ug/l	Benzo(k)fluoranthene	**0.1**		< 0.01	< 0.01
0.01ug/l	Benzo(a)pyrene	**0.01**		< 0.01	< 0.01
0.01ug/l	Indeno(1,2,3-c,d)pyrene	**0.1**		< 0.01	< 0.01
0.01ug/l	Dibenzo(a,h)anthracene	**-**		< 0.01	< 0.01
0.01ug/l	Benzo(g,h,i)perylene	**0.1**		< 0.01	< 0.01
0.2ug/l	PAH, Total	**-**		< 0.20	< 0.20
	Phenols				
100ug/l	Phenol - Monohydric	**0.5**		< 100	< 100

Key	
xx	At or exceeding the SSAC (Site Specific Assessment Criteria)
xx	Within 90th percentile of SSAC contaminant value
LoD	Laboratory 'Limit of Detection'
WSR	Water Supply (Water Quality) Regulations
PoCW	Protection of Controlled Waters

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resource. (Note: Water Resources Act contains no scope for considering significance of pollution). Catastrophic damage to buildings/property. A short-term risk to a particular ecosystem, or organisation forming part of such ecosystem (note: the definitions of ecological systems within the draft circular on Contaminated Land, DETR, 2000).	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from Site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to human health ("significant harm" as defined in DETR, 2000). Pollution of sensitive water resources. (Note: Water Resources Act contains no scope for considering significance of pollution). A significant change in a particular ecosystem, or organism forming part of such ecosystem, (note: the definitions of ecological systems within draft circular on Contaminated Land, DETR, 2000).	Concentration of a contaminant from Site exceed the generic, or Site-specific assessment criteria. Leaching of contaminants from a Site to a major or minor aquifer. Death of a species within a designated nature reserve.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ("significant harm" as defined in the draft circular on Contaminated Land, DETR, 2000). Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater. Damage to building rendering it unsafe to occupy (for example foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.), easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during Site works. The loss of plants in a landscaping scheme. Discolouration of concrete.

Table D1: Classification of Consequence

Classification	Definition
High Likelihood	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.
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.
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 short-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.

Table D2: Classification of Probability

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Risk	**High Likelihood**	**Very high risk**	**High risk**	**Moderate risk**	**Moderate/low risk**
	Likely	**High risk**	**Moderate risk**	**Moderate/low risk**	**Low risk**
	Low Likelihood	**Moderate risk**	**Moderate/low risk**	**Low Risk**	**Very low risk**
	Unlikely	**Moderate/low risk**	**Low risk**	**Very low risk**	**Very low risk**

Table D3: Combination of Consequence with Probability

APPENDIX E

GEOTECHNICAL LABORATORY

TEST CERTIFICATES

GEOLABS Limited
Bucknalls Lane
Garston
Watford
Hertfordshire
WD25 9XX

Tel: +44(0) 1923 892 190
Fax: +44(0) 1923 892 191
email: admin@geolabs.co.uk
web: www.geolabs.co.uk

Create Consulting Engineers
109-112 Temple Chambers
3-7 Temple Avenue
London
EC4Y 0HP

27 June 2023
Report No : GEO/38215/01

For the attention of Mr A Warren

Date samples received	26/05/2023
Date written instructions received	06/06/2023
Date testing commenced	07/06/2023
Date of sample disposal	**25/07/2023**

Our ref **GEO / 38215**
Your Ref **P23-2863**

Project **MILTON PLACE, GRAVESEND**

Further to your instructions we have pleasure in enclosing the results of the tests you requested in the attached figures.

LABORATORY TEST REPORT

Item No	Test Quantity	Description
1	~	Liquid & Plastic Limits Summary
~	3	Water Content
~	3	Liquid & Plastic Limits
2	8	Saturation Water Content
3	9	Point Load Strength Index

Any opinions or interpretations expressed herein are outside the scope of UKAS accreditation. All results contained in this report are provisional unless signed by an approved signatory. The results contained in this report relate only to samples received in the laboratory and are tested 'as received' unless otherwise stated. This report should not be reproduced, except in full, without the written approval of the laboratory. The results reported are applicable only to the test items received by the laboratory.

All the necessary data required by the documented test procedures has been recorded and will be stored for a period of not less than 6 years. This data will be issued to yourselves at your request. All samples will be disposed of after the date shown above. Written confirmation will be required to retain the samples beyond this period and a storage charge may be applied.

We trust that the above meets your requirements and should you require any further information or assistance, please do not hesitate to contact us.

Yours faithfully
on behalf of **GEOLABS Limited**

S Burke
Senior Technician

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Registered Office: Bucknalls Lane Garston Watford Hertfordshire WD25 9XX Registered in England and Wales No: 3177641

BS EN ISO 17892-12 : 2018

SUMMARY OF LIQUID AND PLASTIC LIMIT TESTS

Location	Depth m	Sample Ref	Sample Type	Description	Water Content BS EN ISO 17892-1 : 2014 %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Percentage Passing 425µm %	Atterberg Classification	Test Type	Sample Condition
BH1	1.50		D	Orangish brown silty CLAY with rare fine to medium gravel.	16.4	33	16	17	99	CL	1	1
BH1	2.00		D	Orangish brown slightly sandy silty CLAY with rare fine to medium gravel.	18.1	34	17	17	99	CL	1	1
WS05	1.00-1.40		D	Orangish brown slightly sandy silty CLAY with rare fine to medium gravel.	17.9	40	16	24	99	CI	1	1

Test Type:
1 - 1 point 80g / 30° fall cone method.
2 - 4 point 80g / 30° fall cone method.
3 - Non plastic determination.

Sample condition:
1 - As Received
2 - Air Dried
3 - Washed & Air Dried

Checked and Approved by:

S Burke

S Burke - Senior Technician
27/06/2023

Project Number:

GEO / 38215

Project Name:

MILTON PLACE, GRAVESEND

P23-2863

GEOLABS

UKAS TESTING 1982

Client : Create Consulting Engineers, 109-112 Temple Chambers, 3-7 Temple Avenue, London, EC4Y 0HP (Ref 1687875232)

BS 1377-2 : 2022 : 4.2

SATURATION WATER CONTENT OF CHALK

Location	Depth m	Sample Ref	Sample Type	Description	Water Content BS EN ISO 17892-1 : 2014 %	Bulk Density BS EN ISO 17892-2 : 2014 : 5.2 Mg/m³	Dry Density BS EN ISO 17892-2 : 2014 : 5.2 Mg/m³	Saturation Water Content %	Porosity %
BH1	8.50		D	White CHALK.	31.4	1.91	1.45	32	46
BH1	17.50		D	White CHALK.	29.7	1.94	1.50	30	44
BH1	22.00		D	White CHALK.	27.1	1.99	1.57	27	42
BH2	7.00		D	White CHALK.	35.6	1.93	1.42	33	47
BH2	16.00		D	White CHALK.	35.0	1.92	1.42	33	47
BH2	22.00		D	White CHALK.	29.3	1.93	1.49	30	45
TP01	1.00-1.50		D	White CHALK.	30.6	1.92	1.47	31	46
TP04	1.80		D	White CHALK.	29.9	1.93	1.49	30	45

Notes

Tested by SB
Checked and Approved by

S Burke

S Burke - Senior Technician
27/06/2023

Project Number:

GEO / 38215

Project Name:

MILTON PLACE, GRAVESEND

P23-2863

GEOLABS

ISRM Suggested Methods - Rock Characterization Testing and Monitoring 1974 - 2006 In-house Technical Procedure TP35

DETERMINATION OF POINT LOAD STRENGTH ON ROCK

Sample details				Point Load test											
Borehole Ref.	Sample Ref.	Depth (m)	Description	D. Tested	Test type & Direction		Sample width W (mm)	Platen separation (mm) Start D	Platen separation (mm) End D'	Water Content (%)	Equiv. Diameter D_e (mm)	Failure Load P (kN)	I_s P/De^2 (MPa)	Correction Factor F	Point Load Index $I_{s(50)}$ (MPa)
BH1		8.50	White CHALK	15/06/23	I	U	45.1	30.3	28.1		40.2	0.19	0.12	0.91	0.11
BH1		13.00	White CHALK	15/06/23	I	U	30.0	23.6	21.5		28.7	0.07	0.08	0.78	0.06
BH1		17.50	White CHALK	15/06/23	I	U	80.0	47.6	43.2		66.3	0.64	0.14	1.14	0.16
BH1		22.00	White CHALK	15/06/23	I	U	42.5	23.4	21.0		33.7	0.10	0.09	0.84	0.08
BH2		7.00	White CHALK	15/06/23	I	U	32.0	32.1	30.3		35.1	0.08	0.07	0.85	0.06
BH2		16.00	White CHALK	15/06/23	I	U	43.3	30.1	27.8		39.1	0.15	0.10	0.90	0.09
BH2		22.00	White CHALK	15/06/23	I	U	47.6	26.4	24.1		38.2	0.10	0.07	0.89	0.06
TP01		1.00-1.50	White CHALK	15/06/23	I	U	45.0	39.8	37.5		46.4	0.30	0.14	0.97	0.14
TP01		1.80	White CHALK	15/06/23	I	U	53.1	36.2	34.3		48.2	0.45	0.19	0.98	0.19

(*) Sample failed on weakness

Test type and direction: **D** - Diametral **A** - Axial **B** - Block **I** - Irregular lump **P** - Perpendicular to planes of weakness **U** - Random or unknown orientation **L** - Parallel to planes of weakness

Checked and Approved by

CC

C Clergeaud (Snr. Geologist)

Date: 22/06/2023

Project Number:

GEO / 38215

Project Name:

MILTON PLACE, GRAVESEND

P23-2863

GEOLABS

UKAS TESTING 1982

GEOLABS®

Client	Create Consulting Engineers
Project No.	38215
Project Name	MILTON PLACE, GRAVESEND

TEST RESTRICTION

The following tests have been scheduled on the above project and **CANNOT** be performed for the reason stated. If alternative samples are available for the restricted tests, please supply details.

Laboratory ID	BH / TP No.	Sample Ref.	Depth (m)		Type	Test(s) Scheduled			Reason for Restriction	Description
488116	BH1		13.00		D	SMC			No suitable lumps	White structureless CHALK

Comments / remarks

Test restriction raised by

S Burke

Norfolk Partnership Laboratory
Part of the Norse Group

County Hall, Martineau Lane
NORWICH, Norfolk NR1 2SG
Tel: 01603 578389
Email: civil.laboratory@norsegroup.co.uk

Create Consulting Engineers Ltd
FAO Tom Bennett
15 Princes Street
NORWICH
NR3 1AF

Our Project No	104409
Our Report and sample No	NNPL2023060142-
Your Sample Ref	B1
Your Project or Order No	5070
Date Report Issued	03 July 2023
Date Tested	27 June 2023

Tom.Bennett@createconsultingengineers.co.uk

Determination of the California Bearing Ratio to BS 1377 : Part 4 : 1990 (Withdrawn)

Scheme	Gravesend, Milton Place		
Location	TP02 @ 0.4m Specimen: 1		
Date sampled	22 May 2023	**Date received**	31 May 2023
Sampled by	Client	**Sample Mass**	17.695kg

If a sample certificate was provided, it is available for inspection. The accuracy of any information provided by third parties cannot be guaranteed. These results only relate to the sample tested. Samples submitted by clients are tested 'as received'

Material	Soil	**Sample type**	Bulk Disturbed
Description	Greyish white mottled white CHALK, recovered as slightly sandy, gravelly SILT. Gravel is angular to sub-rounded, fine to coarse chalk and rare flint.		
Supplier	Not applicable	**Source**	Ex site

Test Specimen Preparation details

Location	Not applicable	**Method of Division**	Quartering
Orientation	Not applicable	**Preparation Method**	Sieving, Natural Moisture Content
Retained 37.5mm	12.8 %	**Retained 20mm**	129.2* %
BS Method	3.4, 2.5kg Rammer	**Grading zone**	X
Number of layers	3	**Bulk Density**	1.81 Mg/m³
Blows per layer	62 Blows	**Dry Density**	1.44 Mg/m³
Condition	Soaked	**Init. Moisture Content**	23.0 %
Amount of Swell (mm)	**-0.068**	**Soaking Period**	**4** days

Test Results

	CBR Value %	Surface Modulus $ Mpa
Top	**5.1**	50
Bottom	**3.2**	37

$ The calculation of Surface Modulus is not covered by UKAS accreditation

Moisture Content Method		Oven dried @ 105-110°C			
Moisture Content Top	%	**25.0**	**Moisture Cont. Bottom**	%	**25.0**

Remarks

*Test not applicable for materials with more than 25% retained on a 20mm BS test sieve, BS 1377 part 4:1990 cl 7.2.12. The insitu value is likely to be higher than the test result.

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Test Code = 644

Jim Elliott (Lead Technical Support Tech.)

Norfolk Partnership Laboratory
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Email: civil.laboratory@norsegroup.co.uk

Create Consulting Engineers Ltd
FAO Tom Bennett
15 Princes Street
NORWICH
NR3 1AF

Our Project No	104409
Our Report and sample No	NNPL2023060143-
Your Sample Ref	B1
Your Project or Order No	5070
Date Report Issued	03 July 2023
Date Tested	23 June 2023

Tom.Bennett@createconsultingengineers.co.uk

Determination of the California Bearing Ratio to BS 1377 : Part 4 : 1990 (Withdrawn)

Scheme	Gravesend, Milton Place		
Location	TP04 @ 0.5m Specimen: 1		
Date sampled	23 May 2023	**Date received**	31 May 2023
Sampled by	Client	**Sample Mass**	19.296kg

If a sample certificate was provided, it is available for inspection. The accuracy of any information provided by third parties cannot be guaranteed. These results only relate to the sample tested. Samples submitted by clients are tested 'as received'

Material	Soil	**Sample type**	Bulk Disturbed
Description	Firm dark brown, gravelly CLAY. Gravel is angular to sub-angular flint and occasional chalk.		
Supplier	Not applicable	**Source**	Ex site

Test Specimen Preparation details

Location	Not applicable	**Method of Division**	Quartering
Orientation	Not applicable	**Preparation Method**	Sieving, Natural Moisture Content
Retained 37.5mm	2.7 %	**Retained 20mm**	5.0 %
BS Method	3.4, 2.5kg Rammer	**Grading zone**	4
Number of layers	3	**Bulk Density**	2.04 Mg/m³
Blows per layer	62 Blows	**Dry Density**	1.72 Mg/m³
Condition	Soaked	**Init. Moisture Content**	18.0 %
Amount of Swell (mm)	**0.007**	**Soaking Period**	**4** days

Test Results

	CBR Value %	Surface Modulus $ Mpa
Top	**2.4**	31
Bottom	**3.4**	39

$ The calculation of Surface Modulus is not covered by UKAS accreditation

Moisture Content Method		Oven dried @ 105-110°C			
Moisture Content Top	%	**19.0**	**Moisture Cont. Bottom**	%	**17.0**

Remarks

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Test Code = 644

Jim Elliott (Lead Technical Support Tech.)

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Create Consulting Engineers Ltd
FAO Tom Bennett
15 Princes Street
NORWICH
NR3 1AF

Our Project No	104409
Our Report and sample No	NNPL2023060145-
Your Sample Ref	B1
Your Project or Order No	5070
Date Report Issued	03 July 2023
Date Tested	27 June 2023

Tom.Bennett@createconsultingengineers.co.uk

Determination of the California Bearing Ratio to BS 1377 : Part 4 : 1990 (Withdrawn)

Scheme	Gravesend, Milton Place		
Location	WS04 @ 0.4m Specimen: 1		
Date sampled	24 May 2023	**Date received**	31 May 2023
Sampled by	Client	**Sample Mass**	10.085kg

If a sample certificate was provided, it is available for inspection. The accuracy of any information provided by third parties cannot be guaranteed. These results only relate to the sample tested. Samples submitted by clients are tested 'as received'

Material	Soil	**Sample type**	Bulk Disturbed
Description	Dark greyish brown, clayey, very gravelly, fine and medium SAND. Gravel is angular to sub-angular, fine to coarse chalk and flint.		
Supplier	Not applicable	**Source**	Ex site

Test Specimen Preparation details

Location	Not applicable	**Method of Division**	Quartering
Orientation	Not applicable	**Preparation Method**	Sieving, Natural Moisture Content
Retained 37.5mm	8.0 %	**Retained 20mm**	16.1 %
BS Method	3.4, 2.5kg Rammer	**Grading zone**	5
Number of layers	3	**Bulk Density**	1.89 Mg/m³
Blows per layer	62 Blows	**Dry Density**	1.55 Mg/m³
Condition	Soaked	**Init. Moisture Content**	19.0 %
Amount of Swell (mm)	**-0.004**	**Soaking Period**	**4** days

Test Results

	CBR Value	Surface Modulus $
	%	Mpa
Top	**7.1**	62
Bottom	**7.6**	64
Mean Value	**7**	63

$ The calculation of Surface Modulus is not covered by UKAS accreditation

Moisture Content Method		Oven dried @ 105-110°C			
Moisture Content Top	%	**22.0**	**Moisture Cont. Bottom**	%	**22.0**

Remarks

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Test Code = 644

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Create Consulting Engineers Ltd
Tom Bennett
15 Princes Street
NORWICH
NR3 1AF

Our Project No. 104409
Our Report and sample No. NNPL2023060144-€
Our Specimen Ref.
Your Order No. 5070

Date Report Issued 03 Jul 2023

Tom.Bennett@createconsultingengineers.co.uk

Determination of Saturation Water Content of Chalk to BS1377-2 : 2022

Scheme	Gravesend, Milton Place		
Location	TP06	**Depth**	0.5 m
Date sampled	23 May 2023	**Date received**	31 May 2023
Sampled by	Client	**Date tested**	
Sample type	Bulk Disturbed		

If a sample certificate was provided, it is available for inspection. The accuracy of any information provided by third parties cannot be guaranteed. These results only relate to the sample tested. Samples submitted by clients are tested 'as received'

Material	Soil		
Description	Intact, white chalk GRAVEL.		
Supplier	Not applicable	**Source**	Not applicable

	Test Specimen
Location	
Orientation	Not applicable
	Preparation Details
Method of Division	
Preparation Method	Oven dried @ 105 -110°C
Water Content (%)	26.91
Dry Density (Mg/m^3)	1.51
Saturation Water Content (%)	29

Remarks

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Test Code = 602

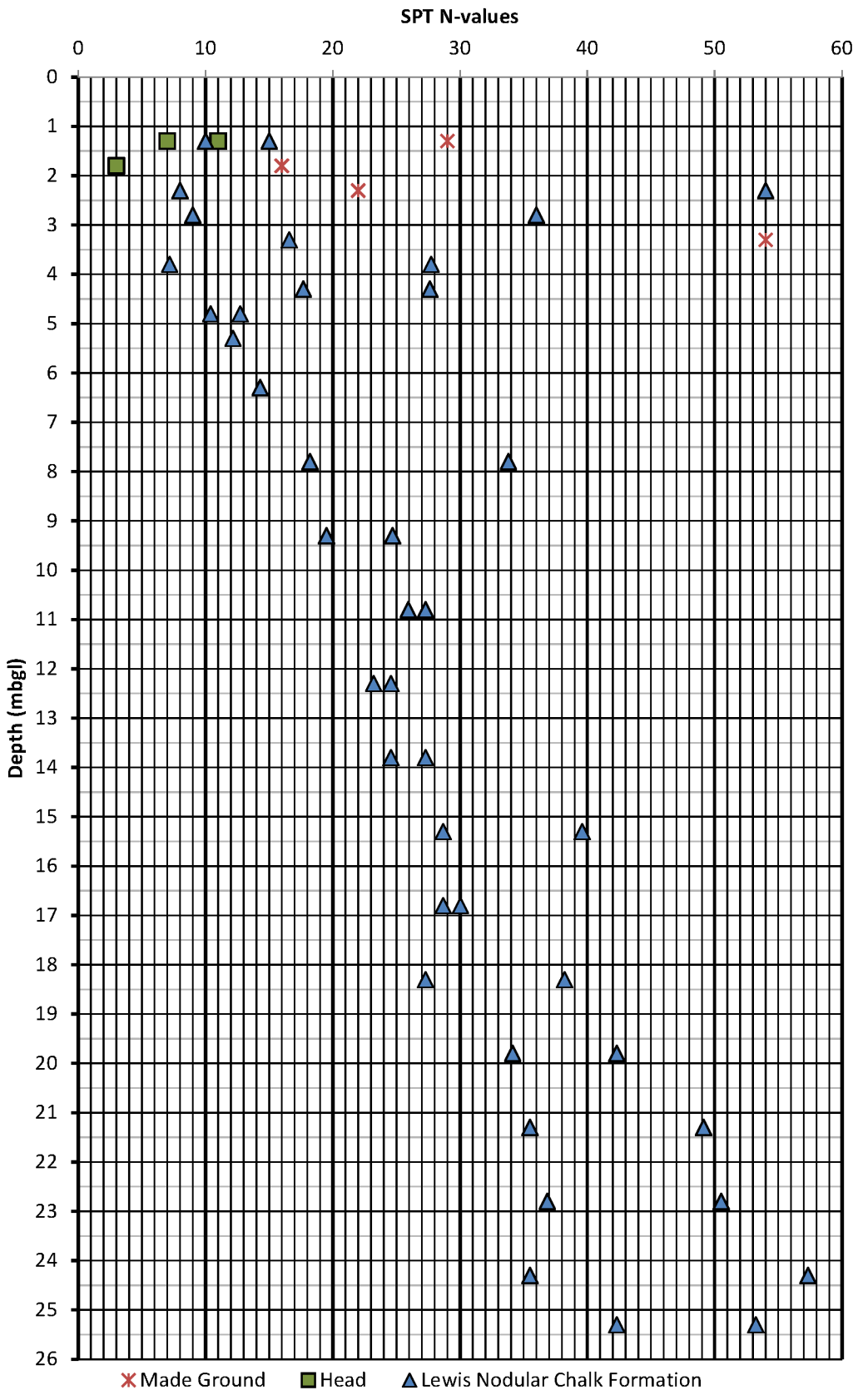
Jim Elliot (Lead Technical Support Tech.) _____

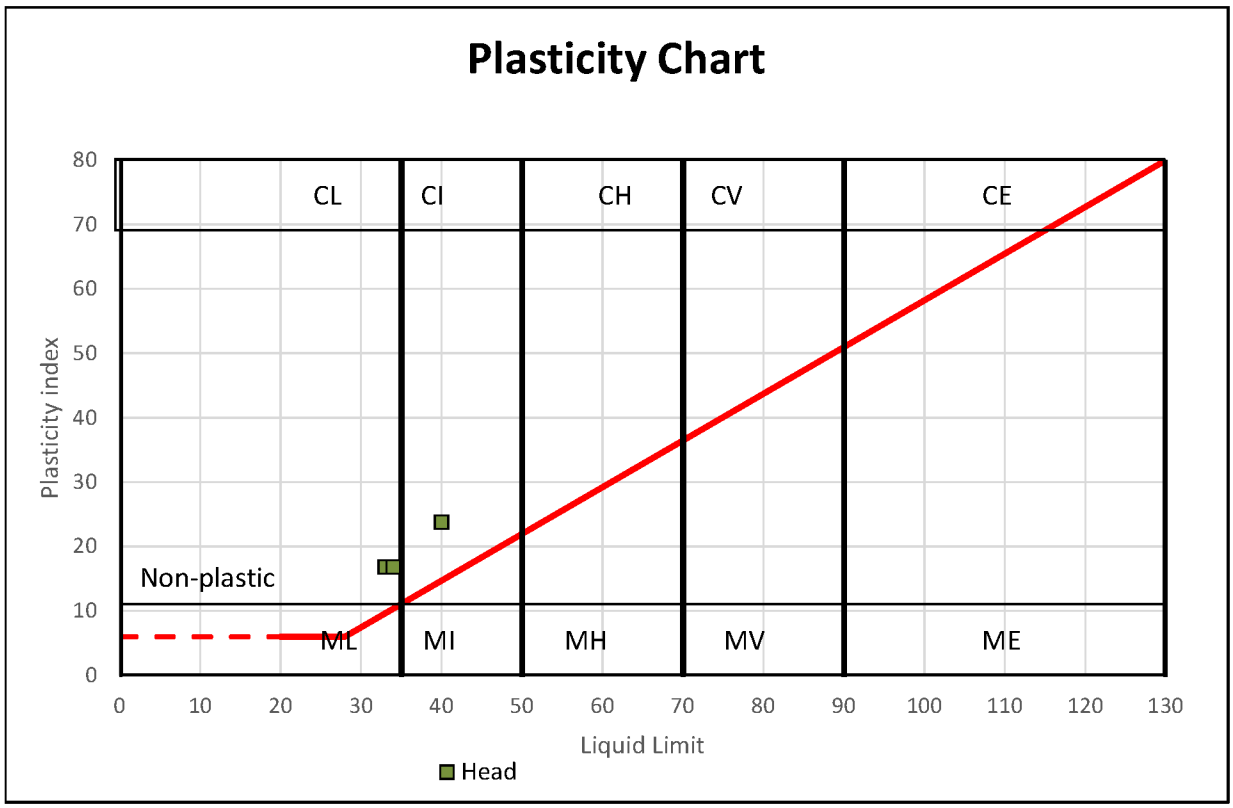
APPENDIX F

GEOTECHNICAL PLOTS

create
CONSULTING ENGINEERS LTD

Milton Place SPT depth plot




Plasticity Chart
CL
CI
CH
CV
CE
Non-plastic
ML
MI
MH
MV
ME
Plasticity index
Liquid Limit
Head
0
10
20
30
40
50
60
70
80
90
100
110
120
130

APPENDIX G

GROUND GAS MONITORING

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS

Site:	Milton Place, Gravesend		**Visit No:**	1 of 3	
Date:	09.06.2023		**Operator:**	AW	

create CONSULTING ENGINEERS LTD

Monitoring Point	Time	GAS CONCENTRATIONS								FLOW DATA		VOLATILES		WELL AND WATER DATA		COMMENTS
		Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		%LEL		Flow rate (l/hr)		PID Peak (ppm)	Product thickness (mm)	Water level (mbgl)	Well Depth (m)	
		Peak	Steady	Peak	Steady	Min.	Steady	Peak	Steady	Peak	Steady					
WS01A	10:41		0.0		1.6		18.0			0.1				DRY	2.75	
BH02	10:51		0.0		2.3		17.9			0.2				9.00	24.70	
WS04	11:04		0.0		0.5		19.1			0.2				DRY	2.37	
WS02	11:12		0.0		0.2		19.3			0.2				DRY	4.90	
Max		NA	0.0	NA	2.3	NA	19.3	NA	NA	0.2	NA	NA	NA	9.00	24.70	
Min		NA	0.0	NA	0.2	NA	17.9	NA	NA	0.1	NA	NA	NA	DRY	2.37	

ND - Not detected
NR - Not recorded
NA - Non applicable

METEOROLOGICAL AND SITE INFORMATION:

State of ground:	X	Dry		Moist		Wet		Snow		Frozen
Wind:	X	Calm		Light		Moderate		Strong		
Cloud cover:	X	None		Slight		Cloudy		Overcast		
Precipitation:	X	None		Slight		Moderate		Heavy		
Time monitoring performed:			10:39	Start			11:15	End		
Barometric pressure (mbar):			1014	Start			1014	End		
Pressure trend (Daily):				Falling	X	Steady		Rising		
Source:	GA5000									
Air Temperature (Deg. C):			21	Before			21	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GA5000
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa

Ambient air check: **CH_4** 0.0 **CO_2** 0.1 **O_2** 20.5

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS

Site:	Milton Place, Gravesend		**Visit No:**	2 of 3	
Date:	23.06.2023		**Operator:**	AW	

create CONSULTING ENGINEERS LTD

Monitoring Point	Time	GAS CONCENTRATIONS								FLOW DATA		VOLATILES		WELL AND WATER DATA		COMMENTS
		Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		%LEL		Flow rate (l/hr)		PID Peak (ppm)	Product thickness (mm)	Water level (mbgl)	Well Depth (m)	
		Peak	Steady	Peak	Steady	Min.	Steady	Peak	Steady	Peak	Steady					
WS01A	07:40		0.0		1.2		18.8			0.1				DRY	2.75	
WS04	07:44		0.0		1.6		18.2			0.2				DRY	2.40	
WS02	07:50		0.0		1.1		19.1			0.1				DRY	4.80	
BH02	08:00		0.0		2.1		18.2			0.1				9.00	24.70	
Max		**NA**	**0.0**	**NA**	**2.1**	**NA**	**19.1**	**NA**	**NA**	**0.2**	**NA**	**NA**	**NA**	**9.00**	**24.70**	
Min		**NA**	**0.0**	**NA**	**1.1**	**NA**	**18.2**	**NA**	**NA**	**0.1**	**NA**	**NA**	**NA**	**DRY**	**2.40**	

ND - Not detected

NR - Not recorded

NA - Non applicable

METEOROLOGICAL AND SITE INFORMATION:

State of ground:	X	Dry		Moist		Wet		Snow		Frozen
Wind:	X	Calm		Light		Moderate		Strong		
Cloud cover:	X	None		Slight		Cloudy		Overcast		
Precipitation:	X	None		Slight		Moderate		Heavy		
Time monitoring performed:			07:35	Start			08:03	End		
Barometric pressure (mbar):			1015	Start			1015	End		
Pressure trend (Daily):				Falling	X	Steady		Rising		
Source:	GA5000									
Air Temperature (Deg. C):			17	Before			17	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GA5000

Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%

Gas Flow range: +100/-50 l/hour

Differential Pressure: (+/-) 1000 Pa

Ambient air check: **CH_4** 0.0 **CO_2** 0.1 **O_2** 20.4

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS

Site:	Milton Place, Gravesend
Date:	29.06.2023

Visit No:	3 of 3
Operator:	AW

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Monitoring Point	Time	GAS CONCENTRATIONS								FLOW DATA		VOLATILES		WELL AND WATER DATA		COMMENTS
		Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		%LEL		Flow rate (l/hr)		PID Peak (ppm)	Product thickness (mm)	Water level (mbgl)	Well Depth (m)	
		Peak	Steady	Peak	Steady	Min.	Steady	Peak	Steady	Peak	Steady					
WS01A	16:38		0.0		1.5		17.7			0.1				DRY	2.75	
WS04	16:43		0.0		0.4		18.5			0.2				DRY	2.40	
WS02	16:50		0.0		0.9		19.0			0.1				DRY	4.80	
BH02	16:58		0.0		2.0		18.2			0.3				9.10	24.70	
Max		NA	0.0	NA	2.0	NA	19.0	NA	NA	0.3	NA	NA	NA	9.10	24.70	
Min		NA	0.0	NA	0.4	NA	17.7	NA	NA	0.1	NA	NA	NA	DRY	2.40	

ND - Not detected

NR - Not recorded

NA - Non applicable

METEOROLOGICAL AND SITE INFORMATION:

State of ground:	X	Dry		Moist		Wet		Snow		Frozen
Wind:		Calm		Light	X	Moderate		Strong		
Cloud cover:		None	X	Slight		Cloudy		Overcast		
Precipitation:	X	None		Slight		Moderate		Heavy		
Time monitoring performed:			16:35	Start			17:05	End		
Barometric pressure (mbar):			1020	Start			1020	End		
Pressure trend (Daily):				Falling	X	Steady		Rising		
Source:	GA5000									
Air Temperature (Deg. C):			19	Before			19	After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GA5000

Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%

Gas Flow range: +100/-50 l/hour

Differential Pressure: (+/-) 1000 Pa

Ambient air check: **CH_4** 0.0 **CO_2** 0.1 **O_2** 20.9

Traffic Light Classification	Methane		Carbon Dioxide	
	Typical Maximum Concentration (%v/v)	Gas Screening Value (l/hr)	Typical Maximum Concentration (%v/v)	Gas Screening Value (l/hr)
Green				
Amber 1	1	0.16	5	0.78
Amber 2	5	0.63	10	1.56
Red	20	1.56	30	3.10

Appendix 1: NHBC Traffic Light System Classification. Traffic Lights with Typical Maximum Concentrations and Gas Screening Values

Traffic Light Classification	Ground Gas Protection Measures Required
Green	No ground gas protection required.
Amber 1	Low level protection, including membrane and ventilated sub-floor void (minimum one complete change in 24 hours) to create a permeability contrast and limit ingress of ground gas into buildings.
Amber 2	High level protection, including membrane and ventilated sub-floor void (minimum one complete change in 24 hours) to create a permeability contrast and prevent ingress of ground gas into buildings.
Red	Development not normally acceptable without further ground gas risk assessment and/or remedial mitigation measures to reduce / remove the source of ground gas.

Appendix 2: NHBC Traffic Light System Classification. Ground Gas Protection Measures Required for the Traffic Lights

APPENDIX H

SOAKAGE TEST RESULTS

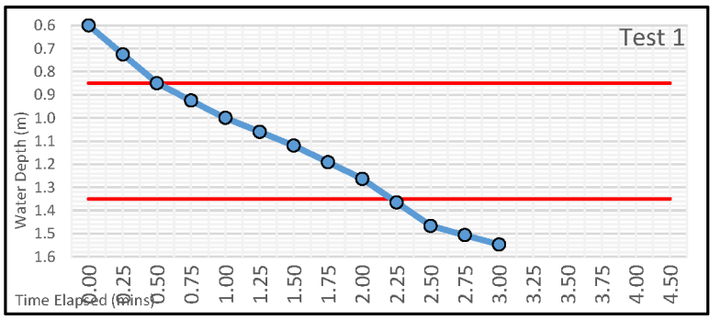
create
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Location	TP01

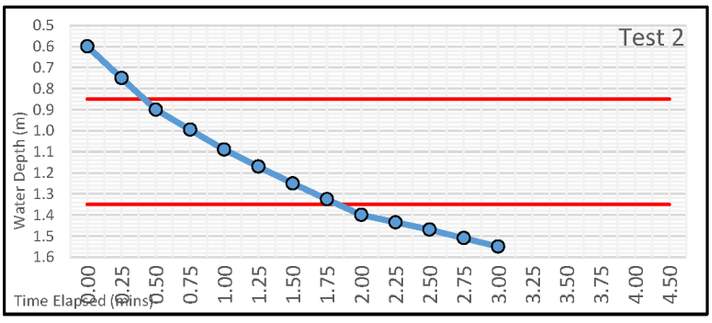
Site:	Milton Place, Gravesend		
Client:	Hill Partnerships Ltd		
Job No:	P23-2863	**Date:**	23/05/2023

Trial Pit Dimensions (m)	
Length	1.60
Width	0.30
Depth	1.60
Test volume (m^3)	0.48
Effective Depth	1.00

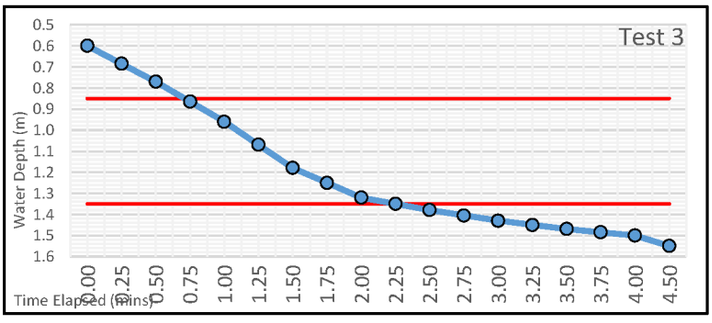
Soil type at test level	Structureless CHALK		
Groundwater	Not encountered	**Stone Filled?**	Yes
Sidewall stability	Stable, vertical	**Voids Ratio (%)**	0.41



V_{p75-25} (m^3)	0.10
A_{S50} (m^2)	2.38
t_{p75-25} (mins)	2
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**3.94E-04**



V_{p75-25} (m^3)	0.10
A_{S50} (m^2)	2.38
t_{p75-25} (mins)	2
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**4.31E-04**



V_{p75-25} (m^3)	0.10
A_{S50} (m^2)	2.38
t_{p75-25} (mins)	2
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**4.59E-04**

Time (mins)	Test 1	Test 2	Test 3
0.00	0.60	0.60	0.60
0.25	0.73	0.75	0.69
0.50	0.85	0.90	0.77
0.75	0.93	1.00	0.87
1.00	1.00	1.09	0.96
1.25	1.06	1.17	1.07
1.50	1.12	1.25	1.18
1.75	1.19	1.33	1.25
2.00	1.26	1.40	1.32
2.25	1.37	1.44	1.35
2.50	1.47	1.47	1.38
2.75	1.51	1.51	1.41
3.00	1.55	1.55	1.43
3.25			1.45
3.50			1.47
3.75			1.49
4.00			1.50
4.50			1.55

Remarks

1 Infiltration testing carried out between 0.6m and 1.6m
2 Datalogger number 825023
3 Test 1 carried out on 23/05/2023
4 Test 2 carried out on 24/05/2023
5 Test 3 carried out on 24/05/2023

Analysis by:	TB
Checked by:	CB

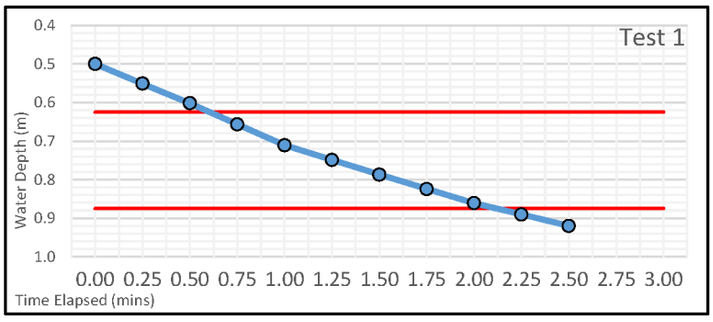
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Location	TP02

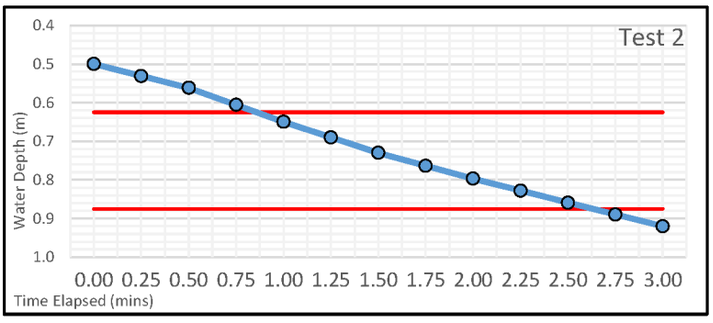
Site:	Milton Place, Gravesend		
Client:	Hill Partnerships Ltd		
Job No:	P23-2863	**Date:**	23/05/2023

Trial Pit Dimensions (m)	
Length	1.40
Width	0.30
Depth	1.00
Test volume (m^3)	0.21
Effective Depth	0.50

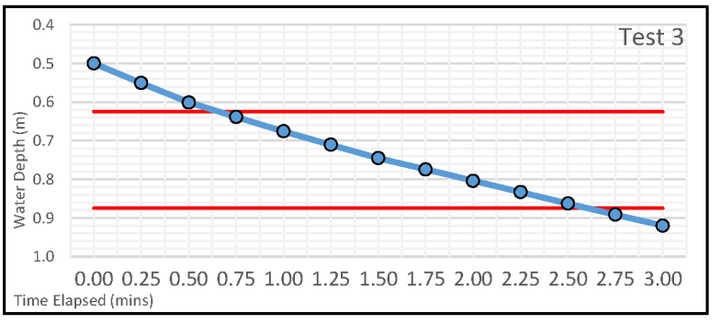
Soil type at test level	Structureless CHALK		
Groundwater	Not encountered	**Stone Filled?**	Yes
Sidewall stability	Stable, vertical	**Voids Ratio (%)**	0.41



V_{p75-25} (m^3)	0.04
A_{S50} (m^2)	1.27
t_{p75-25} (mins)	2
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**3.64E-04**



V_{p75-25} (m^3)	0.04
A_{S50} (m^2)	1.27
t_{p75-25} (mins)	1
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**4.35E-04**



V_{p75-25} (m^3)	0.04
A_{S50} (m^2)	1.27
t_{p75-25} (mins)	2
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**2.82E-04**

Time (mins)	Test 1	Test 2	Test 3
0.00	0.50	0.50	0.50
0.25	0.55	0.53	0.55
0.50	0.60	0.56	0.60
0.75	0.66	0.61	0.64
1.00	0.71	0.65	0.68
1.25	0.75	0.69	0.71
1.50	0.79	0.73	0.75
1.75	0.82	0.76	0.77
2.00	0.86	0.80	0.80
2.25	0.89	0.83	0.83
2.50	0.92	0.86	0.86
2.75		0.89	0.89
3.00		0.92	0.92

Remarks

1 Infiltration testing carried out between 0.5m and 1.0m
2 Datalogger number 823595
3 Test 1 carried out on 23/05/2023
4 Test 2 carried out on 23/05/2023
5 Test 3 carried out on 23/05/2023

Analysis by:	TB
Checked by:	CB

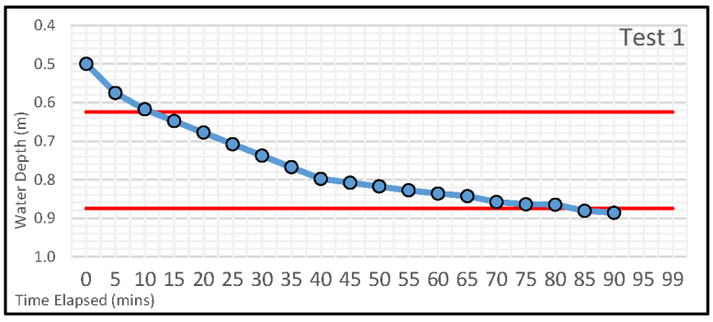
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Location	TP03

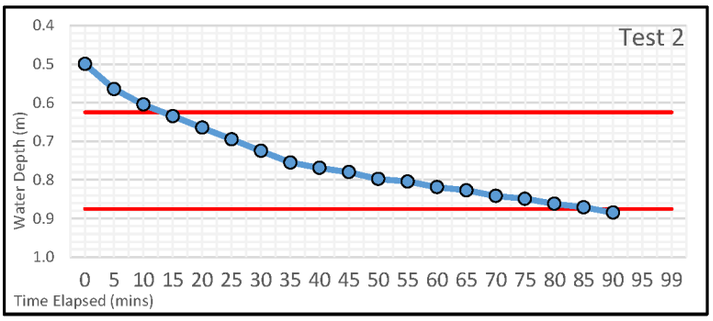
Site:	Milton Place, Gravesend		
Client:	Hill Partnerships Ltd		
Job No:	P23-2863	**Date:**	23/05/2023

Trial Pit Dimensions (m)	
Length	1.30
Width	0.30
Depth	1.00
Test volume (m^3)	0.20
Effective Depth	0.50

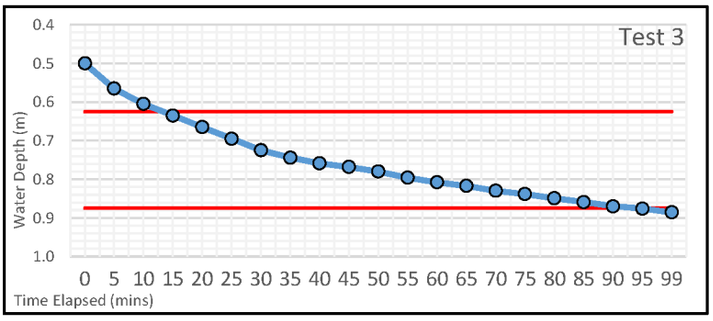
Soil type at test level	Structureless CHALK		
Groundwater	Not encountered	**Stone Filled?**	Yes
Sidewall stability	Stable, vertical	**Voids Ratio (%)**	0.41



V_{p75-25} (m^3)	0.04
A_{S50} (m^2)	1.19
t_{p75-25} (mins)	69
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**8.11E-06**



V_{p75-25} (m^3)	0.04
A_{S50} (m^2)	1.19
t_{p75-25} (mins)	68
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**8.29E-06**



V_{p75-25} (m^3)	0.04
A_{S50} (m^2)	1.19
t_{p75-25} (mins)	71
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**7.89E-06**

Time (mins)	Test 1	Test 2	Test 3
0	0.50	0.50	0.50
5	0.58	0.57	0.57
10	0.62	0.61	0.61
15	0.65	0.64	0.64
20	0.68	0.67	0.67
25	0.71	0.70	0.70
30	0.74	0.73	0.73
35	0.77	0.76	0.74
40	0.80	0.77	0.76
45	0.81	0.78	0.77
50	0.82	0.80	0.78
55	0.83	0.80	0.80
60	0.84	0.82	0.81
65	0.84	0.83	0.82
70	0.86	0.84	0.83
75	0.86	0.85	0.84
80	0.87	0.86	0.85
85	0.88	0.87	0.86
90	0.89	0.89	0.87
95			0.88
99			0.89

Remarks

1 Infiltration testing carried out between 0.5m and 1.0m
2 Datalogger number 823595
3 Test 1 carried out on 23/05/2023
4 Test 2 carried out on 23/05/2023
5 Test 3 carried out on 23/05/2023

Analysis by:	TB
Checked by:	CB

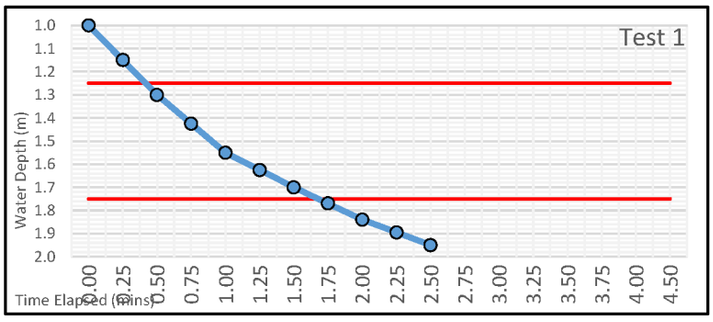
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Location	TP04

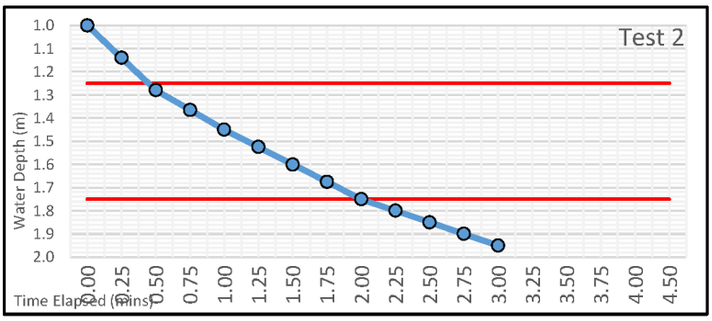
Site:	Milton Place, Gravesend		
Client:	Hill Partnerships Ltd		
Job No:	P23-2863	**Date:**	23/05/2023

Trial Pit Dimensions (m)	
Length	1.70
Width	0.30
Depth	2.00
Test volume (m^3)	0.51
Effective Depth	1.00

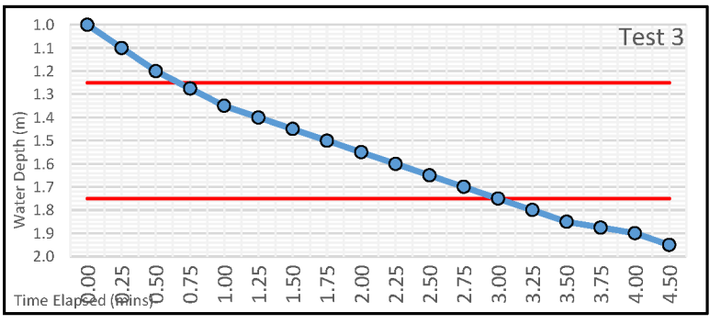
Soil type at test level	Structureless CHALK		
Groundwater	Not encountered	**Stone Filled?**	Yes
Sidewall stability	Stable, vertical	**Voids Ratio (%)**	0.41



V_{p75-25} (m^3)	0.10
A_{S50} (m^2)	2.51
t_{p75-25} (mins)	1
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**5.14E-04**



V_{p75-25} (m^3)	0.10
A_{S50} (m^2)	2.51
t_{p75-25} (mins)	2
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**4.48E-04**



V_{p75-25} (m^3)	0.10
A_{S50} (m^2)	2.51
t_{p75-25} (mins)	2
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**2.95E-04**

Time (mins)	Test 1	Test 2	Test 3
0.00	1.00	1.00	1.00
0.25	1.15	1.14	1.10
0.50	1.30	1.28	1.20
0.75	1.43	1.37	1.28
1.00	1.55	1.45	1.35
1.25	1.63	1.53	1.40
1.50	1.70	1.60	1.45
1.75	1.77	1.68	1.50
2.00	1.84	1.75	1.55
2.25	1.90	1.80	1.60
2.50	1.95	1.85	1.65
2.75		1.90	1.70
3.00		1.95	1.75
3.25			1.80
3.50			1.85
3.75			1.88
4.00			1.90
4.50			1.95

Remarks

1 Infiltration testing carried out between 1.0m and 2.0m
2 Datalogger number 823591
3 Test 1 carried out on 23/05/2023
4 Test 2 carried out on 24/05/2023
5 Test 3 carried out on 24/05/2023

Analysis by:	TB
Checked by:	CB

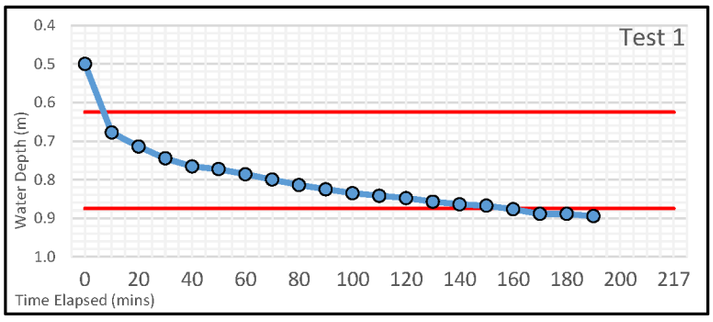
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Location	TP05

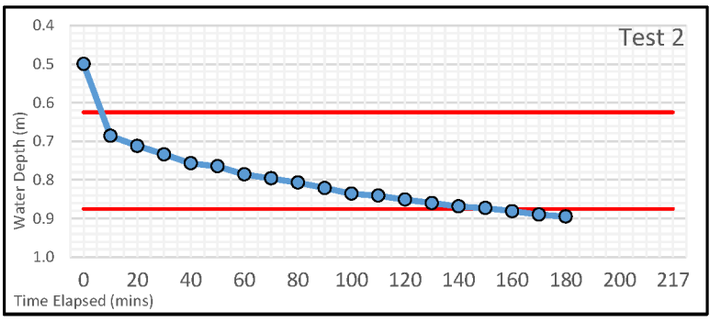
Site:	Milton Place, Gravesend		
Client:	Hill Partnerships Ltd		
Job No:	P23-2863	**Date:**	23/05/2023

Trial Pit Dimensions (m)	
Length	1.70
Width	0.30
Depth	1.00
Test volume (m^3)	0.26
Effective Depth	0.50

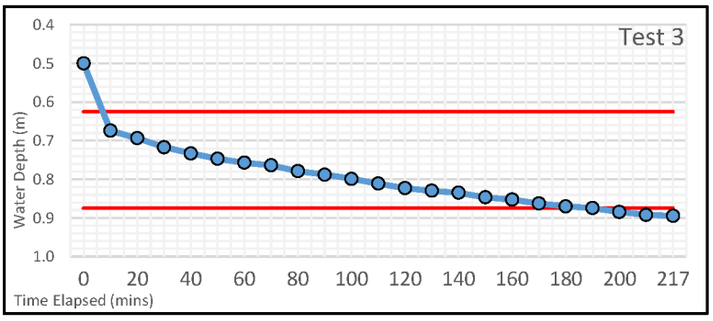
Soil type at test level	MADE GROUND		
Groundwater	Not encountered	**Stone Filled?**	Yes
Sidewall stability	Stable, vertical	**Voids Ratio (%)**	0.41



V_{p75-25} (m^3)	0.05
A_{S50} (m^2)	1.51
t_{p75-25} (mins)	152
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**3.80E-06**



V_{p75-25} (m^3)	0.05
A_{S50} (m^2)	1.51
t_{p75-25} (mins)	149
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**3.89E-06**



V_{p75-25} (m^3)	0.05
A_{S50} (m^2)	1.51
t_{p75-25} (mins)	184
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**3.14E-06**

Time (mins)	Test 1	Test 2	Test 3
0	0.50	0.50	0.50
10	0.68	0.69	0.67
20	0.71	0.71	0.69
30	0.75	0.73	0.72
40	0.77	0.76	0.73
50	0.77	0.77	0.75
60	0.79	0.79	0.76
70	0.80	0.80	0.76
80	0.81	0.81	0.78
90	0.83	0.82	0.79
100	0.84	0.84	0.80
110	0.84	0.84	0.81
120	0.85	0.85	0.82
130	0.86	0.86	0.83
140	0.86	0.87	0.84
150	0.87	0.87	0.85
160	0.88	0.88	0.85
170	0.89	0.89	0.86
180	0.89	0.90	0.87
190	0.90		0.88
200			0.89
210			0.89
217			0.90

Remarks

1 Infiltration testing carried out between 0.5m and 1.0m
2 Datalogger number 823838
3 Test 1 carried out on 23/05/2023
4 Test 2 carried out on 23/05/2023
5 Test 3 carried out on 24/05/2023

Analysis by:	TB
Checked by:	CB

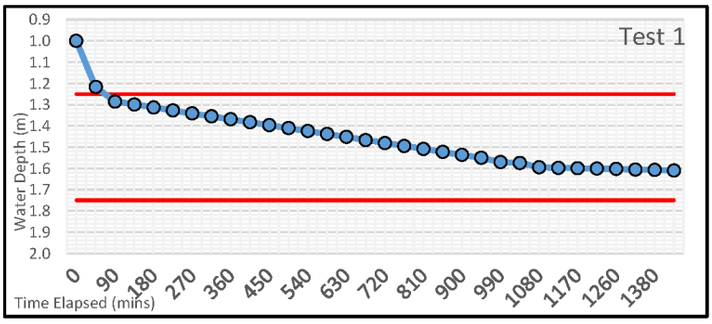
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CONSULTING ENGINEERS LTD

Location	TP06

Site:	Milton Place, Gravesend		
Client:	Hill Partnerships Ltd		
Job No:	P23-2863	**Date:**	23/05/2023

Trial Pit Dimensions (m)	
Length	1.70
Width	0.30
Depth	2.00
Test volume (m^3)	0.51
Effective Depth	1.00

Soil type at test level	Slightly Silty CLAY		
Groundwater	Not encountered	**Stone Filled?**	Yes
Sidewall stability	Stable, vertical	**Voids Ratio (%)**	0.41



V_{p75-25} (m^3)	0.10
A_{S50} (m^2)	2.51
t_{p75-25} (mins)	N/A
Soil infiltration rate $f = \frac{V_{p75-25}}{a_{S50} \times t_{p75-25}}$	**TEST FAIL**

Time (mins)	Test 1	Test 2	Test 3
0	1.00	-	-
45	1.22	-	-
90	1.29	-	-
135	1.30	-	-
180	1.31	-	-
225	1.33	-	-
270	1.34	-	-
315	1.35	-	-
360	1.37	-	-
405	1.38	-	-
450	1.40	-	-
495	1.41	-	-
540	1.42	-	-
585	1.44	-	-
630	1.45	-	-
675	1.47	-	-
720	1.48	-	-
765	1.49	-	-
810	1.51	-	-
855	1.52	-	-
900	1.54	-	-
945	1.55	-	-
990	1.57	-	-
1035	1.57	-	-
1080	1.60	-	-
1125	1.60	-	-
1170	1.60	-	-
1215	1.60	-	-
1260	1.60	-	-
1320	1.61	-	-
1380	1.61	-	-
1440	1.61	-	-

Remarks

1. Infiltration testing carried out between 1.0m and 2.0m
2. Datalogger number 823594
3. Test 1 carried out on 23/05/2023
4. Test failed due to insufficient drainage in 24 hour period

Analysis by:	TB
Checked by:	CB

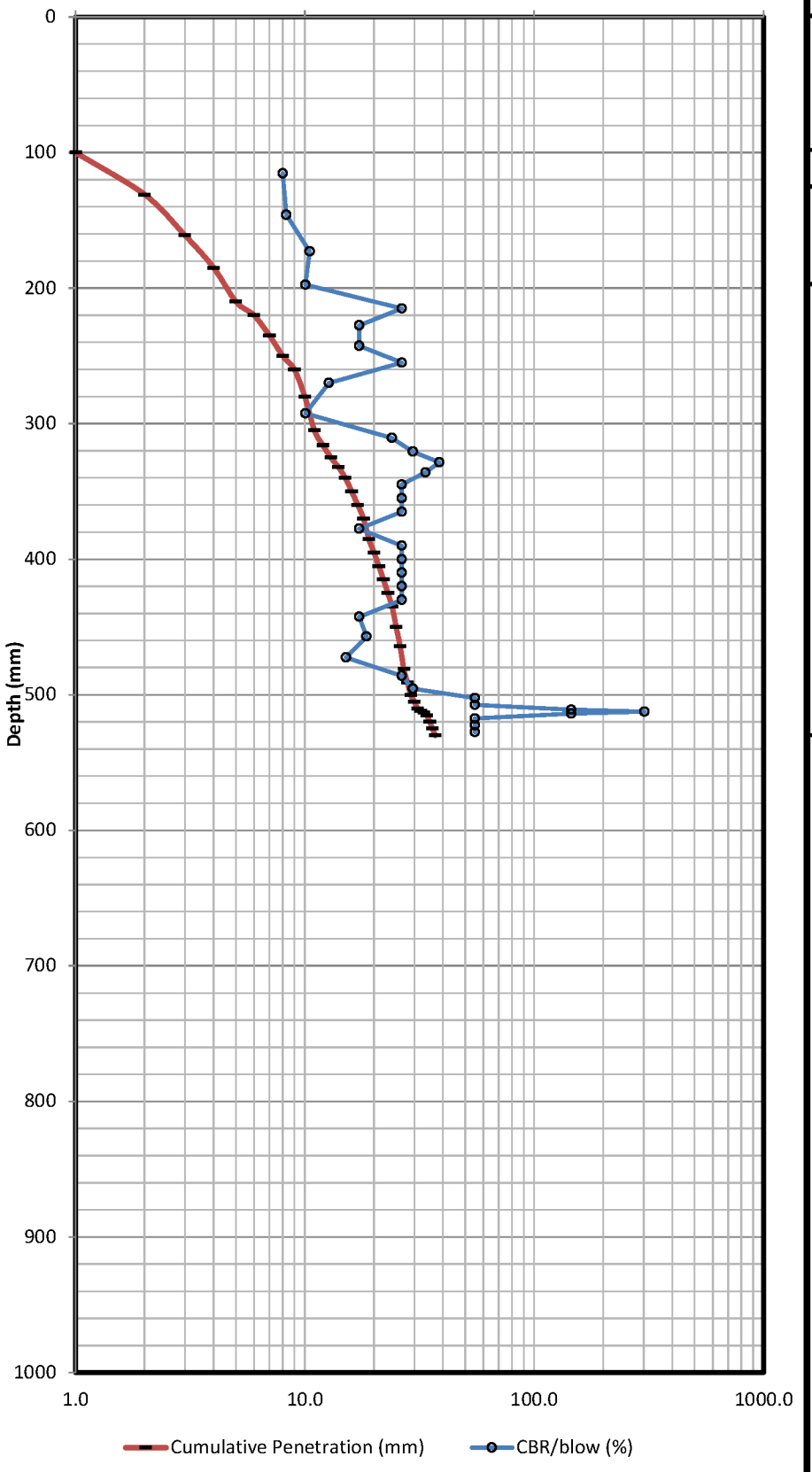
APPENDIX I

DYNAMIC CONE PENETROMETER RESULTS

create
CONSULTING ENGINEERS LTD

Date	22/05/2023
Job Number	P23-2863
Site	Milton Place, Gravesend
Engineer	TB

Location	
	TP02
	DCP02



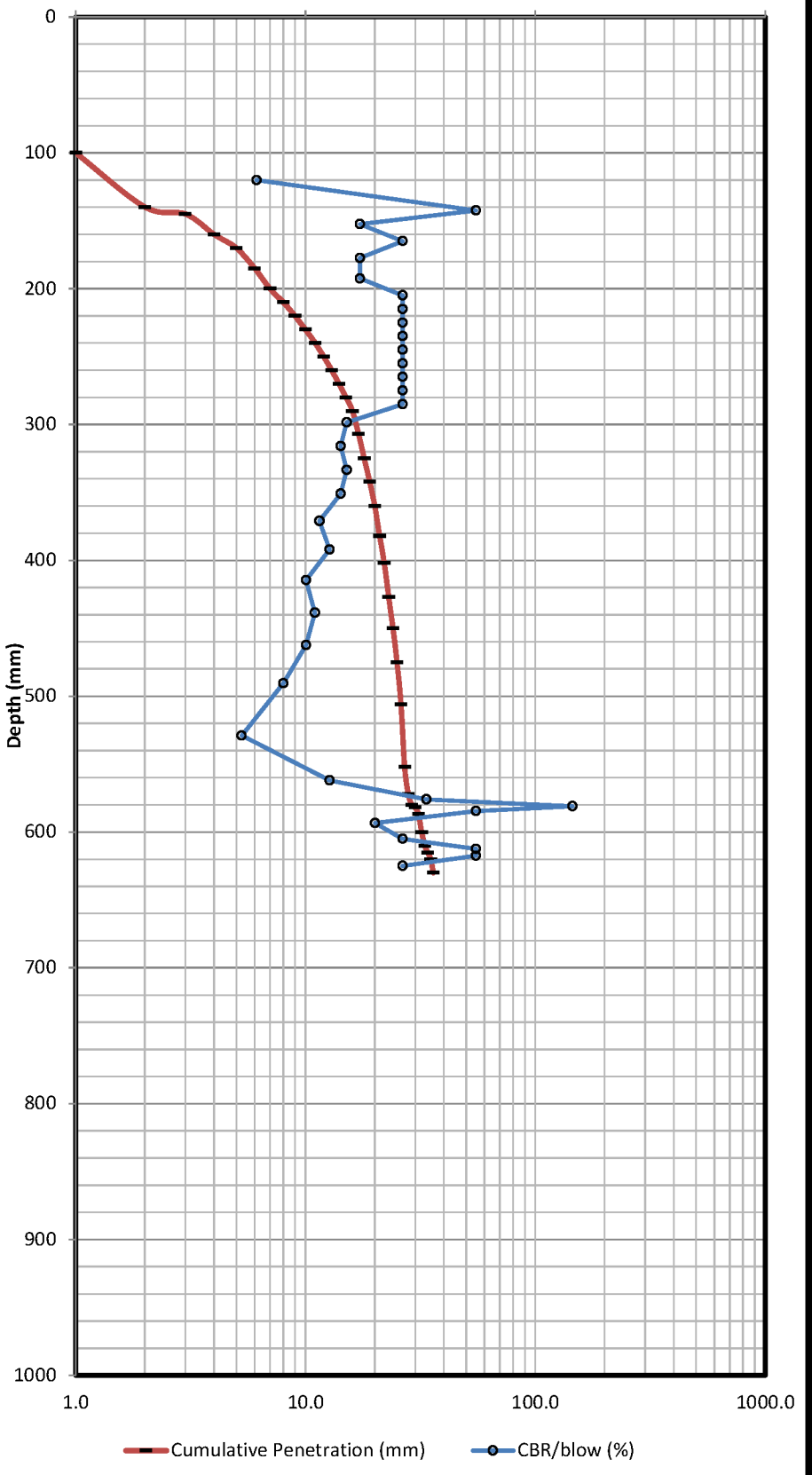
Interpreted CBR Value	
100mm Made Ground removed	
Start of Test	
Initial Penetration	
MADE GROUND	
21.2	HEAD
	CHALK
End of test	

1. 100mm Made Ground removed prior to starting test
2. Test refused at 530mm

create
CONSULTING ENGINEERS LTD

Date	22/05/2023
Job Number	P23-2863
Site	Milton Place, Gravesend
Engineer	TB

Location	
	TP04
	DCP04



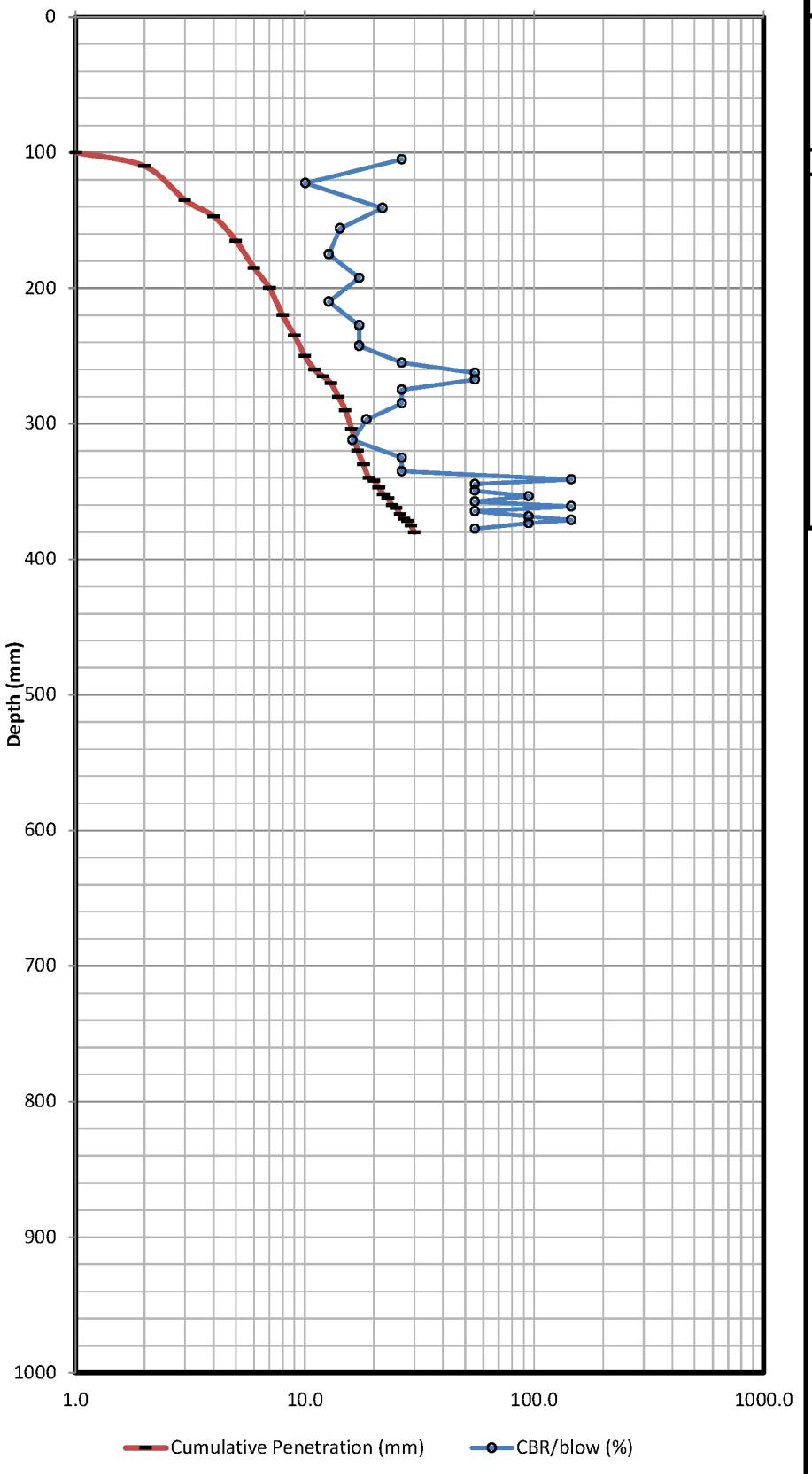
Interpreted CBR Value	
100mm Made Ground removed	
Start of Test	
Initial Penetration	
MADE GROUND	
8.8	CHALK
End of test	

1. 100mm Made Ground removed prior to starting test
2. Test refused at 630mm

create
CONSULTING ENGINEERS LTD

Date	22/05/2023
Job Number	P23-2863
Site	Milton Place, Gravesend
Engineer	TB

Location	
	TP05
	DCP05



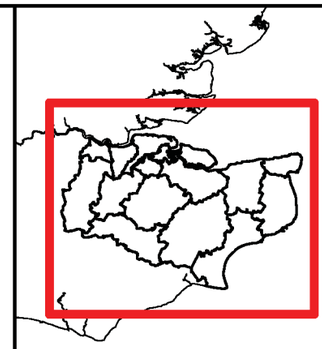
Interpreted CBR Value	
100mm Made Ground removed	
Start of Test	
Initial Penetration	
(18.6)	MADE GROUND
End of test	

1. 100mm Made Ground removed prior to starting test
2. Test refused at 380mm

APPENDIX D – Groundwater Risk Areas

Extract from Kent County Council's Preliminary Flood Risk Assessment

N



Legend

Griound water Risk Areas

- Negligible
- Low
- Medium
- High

Drawing Title:

Groundwater Risk Areas

Drawing Number:

Figure 6

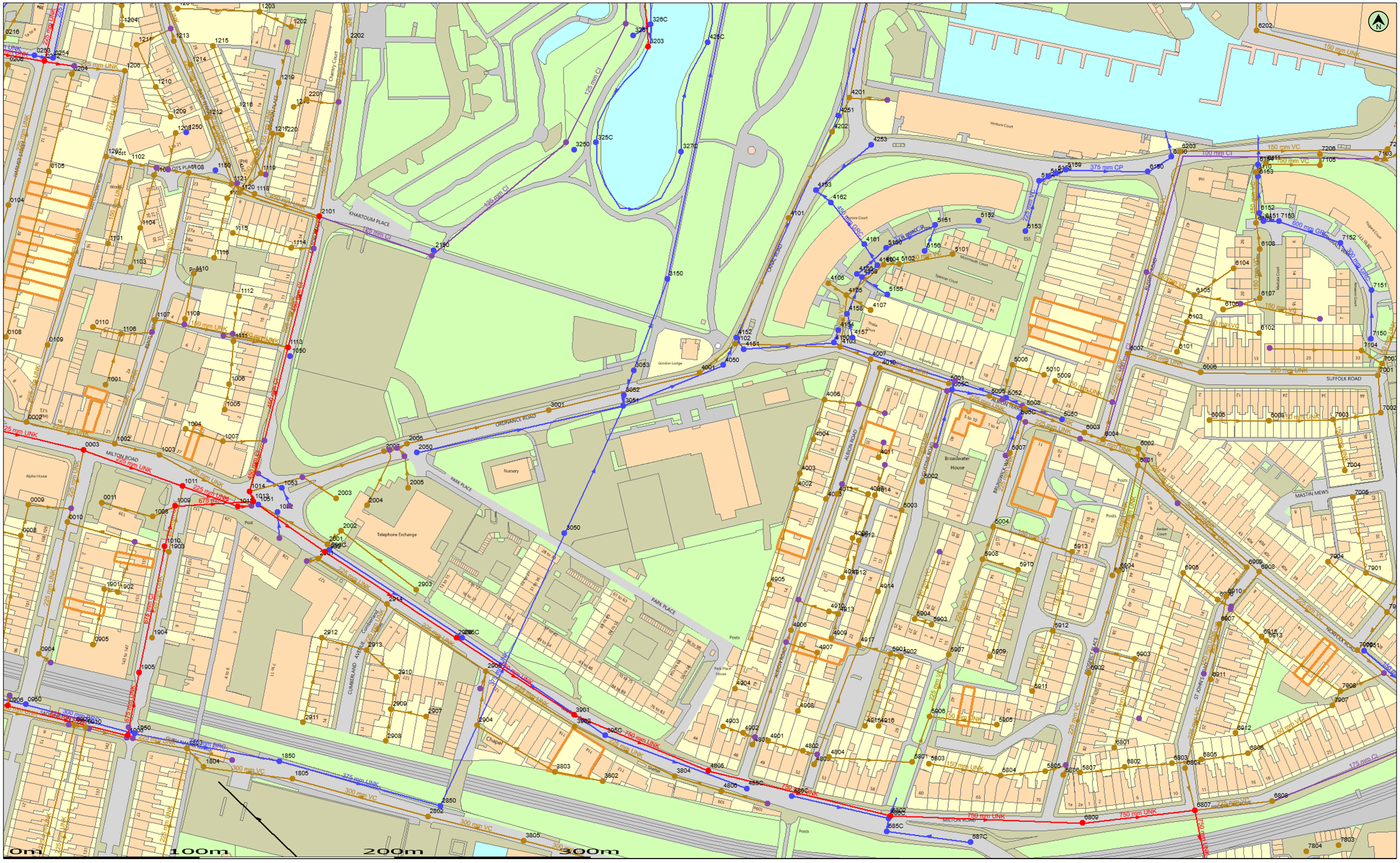
0 2.5 5 10

Kilometers

Kent County Council

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APPENDIX E – Southern Water Asset Plans



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Wastewater Plan A2
Powered by digdat

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2024 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

Foul Gravity Sewer
Combined Gravity Sewer
Culverted Water Course or Treated Effluent
Surface Water Gravity Sewer
Rising Main, Vacuum or Syphon
Combined Pumping Station
Surface Water Pumping Station
Foul Pumping Station
Water Treatment Works
Section 104 Area
Building Over Agreement Area
Foul Manhole
Combined Manhole
Surface Water Manhole
Side Entry Manhole, Decarcation Chamber, Dummy Manhole or Surface Water Soakaway
Combined Outfall
Foul Outfall
Surface Water Outfall
Surface Water Inlet

alex.herman@ptaconsult.co.uk

Milton Place

WATER for LIFE
from Southern Water

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0003	C	14.08	0.00	
0212	C	0.00	0.00	
0906	C	17.25	0.00	
1009	C	0.00	0.00	
1010	C	0.00	0.00	
1011	C	0.00	0.00	
1012	C	12.20	9.21	
1013	C	0.00	0.00	
1014	C	12.10	0.00	
1113	C	0.00	0.00	
1905	C	15.82	5.89	
1906	C	16.48	6.01	
2101	C	11.41	0.00	
2902	C	12.06	0.00	
2906	C	12.53	5.66	
3203	C	0.00	0.00	
3901	C	13.37	5.62	
4805	C	15.47	5.60	
5802	C	14.69	5.57	
6807	C	9.42	0.00	
6809	C	11.60	5.53	
0002	F	15.06	0.00	
0008	F	0.00	0.00	
0009	F	0.00	0.00	
0010	F	14.53	11.72	
0011	F	0.00	0.00	
0104	F	14.99	10.61	
0105	F	0.00	0.00	
0108	F	0.00	0.00	
0109	F	16.04	13.50	
0110	F	0.00	0.00	
0204	F	0.00	0.00	
0206	F	0.00	0.00	
0216	F	0.00	0.00	
0904	F	16.16	0.00	
0905	F	0.00	0.00	
0909	F	16.77	0.00	
0910	F	16.67	13.68	
1001	F	0.00	0.00	
1002	F	13.67	10.65	
1003	F	13.15	10.15	
1004	F	0.00	0.00	
1005	F	0.00	0.00	
1006	F	0.00	0.00	
1007	F	0.00	0.00	
1008	F	0.00	0.00	
1101	F	0.00	0.00	
1102	F	14.75	12.08	
1103	F	0.00	0.00	
1104	F	0.00	0.00	
1105	F	13.80	11.08	
1106	F	0.00	0.00	
1107	F	14.21	0.00	
1108	F	0.00	0.00	
1109	F	0.00	0.00	
1110	F	0.00	0.00	
1111	F	0.00	0.00	
1112	F	0.00	0.00	
1114	F	0.00	0.00	
1115	F	0.00	0.00	
1116	F	0.00	0.00	
1117	F	13.44	10.64	
1118	F	12.91	0.00	
1119	F	12.58	9.15	
1120	F	13.19	0.00	
1121	F	0.00	0.00	
1201	F	0.00	0.00	
1202	F	0.00	0.00	
1203	F	0.00	0.00	
1204	F	0.00	0.00	
1205	F	0.00	0.00	
1206	F	0.00	0.00	
1207	F	14.87	12.35	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
1208	F	0.00	0.00	
1209	F	0.00	0.00	
1210	F	14.16	0.00	
1211	F	13.40	10.84	
1212	F	0.00	0.00	
1213	F	0.00	0.00	
1214	F	13.51	6.36	
1215	F	0.00	0.00	
1216	F	0.00	0.00	
1217	F	0.00	0.00	
1218	F	0.00	0.00	
1219	F	0.00	0.00	
1220	F	0.00	0.00	
1803	F	15.93	0.00	
1804	F	15.65	0.00	
1805	F	15.00	13.56	
1901	F	0.00	0.00	
1902	F	0.00	0.00	
1903	F	13.41	10.01	
1904	F	14.83	10.49	
2001	F	0.00	0.00	
2002	F	0.00	0.00	
2003	F	0.00	0.00	
2004	F	0.00	0.00	
2005	F	0.00	0.00	
2006	F	0.00	0.00	
2007	F	0.00	0.00	
2201	F	11.39	0.00	
2202	F	8.64	6.57	
2802	F	15.50	13.88	
2901	F	11.99	0.00	
2903	F	0.00	0.00	
2904	F	0.00	0.00	
2905	F	12.68	0.00	
2907	F	0.00	0.00	
2908	F	0.00	0.00	
2909	F	0.00	0.00	
2910	F	0.00	0.00	
2911	F	0.00	0.00	
2912	F	0.00	0.00	
2913	F	0.00	0.00	
2914	F	12.23	9.85	
3001	F	0.00	0.00	
3802	F	0.00	0.00	
3803	F	0.00	0.00	
3804	F	15.17	13.26	
3805	F	16.70	14.28	
3902	F	13.51	11.47	
4001	F	0.00	0.00	
4002	F	0.00	0.00	
4003	F	0.00	0.00	
4004	F	0.00	0.00	
4005	F	0.00	0.00	
4006	F	0.00	0.00	
4007	F	0.00	0.00	
4008	F	0.00	0.00	
4009	F	0.00	0.00	
4010	F	0.00	0.00	
4011	F	0.00	0.00	
4012	F	0.00	0.00	
4013	F	0.00	0.00	
4014	F	0.00	0.00	
4101	F	0.00	0.00	
4102	F	0.00	0.00	
4103	F	7.12	4.83	
4104	F	6.54	5.52	
4105	F	6.67	5.36	
4106	F	6.63	5.42	
4107	F	6.89	5.63	
4201	F	0.00	0.00	
4202	F	0.00	0.00	
4801	F	0.00	0.00	
4802	F	0.00	0.00	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
4803	F	0.00	0.00	
4804	F	0.00	0.00	
4806	F	15.65	13.74	
4901	F	0.00	0.00	
4902	F	0.00	0.00	
4903	F	0.00	0.00	
4904	F	0.00	0.00	
4905	F	0.00	0.00	
4906	F	0.00	0.00	
4907	F	0.00	0.00	
4908	F	0.00	0.00	
4909	F	0.00	0.00	
4910	F	0.00	0.00	
4911	F	0.00	0.00	
4912	F	0.00	0.00	
4913	F	0.00	0.00	
4914	F	0.00	0.00	
4915	F	0.00	0.00	
4916	F	0.00	0.00	
4917	F	0.00	0.00	
5001	F	7.76	5.31	
5002	F	0.00	0.00	
5003	F	10.14	0.00	
5004	F	9.88	7.64	
5005	F	7.81	5.50	
5006	F	6.89	0.00	
5007	F	8.51	6.32	
5008	F	7.84	5.68	
5009	F	0.00	0.00	
5010	F	0.00	0.00	
5101	F	6.51	5.73	
5102	F	6.67	5.57	
5801	F	13.89	11.81	
5803	F	14.15	12.33	
5804	F	13.10	10.98	
5805	F	12.64	10.65	
5806	F	11.99	0.00	
5807	F	11.62	10.59	
5901	F	13.00	0.00	
5902	F	12.74	11.98	
5903	F	11.92	11.03	
5904	F	11.87	10.80	
5905	F	12.68	11.88	
5906	F	13.03	0.00	
5907	F	12.18	9.96	
5908	F	10.28	0.00	
5909	F	11.74	10.17	
5910	F	10.00	8.86	
5911	F	11.82	10.97	
5912	F	10.77	9.23	
5913	F	9.12	0.00	
6001	F	7.69	5.06	
6002	F	7.78	0.00	
6003	F	7.92	5.36	
6004	F	7.89	5.36	
6005	F	0.00	0.00	
6006	F	5.10	2.56	
6007	F	5.51	0.00	
6008	F	0.00	0.00	
6101	F	0.00	0.00	
6102	F	0.00	0.00	
6103	F	0.00	0.00	
6104	F	4.57	3.06	
6105	F	0.00	0.00	
6106	F	4.80	2.64	
6107	F	4.80	2.56	
6108	F	4.87	2.40	
6109	F	4.64	2.29	
6110	F	4.81	2.13	
6111	F	4.80	2.06	
6202	F	4.48	3.02	
6203	F	0.00	0.00	
6801	F	11.11	10.14	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
6802	F	0.00	0.00	
6803	F	9.63	0.00	
6804	F	9.39	5.69	
6805	F	9.21	0.00	
6806	F	8.23	7.29	
6808	F	7.90	6.38	
6901	F	0.00	0.00	
6902	F	10.54	8.39	
6903	F	9.67	8.54	
6904	F	9.05	7.08	
6905	F	7.45	6.09	
6906	F	0.00	0.00	
6907	F	7.82	5.22	
6908	F	6.62	4.30	
6909	F	6.95	6.18	
6910	F	7.38	6.11	
6911	F	8.43	5.91	
6912	F	8.38	0.00	
6913	F	0.00	0.00	
6915	F	0.00	0.00	
7001	F	4.52	3.02	
7002	F	4.66	3.17	
7003	F	4.42	3.36	
7004	F	4.74	0.00	
7005	F	5.27	0.00	
7007	F	4.55	3.39	
7103	F	0.00	0.00	
7104	F	0.00	0.00	
7105	F	4.76	1.93	
7204	F	4.89	1.18	
7206	F	0.00	0.00	
7803	F	6.64	0.00	
7804	F	0.00	0.00	
7901	F	4.80	3.38	
7904	F	0.00	0.00	
7905	F	5.14	2.04	
7906	F	5.18	1.86	
7907	F	0.00	0.00	
7908	F	5.86	0.00	
0253	S	0.00	0.00	
0254	S	13.68	0.00	
0950	S	17.12	15.51	
1050	S	11.75	4.49	
1051	S	0.00	0.00	
1052	S	11.93	0.00	
1053	S	11.67	0.00	
1150	S	13.70	0.00	
1250	S	14.13	0.00	
1850	S	0.00	0.00	
1950	S	16.51	0.00	
2050	S	0.00	0.00	
2150	S	0.00	0.00	
2850	S	0.00	0.00	
295C	S	0.00	0.00	
296C	S	0.00	0.00	
3050	S	0.00	0.00	
3051	S	0.00	0.00	
3052	S	0.00	0.00	
3053	S	0.00	0.00	
3150	S	0.00	0.00	
3250	S	0.00	0.00	
3251	S	0.00	0.00	
325C	S	0.00	0.00	
326C	S	0.00	0.00	
327C	S	0.00	0.00	
395C	S	0.00	0.00	
4050	S	0.00	0.00	
4150	S	6.90	5.50	
4151	S	0.00	0.00	
4152	S	0.00	0.00	
4153	S	5.51	0.00	
4154	S	7.25	5.88	
4156	S	6.63	4.98	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
4157	S	7.20	5.96	
4158	S	6.91	5.17	
4159	S	6.63	5.06	
4160	S	6.56	4.72	
4161	S	6.72	4.65	
4162	S	7.00	4.56	
4251	S	0.00	0.00	
4253	S	0.00	0.00	
425C	S	0.00	0.00	
485C	S	0.00	0.00	
486C	S	0.00	0.00	
5050	S	0.00	0.00	
5052	S	0.00	0.00	
505C	S	0.00	0.00	
506C	S	0.00	0.00	
5150	S	6.48	4.21	
5151	S	6.35	4.25	
5152	S	6.27	3.85	
5153	S	5.98	3.82	
5154	S	5.14	3.67	
5155	S	7.04	5.14	
5156	S	6.52	5.45	
5157	S	5.00	2.84	
5158	S	4.90	3.11	
5159	S	4.90	3.54	
585C	S	0.00	0.00	
586C	S	0.00	0.00	
587C	S	0.00	0.00	
6150	S	4.72	2.47	
6151	S	4.80	2.76	
6152	S	4.82	2.67	
6153	S	4.76	2.35	
6154	S	4.81	2.30	
6250	S	4.70	2.42	
7150	S	4.57	3.46	
7151	S	4.63	3.08	
7152	S	4.80	2.90	
7153	S	4.79	2.82	
7951	S	5.10	3.72	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

APPENDIX F – Southern Water Pre-Planning Enquiry Response

from Southern Water

Angus Coles
Hill Partnerships Ltd
29 Red Lion St
Chesham
Buckinghamshire
HP5 1EJ

Your ref
17990

Our ref
DSA000038742

Date
12 December 2024

Contact
Tel 0330 303 0119

Dear Mr Coles,

Level 1 Capacity Check Enquiry: Milton Place, Ordnance Road, Gravesend, Kent, DA12 2BT.

We have completed the capacity check for the above development site and the results are as follows:

Foul Water

The enquiry has been reassessed to determine the capacity available for 0.70 l/s at manhole reference TQ65743001.

There is currently adequate capacity in the local sewerage network to accommodate a foul flow of 0.70 l/s for the above development at manhole reference TQ65743001. Please note that no surface water flows (existing or proposed) can be accommodated within the existing foul sewerage system unless agreed by the Lead Local Flood Authority in consultation with Southern Water, after the hierarchy Part H3 of Building Regulations has been complied with.

Connecting to our network

It should be noted that this information is only a hydraulic assessment of the existing sewerage network and does not grant approval for a connection to the public sewerage system. A formal Sewer Connection (S106) application is required to be completed and approved by Southern Water Services. To make an application visit: developerservices.southernwater.co.uk

Please note the information provided above does not grant approval for any designs/drawings submitted for the capacity analysis. The results quoted above are only valid for 12 months from the date of issue of this letter.

Please get in touch via the Get Connected customer dashboard if you have any queries.

Yours sincerely,

Future Growth Planning Team
Developer Services

southernwater.co.uk/developing-building/planning-your-development

Southern Water Services Ltd, Registered Office: Southern House, Yeoman Road, Worthing, West Sussex, BN13 3NX Registered in England No. 2366670

APPENDIX G – Kent County Council's LLFA Correspondence

[redacted]

Cc:

Subject:

Hi Daniel,

Thank you for your latest feedback.

RE infiltration testing – we are agreeable to a condition being included for further testing to be carried out on site to prove that a good infiltration rate is achievable at the proposed basin location.

RE pre planning surface water capacity check – we are not proposing to make this application at this stage, as we believe we can infiltrate on site, and connecting to the surface water sewer is only a backup option which we would only pursue in more detail should in the unlikely event infiltration prove not possible.

I trust our response is satisfactory and we can proceed with our Drainage Strategy for the planning application on this basis.

Kind regards,

Alex Herman
Director

Powell Tolner & Associates Ltd
T: 01494 772 721 | M: 07957 463 183 | W: www.ptaconsult.co.uk
PTA, 29 Red Lion Street, Chesham, Bucks., HP5 1EJ

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[redacted]

Morning Alex,

Apologies for the delay in responding back to you.

From your email and the drawing, I have no immediate concerns arising from the design presented.

My follow up comments would be:

- The timing of when undertaking further infiltration testing on site. For most major applications proposing infiltration, we would typically request for preliminary testing to be provided as part of outline/full stages, with further targeted testing to be carried out as part of the detailed design stage. With preliminary testing having already been undertaken, we would seek to attach a detailed design condition that would require further ground investigations to be carried out before construction commences.
- With the option of discharging to the sewer being a potential alternative should rates not be feasible, we would advise that a capacity check is undertaken with Southern Water prior to the application being submitted. The purpose of this is to confirm if the receiving sewer has sufficient capacity to accommodate the additional flows from the development, thus identifying if the second option is feasible if the first option fails.

Kind Regards,

Daniel

Daniel Hoare MCIWEM | Senior Flood Risk Officer | Flood & Water Management | Kent County Council | Invicta House, County Hall, Maidstone ME14 1XX | External: 03000 413550
As Lead Local Flood Authority (LLFA) for the County, we are the statutory consultee in planning to promote the provision of Sustainable Drainage Systems. You can find out more by visiting: http://www.kent.gov.uk/waste-planning-and-land/flooding-and-drainage/sustainable-drainage-systems

[redacted]

Subject: RE: Milton Place Car Park- Pre App 2

Some people who received this message don't often get email from alex.herman@ptaconsult.co.uk. Learn why this is important

Hi Daniel,

I hope you are well. Could you please provide your feedback to our below responses. It would be really appreciated if you could respond today as we have the next pre-app meeting at 9.30am tomorrow morning. Please find attached again for reference our updated Surface Water Drainage Strategy drawing. Many thanks in advance.

Kind regards,

Alex Herman
Director

Powell Tolner & Associates Ltd
T: 01494 772 721 | M: 07957 463 183 | W: www.ptaconsult.co.uk
PTA, 29 Red Lion Street, Chesham, Bucks., HP5 1EJ

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[redacted]

Hi Daniel,

Apologies, but just to clarify, the next pre-app meeting is not today as I suggested below, but is actually next Tuesday 1st October. I understand that you will not be attending that meeting, but please feel free to respond with any further thoughts before the next meeting and I will relay any further correspondence between us back to the team.

Kind regards,

Alex Herman
Director

Powell Tolner & Associates Ltd
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From: Alex Herman
Sent: 23 October 2024 19:11

[redacted]

Hi Daniel,

Thank you for your below comments following the last pre-app meeting on 1st October. In advance of tomorrow's pre-app meeting, please find below our response to your comments (in GREEN) and please find attached our updated preliminary Surface Water Drainage Strategy drawing which now includes;

- The latest proposed site plan overlaid
- Allowance for attenuating run-off from the resurfaced car park into the infiltration basin, overall basin volume increased to circa 280m^3 to accommodate run-off from the car park
- The Southern Water deep surface water sewer is shown crossing the car park and the site entrance
- We have shown provision for an overflow from the infiltration basin into the Southern Water sewer – should infiltration rates prove not to be as anticipated on site during construction/installation of the infiltration basin

Responses to your comments;

- Several of the drawings shown within the meeting, including the Preliminary Surface Water Drainage Strategy Sketch, do not feature the surface water sewer crossing the car park from manhole 1050 (Milton Road) to 2150 near the entrance of the Fort. Alex (PTA Consult) confirmed to us that this sewer line is known and has been considered. It is advisable that this is shown on any future strategy drawing to ensure that the development proposals do not encroach the sewer line. A question was raised about potential diversions, if necessary. The LLFA can confirm that the sewer is an asset owned and operated by Southern Water, subsequently requiring their consent instead of ours. **The sewer is now shown on the attached updated drawing – we will liaise where necessary with Southern Water to seek approval for building the new site access over the sewer, albeit the sewer is very deep with +6m cover over the pipe at the proposed site entrance and therefore considered to be unaffected by the proposed scheme.**

- The current proposals presented within the meeting would be that the current extent of the car park would be reduced from the development and that the remaining section would be resurfaced. It is our understanding that no formal drainage currently exists for the car park. With the relative fall from Milton Road towards the proposed infiltration basin, there is the potential of flows from this area contributing to the basin. This may subsequently need consideration for additional storage to be provided within the basin or for separate drainage measures to be included serving the car park.**We have now included for attenuating the resurfaced car park in the overall catchment area for the site and providing addition storage in the infiltration basin. We propose to introduce a new land drain along the eastern edge of the car park to capture run-off from the car park and positively drain it into the basin via below ground perforated pipework in the land drain and subsequently into the basin via a new headwall/outlet pipe, as shown indicatively on the attached updated drawing.**

- Alternatively, it was indicated that a potential bund may be used to convey flows away from the basin. The LLFA would have concerns with this approach as this may encourage the channelling of flows, whereas the existing situation is a sheet flow onto the greenspace, where it is expected to infiltrate. This process would be interrupted with the introduction of a bunded basin. Further consideration as to how to manage runoff from the car park is needed. **We will not be proposing a bund around the infiltration basin and instead are proposing a land drain to capture runoff from the car park as noted above.**

- A copy of the Phase 2 Geo-Environmental Report was made available to us prior to the meeting. Within this report, it included an assessment into the extent and material used to infill the former swimming pool is needed. It is unclear as to whether the proposed basin

would be partially located within the extent of the former swimming pool. With the former pool being infilled with demolition material from the former building, we would expect any material in contact with basin to be removed and replaced where needed with clean soils/inert material. Furthermore, additional material may have to be removed where there is a potential for interaction of infiltrating surface water and the material. This is to ensure against mobilising potential contaminates contained within the demolished material. **Agree. We propose to locate the basin as far as possible away from the known extent of the swimming pool infill.**

- The current rate the infiltration basin has been designed for is 2.82x10-4m/s. The Phase 2 Geo-Environmental report shows the closest trial pits where infiltration tests have been undertaken are TP03 and TP04. The rates obtained between both pits are viewed to be significantly different, with the lowest value within TP03 of 0.028 m/hr (7.89E-06m/s) and 1.06 m/hr (2.95E-04m/s) for TP04. The difference between the rates is likely attributable to the test depth of the trial pits. The soakage test within TP04 was between 1-2 meters deep, wholly within the chalk, whereas TP03 was only tested to a metre deep and with made ground recorded to 0.6m deep. With the basin proposed to extend to only a metre in depth, we raised concerns that the application of the higher rate in the design of the basin (TP04) may overestimate the achievable rate of infiltration at a shallower depth (more respective of TP03). We would therefore seek further clarification as to the reasoning for using the higher rate, as we would typically seek for the lowest rate to be utilised. **We consider that 2.82x10-4 m/s is the most appropriate rate for the location of the proposed basin, and we will ensure that crest and base level of the basin will be set low enough to be in contact with the good chalk material. We have had a look to see what the impact would be on the size, shape and volume of the basin should we need to use the lowest infiltration rate of 7.89x10-6 m/s, and the size of basin would not fit within the space available on site. As per note we have added to the attached drawing, we suggest the following;**
  "Exact volume of pond, and therefore shape, is subject to results of onsite infiltration testing within this location. Pond size shown is maximised for the space available. If infiltration rates for this area are poorer than anticipated, a high level surface water overflow into the adjacent public surface water sewer network will be required. The surface water would be reduced to greenfield Qbar rates, and discharged into the adajcent Southern Water sewer network; pending approval from the LLFA and Southern Water."

- Statement 10.16 within the Phase 2 Geo-Environmental Report refers to separation distances between proposed structures and infiltrating features. With no recommended distance being specified, we would expect for the CIRIA C574 guidance (Engineering in Chalk) to be followed. If the chalk is of 'low density', the document advises for a for a separation distance of 10 metres to be applied. For future drainage strategy drawings, it was advised for this to be illustrated. **Agree, the basin has been positioned so that it is at least 10m away from any buildings.**

- The Phase 2 Geo-Environmental Report indicates that groundwater levels were taken within boreholes on the 22nd of May 2023. The report highlights that groundwater was struck at 7.0m bgl (BH02). With the River Thames being near to the proposed site, there could be interactions with the river, resulting in fluctuating levels groundwater. With the winter months approaching, we would advise that further monitoring is undertaken during this period through winter and spring, when groundwater should be rising/ reaching peak. In view of a formal planning submission being made in November, it would be something the LLFA would likely Condition, with results being provided at detailed design. **We understand your concern, however based on**

the SI report and local BGS borehole records we consider that there is a low risk of groundwater fluctuation to a shallow enough depth to potentially affect the proposed infiltration strategy.

- As per all major developments, the LLFA seek for adequate pollution control on site. This would be in accordance with Part E - Chapter 26 of the CIRIA SuDS Manual (2015). An assessment should be made using the supporting guidance within in this chapter to demonstrate suitable levels of treatment being provided by the drainage system. With uncertainty surrounding the contributions of runoff from the car parking area, pollutants from this area may also have to be considered if this area will be draining to the infiltration basin. **As per the note on the attached drawing, we consider that the proposed hardstanding catchment areas of the site are deemed to be low to medium pollution risk. The combined pollution mitigation indices for the infiltration basin is above 0.7, 0.6 & 0.7 for total suspended solids, metals, and hydrocarbons respectively, in line with the recommendations of the CIRIA SuDS Manual (C753 2015) for a medium pollution risk area.**

I trust the above and attached provide a helpful update and response to your comments, but please do provide us with any further thoughts or questions you may have on our latest proposals in advance of our formal planning submission.

Kind regards,

Alex Herman
Director

Powell Tolner & Associates Ltd
T: 01494 772 721 | M: 07957 463 183 | W: www.ptaconsult.co.uk
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[redacted]

Subject: RE: Milton Place Car Park- Pre App 2

You don't often get email from daniel.hoare@kent.gov.uk. Learn why this is important

[EXTERNAL EMAIL] This email originated from outside of Hill. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Morning,

Thank you for inviting myself and Cathy to the meeting on Tuesday to discuss the potential drainage arrangements for the forthcoming planning submission. As raised within the meeting, we have prepared some follow up comments below for consideration moving forward. We are more than happy to have further discussions if needed.

- Several of the drawings shown within the meeting, including the Preliminary Surface Water Drainage Strategy Sketch, do not feature the surface water sewer crossing the car park from manhole 1050 (Milton Road) to 2150 near the entrance of the Fort. Alex (PTA Consult) confirmed to us that this sewer line is known and has been considered. It is advisable that this is shown on any future strategy drawing to ensure that the development proposals do not encroach the sewer line. A question was raised about potential diversions, if necessary. The LLFA can confirm that the sewer is an asset owned and operated by Southern Water, subsequently requiring their consent instead of ours.

- The current proposals presented within the meeting would be that the current extent of the car park would be reduced from the development and that the remaining section would be resurfaced. It is our understanding that no formal drainage currently exists for the car park. With the relative fall from Milton Road towards the proposed infiltration basin, there is the potential of flows from this area contributing to the basin. This may subsequently need consideration for additional storage to be provided within the basin or for separate drainage measures to be included serving the car park.

- Alternatively, it was indicated that a potential bund may be used to convey flows away from the basin. The LLFA would have concerns with this approach as this may encourage the channelling of flows, whereas the existing situation is a sheet flow onto the greenspace, where it is expected to infiltrate. This process would be interrupted with the introduction of a bunded basin. Further consideration as to how to manage runoff from the car park is needed.

- A copy of the Phase 2 Geo-Environmental Report was made available to us prior to the meeting. Within this report, it included an assessment into the extent and material used to infill the former swimming pool is needed. It is unclear as to whether the proposed basin would be partially located within the extent of the former swimming pool. With the former pool being infilled with demolition material from the former building, we would expect any material in contact with basin to be removed and replaced where needed with clean soils/inert material. Furthermore, additional material may have to be removed where there is a potential for interaction of infiltrating surface water and the material. This is to ensure against mobilising potential contaminates contained within the demolished material.

- The current rate the infiltration basin has been designed for is 2.82x10-4m/s. The Phase 2 Geo-Environmental report shows the closest trial pits where infiltration tests have been undertaken are TP03 and TP04. The rates obtained between both pits are viewed to be significantly different, with the lowest value within TP03 of 0.028 m/hr (7.89E-06m/s) and 1.06 m/hr (2.95E-04m/s) for TP04. The difference between the rates is likely attributable to the test depth of the trial pits. The soakage test within TP04 was between 1-2 meters deep, wholly within the chalk, whereas TP03 was only tested to a metre deep and with made ground recorded to 0.6m deep. With the basin proposed to extend to only a metre in depth, we raised concerns that the application of the higher rate in the design of the basin (TP04) may overestimate the achievable rate of infiltration at a shallower depth (more respective of TP03). We would therefore seek further clarification as to the reasoning for using the higher rate, as we would typically seek for the lowest rate to be utilised.

- Statement 10.16 within the Phase 2 Geo-Environmental Report refers to separation distances between proposed structures and infiltrating features. With no recommended distance being specified, we would expect for the CIRIA C574 guidance (Engineering in Chalk) to be followed. If the chalk is of 'low density', the document advises for a for a separation distance of 10 metres to be applied. For future drainage strategy drawings, it was advised for this to be illustrated.

- The Phase 2 Geo-Environmental Report indicates that groundwater levels were taken within boreholes on the 22nd of May 2023. The report highlights that groundwater was struck at 7.0m bgl (BH02). With the River Thames being near to the proposed site, there could be interactions with the river, resulting in fluctuating levels groundwater. With the winter months approaching, we would advise that further monitoring is undertaken during this period through winter and spring, when groundwater should be rising/ reaching peak. In view of a formal planning submission being made in November, it would be something the LLFA would likely Condition, with results being provided at detailed design.

- As per all major developments, the LLFA seek for adequate pollution control on site. This would be in accordance with Part E - Chapter 26 of the CIRIA SuDS Manual (2015). An assessment should be made using the supporting guidance within in this chapter to demonstrate suitable levels of treatment being provided by the drainage system. With uncertainty surrounding the contributions of runoff from the car parking area, pollutants from this area may also have to be considered if this area will be draining to the infiltration basin.

If there was anyone missed off the mailing list, please forward a copy on to them.

Kind Regards,

Daniel

Daniel Hoare MCIWEM | Senior Flood Risk Officer | Flood & Water Management | Kent County Council | Invicta House, County Hall, Maidstone ME14 1XX | External: 03000 413550
As Lead Local Flood Authority (LLFA) for the County, we are the statutory consultee in planning to promote the provision of Sustainable Drainage Systems. You can find out more by visiting: http://www.kent.gov.uk/waste-planning-and-land/flooding-and-drainage/sustainable-drainage-systems

From: Kate Holland <kate@invictaplanning.co.uk>
Sent: Friday, September 27, 2024 3:40 PM

[redacted]

Good afternoon

Following on from my email yesterday, please see attached surface water drainage strategy sketch to also be discussed at our meeting next week.

Kind regards

Kate

Kate Holland
Invicta Planning
Planning Director | BSc MA MRTPI
www.invictaplanning.co.uk

E: kate@invictaplanning.co.uk
M: 07889 807874 **T:** 01732 885563
A: Chart House, 10 Western Road, Borough Green, Kent, TN15 8AG

From: Kate Holland
Sent: 26 September 2024 18:00
[redacted].uk;

Good afternoon All

Ahead of our meeting next week, please see the link below to the pre-application pack of information which includes:

- Cover Letter from Invicta Planning
- Pre-App document produced by JTP
- Transport Scoping Note produced by TPA

We are also intending to send some information in relation to the surface water drainage strategy for the site tomorrow morning; however, in the interim the location and size of the SuDS features are included on the landscape drawings within the JTP document.

https://we.tl/t-0OO1Fbi99C

I will produce and circulate a meeting agenda ahead of the meeting.

Any questions, please do let me know.

Kind regards

Kate

Kate Holland
Invicta Planning
Planning Director | BSc MA MRTPI
www.invictaplanning.co.uk

E: kate@invictaplanning.co.uk
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A: Chart House, 10 Western Road, Borough Green, Kent, TN15 8AG

APPENDIX H – Post Development Drainage Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	0.800
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.023	5.00	10.613	1200	565212.404	174051.792	1.893
2	0.020	5.00	9.340	450	565249.620	174061.174	1.000
3	0.015	5.00	9.439	450	565248.833	174064.330	1.134
4	0.045	5.00	8.815	600	565289.090	174074.418	1.000
5	0.021	5.00	11.495	450	565195.067	174065.734	1.180
6	0.021	5.00	11.310	450	565203.227	174101.841	1.365
7	0.012	5.00	11.104	450	565209.689	174108.257	1.309
8	0.040	5.00	10.606	450	565221.590	174078.376	1.121
9	0.019	5.00	10.648	450	565216.335	174097.795	0.998
10			10.272	450	565226.960	174097.365	0.987
11	0.028	5.00	9.699	450	565237.839	174080.769	0.899
12	0.019	5.00	10.069	450	565233.303	174098.962	1.529
13	0.014	5.00	10.004	1200	565231.429	174106.569	1.599
14	0.136	5.00	8.509	1200	565278.306	174118.341	1.069
15			8.509	1200	565276.999	174123.533	1.109
16	0.226	5.00	9.064	450	565260.241	174130.299	1.214
Pond			8.720		565272.901	174127.074	1.325
17			8.500		565275.319	174130.938	1.000

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	38.380	0.600	8.720	8.340	0.380	101.0	150	5.64	50.0
1.001	2	3	3.253	0.600	8.340	8.305	0.035	92.9	150	5.69	50.0
1.002	3	4	41.502	0.600	8.305	7.890	0.415	100.0	150	6.38	50.0
1.003	4	14	45.227	0.600	7.815	7.440	0.375	120.6	225	7.01	50.0
2.000	5	6	37.018	0.600	10.315	9.945	0.370	100.0	150	5.61	50.0
2.001	6	7	9.106	0.600	9.945	9.795	0.150	60.7	150	5.73	50.0
2.002	7	13	21.805	0.600	9.795	9.050	0.745	29.3	150	5.93	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.000	17.7	3.2	1.743	0.850	0.023	0.0	43	0.759
1.001	1.043	18.4	5.8	0.850	0.984	0.043	0.0	58	0.924
1.002	1.005	17.8	7.9	0.984	0.775	0.058	0.0	70	0.975
1.003	1.189	47.3	14.0	0.775	0.844	0.103	0.0	84	1.040
2.000	1.004	17.7	2.8	1.030	1.215	0.021	0.0	40	0.733
2.001	1.293	22.8	5.6	1.215	1.159	0.041	0.0	51	1.073
2.002	1.868	33.0	7.2	1.159	0.804	0.053	0.0	48	1.503

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	8	10	19.734	0.600	9.485	9.285	0.200	98.7	150	5.33	50.0
4.000	9	10	10.634	0.600	9.650	9.285	0.365	29.1	150	5.09	50.0
3.001	10	12	6.541	0.600	9.285	9.115	0.170	38.5	150	5.39	50.0
5.000	11	12	18.750	0.600	8.800	8.615	0.185	101.4	150	5.31	50.0
3.002	12	13	7.834	0.600	8.540	8.460	0.080	97.9	225	5.49	50.0
2.003	13	14	48.333	0.600	8.405	7.440	0.965	50.1	225	6.36	50.0
1.004	14	15	5.354	0.600	7.440	7.400	0.040	133.8	300	7.08	50.0
1.005	15	Pond	1.000	0.600	7.400	7.395	0.005	200.0	300	7.10	50.0
6.000	16	Pond	2.000	0.600	7.850	7.600	0.250	8.0	150	5.01	50.0
1.006	Pond	17	1.000	0.600	7.400	7.500	-0.100	-10.0	150	7.11	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	1.011	17.9	5.5	0.971	0.837	0.040	0.0	57	0.892
4.000	1.872	33.1	2.5	0.848	0.837	0.019	0.0	28	1.105
3.001	1.627	28.8	8.0	0.837	0.804	0.059	0.0	54	1.399
5.000	0.998	17.6	3.8	0.749	1.304	0.028	0.0	47	0.797
3.002	1.321	52.5	14.4	1.304	1.319	0.107	0.0	80	1.131
2.003	1.852	73.6	23.5	1.374	0.844	0.174	0.0	87	1.654
1.004	1.357	95.9	55.9	0.769	0.809	0.413	0.0	165	1.408
1.005	1.108	78.3	55.9	0.809	1.025	0.413	0.0	188	1.200
6.000	3.584	63.3	30.6	1.064	0.970	0.226	0.0	74	3.555
1.006	1.000	17.7	86.6	1.170	0.850	0.639	0.0	150	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	38.380	101.0	150	1 PTA	10.613	8.720	1.743	9.340	8.340	0.850
1.001	3.253	92.9	150	1 PTA	9.340	8.340	0.850	9.439	8.305	0.984
1.002	41.502	100.0	150	1 PTA	9.439	8.305	0.984	8.815	7.890	0.775
1.003	45.227	120.6	225	1 PTA	8.815	7.815	0.775	8.509	7.440	0.844
2.000	37.018	100.0	150	1 PTA	11.495	10.315	1.030	11.310	9.945	1.215
2.001	9.106	60.7	150	1 PTA	11.310	9.945	1.215	11.104	9.795	1.159
2.002	21.805	29.3	150	1 PTA	11.104	9.795	1.159	10.004	9.050	0.804
3.000	19.734	98.7	150	1 PTA	10.606	9.485	0.971	10.272	9.285	0.837
4.000	10.634	29.1	150	1 PTA	10.648	9.650	0.848	10.272	9.285	0.837
3.001	6.541	38.5	150	1 PTA	10.272	9.285	0.837	10.069	9.115	0.804

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	450	Manhole	Adoptable
1.001	2	450	Manhole	Adoptable	3	450	Manhole	Adoptable
1.002	3	450	Manhole	Adoptable	4	600	Manhole	Adoptable
1.003	4	600	Manhole	Adoptable	14	1200	Manhole	Adoptable
2.000	5	450	Manhole	Adoptable	6	450	Manhole	Adoptable
2.001	6	450	Manhole	Adoptable	7	450	Manhole	Adoptable
2.002	7	450	Manhole	Adoptable	13	1200	Manhole	Adoptable
3.000	8	450	Manhole	Adoptable	10	450	Manhole	Adoptable
4.000	9	450	Manhole	Adoptable	10	450	Manhole	Adoptable
3.001	10	450	Manhole	Adoptable	12	450	Manhole	Adoptable

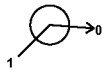
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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
5.000	18.750	101.4	150	1 PTA	9.699	8.800	0.749	10.069	8.615	1.304
3.002	7.834	97.9	225	1 PTA	10.069	8.540	1.304	10.004	8.460	1.319
2.003	48.333	50.1	225	1 PTA	10.004	8.405	1.374	8.509	7.440	0.844
1.004	5.354	133.8	300	1 PTA	8.509	7.440	0.769	8.509	7.400	0.809
1.005	1.000	200.0	300	1 PTA	8.509	7.400	0.809	8.720	7.395	1.025
6.000	2.000	8.0	150	1 PTA	9.064	7.850	1.064	8.720	7.600	0.970
1.006	1.000	-10.0	150	1 PTA	8.720	7.400	1.170	8.500	7.500	0.850

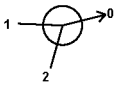
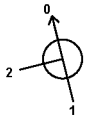
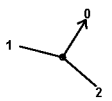
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
5.000	11	450	Manhole	Adoptable	12	450	Manhole	Adoptable
3.002	12	450	Manhole	Adoptable	13	1200	Manhole	Adoptable
2.003	13	1200	Manhole	Adoptable	14	1200	Manhole	Adoptable
1.004	14	1200	Manhole	Adoptable	15	1200	Manhole	Adoptable
1.005	15	1200	Manhole	Adoptable	Pond		Junction	
6.000	16	450	Manhole	Adoptable	Pond		Junction	
1.006	Pond		Junction		17		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	565212.404	174051.792	10.613	1.893	1200				
						0	1.000	8.720	150
2	565249.620	174061.174	9.340	1.000	450		1.000	8.340	150
						0	1.001	8.340	150
3	565248.833	174064.330	9.439	1.134	450	1	1.001	8.305	150
									
						0	1.002	8.305	150
4	565289.090	174074.418	8.815	1.000	600		1.002	7.890	150
						0	1.003	7.815	225
5	565195.067	174065.734	11.495	1.180	450				
						0	2.000	10.315	150
6	565203.227	174101.841	11.310	1.365	450	1	2.000	9.945	150
									
						0	2.001	9.945	150
7	565209.689	174108.257	11.104	1.309	450	1	2.001	9.795	150
									
						0	2.002	9.795	150

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
8	565221.590	174078.376	10.606	1.121	450				
						0	3.000	9.485	150
9	565216.335	174097.795	10.648	0.998	450				
						0	4.000	9.650	150
10	565226.960	174097.365	10.272	0.987	450		1	4.000	9.285	150
							2	3.000	9.285	150
						0	3.001	9.285	150
11	565237.839	174080.769	9.699	0.899	450				
						0	5.000	8.800	150
12	565233.303	174098.962	10.069	1.529	450		1	5.000	8.615	150
							2	3.001	9.115	150
						0	3.002	8.540	225
13	565231.429	174106.569	10.004	1.599	1200		1	3.002	8.460	225
							2	2.002	9.050	150
						0	2.003	8.405	225
14	565278.306	174118.341	8.509	1.069	1200		1	2.003	7.440	225
							2	1.003	7.440	225
						0	1.004	7.440	300
15	565276.999	174123.533	8.509	1.109	1200		1	1.004	7.400	300
						0	1.005	7.400	300
16	565260.241	174130.299	9.064	1.214	450				
						0	6.000	7.850	150
Pond	565272.901	174127.074	8.720	1.325			1	6.000	7.600	150
							2	1.005	7.395	300
						0	1.006	7.400	150
17	565275.319	174130.938	8.500	1.000			1	1.006	7.500	150

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	1 year (l/s)	3.1
Rainfall Events	Singular	Drain Down Time (mins)	480	30 year (l/s)	8.8
Summer CV	0.750	Additional Storage (m³/ha)	20.0	100 year (l/s)	11.8
Winter CV	0.840	Starting Level (m)		Check Discharge Volume	✓
Analysis Speed	Detailed	Check Discharge Rate(s)	✓	100 year 360 minute (m³)	

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Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	35	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	2.40
Greenfield Method	IH124	Growth Factor 100 year	3.19
Positively Drained Area (ha)	1.432	Betterment (%)	0
SAAR (mm)	551	QBar	3.7
Soil Index	3	Q 1 year (l/s)	3.1
SPR	0.40	Q 30 year (l/s)	8.8
Region	7	Q 100 year (l/s)	11.8
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	1.432	Storm Duration (mins)	360
Soil Index	3	Betterment (%)	0
SPR	0.40	PR	
CWI		Runoff Volume (m^3)	

Node Pond Online Weir Control

Flap Valve	x	Design Depth (m)	2.000	Discharge Coefficient	0.590
Replaces Downstream Link	✓	Design Flow (l/s)	0.1		
Invert Level (m)	8.000	Width (m)	2.000		

Node Pond Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	1.01520	Safety Factor	2.0	Invert Level (m)	7.200
Side Inf Coefficient (m/hr)	1.01520	Porosity	1.00	Time to half empty (mins)	23

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	139.9	52.7	1.000	296.7	476.8

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.65%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	8.762	0.042	3.1	0.0573	0.0000	OK
15 minute winter	2	11	8.406	0.066	5.6	0.0363	0.0000	OK
15 minute winter	3	11	8.373	0.068	7.4	0.0291	0.0000	OK
15 minute winter	4	11	7.895	0.080	12.9	0.0941	0.0000	OK
15 minute winter	5	10	10.354	0.039	2.7	0.0198	0.0000	OK
15 minute winter	6	10	9.997	0.052	5.4	0.0240	0.0000	OK
15 minute winter	7	11	9.843	0.048	6.9	0.0161	0.0000	OK
15 minute winter	8	10	9.543	0.058	5.4	0.0508	0.0000	OK
15 minute winter	9	10	9.678	0.028	2.5	0.0148	0.0000	OK
15 minute winter	10	10	9.342	0.057	7.8	0.0091	0.0000	OK
15 minute winter	11	10	8.848	0.048	3.8	0.0375	0.0000	OK
15 minute winter	12	10	8.626	0.086	13.9	0.0351	0.0000	OK
15 minute winter	13	11	8.490	0.085	22.5	0.1112	0.0000	OK
15 minute winter	14	11	7.640	0.200	52.5	0.7361	0.0000	OK
15 minute winter	15	11	7.591	0.191	51.7	0.2162	0.0000	OK
15 minute winter	16	10	7.936	0.086	30.1	0.3337	0.0000	OK
120 minute winter	Pond	82	7.443	0.048	35.2	38.6600	0.0000	OK
15 minute summer	17	1	7.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	3.0	0.538	0.169	0.2184	
15 minute winter	2	1.001	3	5.5	0.731	0.298	0.0247	
15 minute winter	3	1.002	4	7.3	0.950	0.410	0.3182	
15 minute winter	4	1.003	14	12.8	0.497	0.272	1.1287	
15 minute winter	5	2.000	6	2.6	0.585	0.149	0.1676	
15 minute winter	6	2.001	7	5.3	1.042	0.233	0.0465	
15 minute winter	7	2.002	13	6.9	1.458	0.208	0.1029	
15 minute winter	8	3.000	10	5.3	0.859	0.298	0.1225	
15 minute summer	9	4.000	10	2.4	0.606	0.072	0.0434	
15 minute winter	10	3.001	12	7.6	1.309	0.266	0.0383	
15 minute winter	11	5.000	12	3.7	0.779	0.208	0.0884	
15 minute winter	12	3.002	13	13.8	1.060	0.263	0.1021	
15 minute winter	13	2.003	14	22.6	0.868	0.307	1.2352	
15 minute winter	14	1.004	15	51.7	1.061	0.539	0.2607	
15 minute winter	15	1.005	Pond	51.5	1.145	0.658	0.0450	
15 minute winter	16	6.000	Pond	29.9	3.167	0.471	0.0188	
120 minute winter	Pond	Weir	17	0.0				0.0
120 minute winter	Pond	Infiltration		19.6				

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Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.65%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	8.796	0.076	9.3	0.1049	0.0000	OK
15 minute winter	2	12	8.720	0.380	17.0	0.2097	0.0000	SURCHARGED
15 minute winter	3	12	8.683	0.378	19.8	0.1617	0.0000	SURCHARGED
15 minute winter	4	11	8.188	0.373	34.1	0.4417	0.0000	SURCHARGED
15 minute winter	5	10	10.386	0.071	8.3	0.0361	0.0000	OK
15 minute winter	6	10	10.048	0.103	16.4	0.0476	0.0000	OK
15 minute winter	7	11	9.885	0.090	20.7	0.0306	0.0000	OK
15 minute winter	8	10	9.604	0.119	16.3	0.1051	0.0000	OK
15 minute winter	9	10	9.698	0.048	7.5	0.0258	0.0000	OK
15 minute winter	10	10	9.405	0.120	23.5	0.0191	0.0000	OK
15 minute winter	11	10	8.891	0.091	11.3	0.0714	0.0000	OK
15 minute winter	12	11	8.831	0.291	41.9	0.1192	0.0000	SURCHARGED
15 minute winter	13	11	8.763	0.358	67.5	0.4679	0.0000	SURCHARGED
15 minute winter	14	11	7.968	0.528	147.7	1.9385	0.0000	SURCHARGED
60 minute winter	15	46	7.882	0.482	95.3	0.5450	0.0000	SURCHARGED
15 minute winter	16	11	8.551	0.701	90.8	2.7219	0.0000	SURCHARGED
60 minute winter	Pond	47	7.878	0.483	147.1	130.9877	0.0000	SURCHARGED
15 minute summer	17	1	7.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	1	1.000	2	8.7	0.661	0.495	0.5048	
15 minute summer	2	1.001	3	14.0	0.882	0.758	0.0573	
15 minute winter	3	1.002	4	19.6	1.156	1.104	0.7306	
15 minute winter	4	1.003	14	34.5	0.885	0.729	1.7987	
15 minute winter	5	2.000	6	8.1	0.767	0.458	0.3907	
15 minute winter	6	2.001	7	16.0	1.342	0.702	0.1088	
15 minute winter	7	2.002	13	20.7	1.922	0.628	0.2350	
15 minute winter	8	3.000	10	16.0	1.063	0.897	0.2977	
15 minute summer	9	4.000	10	7.1	0.754	0.214	0.1025	
15 minute winter	10	3.001	12	23.1	1.655	0.803	0.0911	
15 minute winter	11	5.000	12	11.2	0.990	0.634	0.2684	
15 minute winter	12	3.002	13	41.5	1.351	0.790	0.3116	
15 minute summer	13	2.003	14	62.3	1.592	0.846	1.9223	
15 minute winter	14	1.004	15	146.7	2.083	1.529	0.3770	
15 minute winter	15	1.005	Pond	146.6	2.082	1.872	0.0704	
15 minute winter	16	6.000	Pond	85.1	4.833	1.343	0.0349	
60 minute winter	Pond	Weir	17	0.0				0.0
60 minute winter	Pond	Infiltration		47.0				

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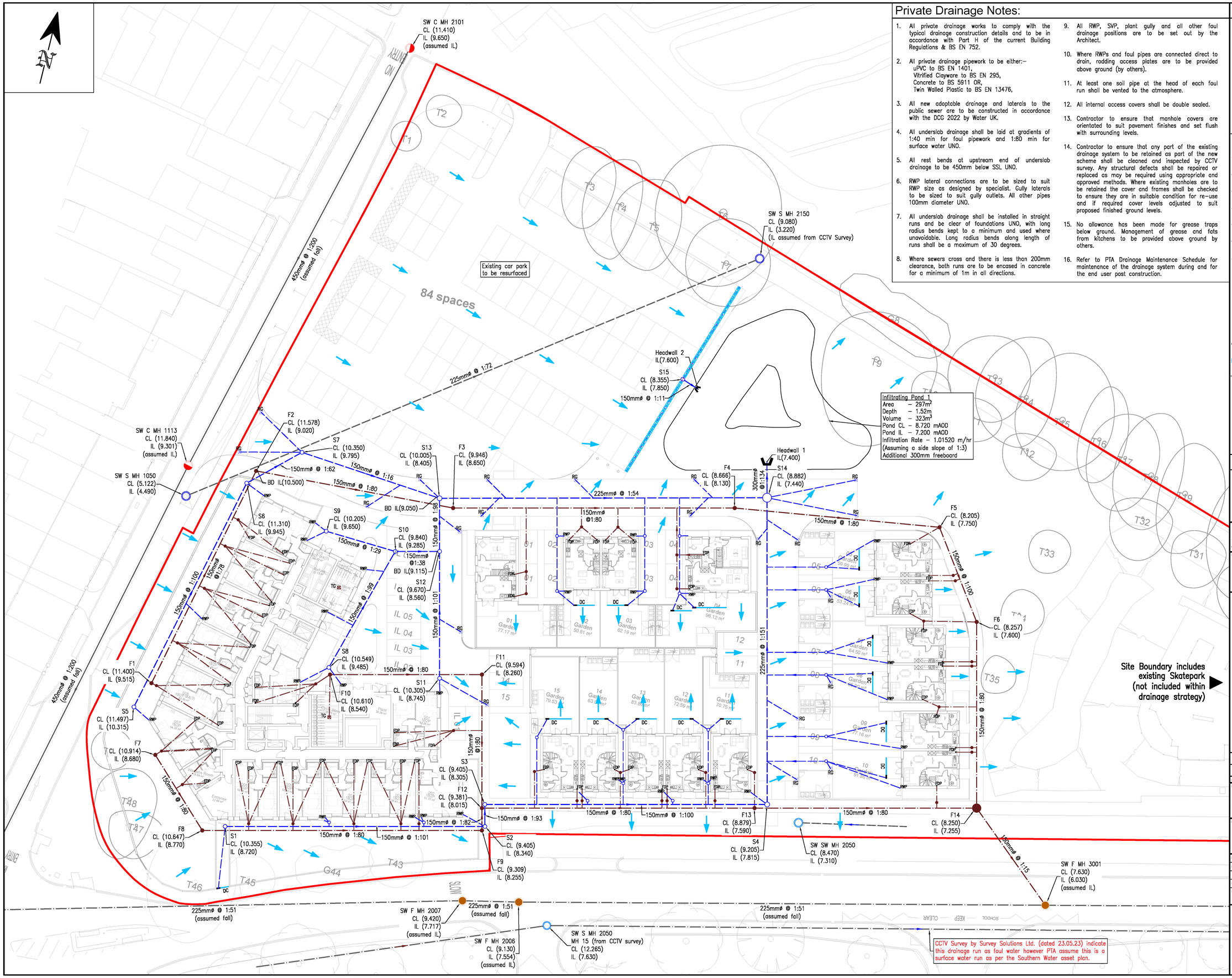
Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.65%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	12	9.215	0.495	12.2	0.6820	0.0000	SURCHARGED
15 minute winter	2	12	9.122	0.782	20.5	0.4317	0.0000	FLOOD RISK
15 minute winter	3	12	9.076	0.771	21.6	0.3301	0.0000	SURCHARGED
15 minute winter	4	11	8.435	0.620	41.0	0.7339	0.0000	SURCHARGED
15 minute winter	5	10	10.398	0.083	10.8	0.0423	0.0000	OK
15 minute winter	6	10	10.075	0.130	21.5	0.0600	0.0000	OK
15 minute winter	7	10	9.904	0.109	27.1	0.0370	0.0000	OK
15 minute winter	8	12	9.838	0.353	21.2	0.3113	0.0000	SURCHARGED
15 minute winter	9	10	9.706	0.056	9.8	0.0297	0.0000	OK
15 minute winter	10	12	9.610	0.325	29.1	0.0517	0.0000	SURCHARGED
15 minute winter	11	12	9.513	0.713	14.8	0.5613	0.0000	FLOOD RISK
15 minute winter	12	12	9.409	0.869	49.0	0.3561	0.0000	SURCHARGED
15 minute winter	13	12	9.309	0.904	78.1	1.1820	0.0000	SURCHARGED
15 minute winter	14	11	8.122	0.682	182.1	2.5031	0.0000	SURCHARGED
60 minute winter	15	43	8.057	0.657	123.3	0.7425	0.0000	SURCHARGED
15 minute winter	16	11	9.061	1.211	118.4	4.7031	0.0000	FLOOD RISK
60 minute winter	Pond	44	8.042	0.647	191.9	173.4884	0.0000	SURCHARGED
15 minute summer	17	1	7.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	10.9	0.692	0.614	0.6757	
15 minute winter	2	1.001	3	16.1	0.915	0.874	0.0573	
15 minute winter	3	1.002	4	22.2	1.260	1.250	0.7306	
15 minute winter	4	1.003	14	40.7	1.023	0.860	1.7987	
15 minute winter	5	2.000	6	10.6	0.796	0.598	0.4856	
15 minute winter	6	2.001	7	21.0	1.423	0.919	0.1362	
15 minute winter	7	2.002	13	26.6	2.006	0.806	0.3356	
15 minute winter	8	3.000	10	19.3	1.098	1.081	0.3474	
15 minute summer	9	4.000	10	9.3	0.788	0.280	0.1242	
15 minute summer	10	3.001	12	27.0	1.693	0.940	0.1152	
15 minute winter	11	5.000	12	13.5	0.992	0.764	0.3301	
30 minute summer	12	3.002	13	44.9	1.364	0.854	0.3116	
15 minute winter	13	2.003	14	77.2	1.940	1.048	1.9223	
15 minute winter	14	1.004	15	181.4	2.577	1.891	0.3770	
15 minute winter	15	1.005	Pond	181.4	2.576	2.316	0.0704	
15 minute winter	16	6.000	Pond	108.6	6.170	1.715	0.0352	
60 minute winter	Pond	Weir	17	32.3				14.8
60 minute winter	Pond	Infiltration		57.3				

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APPENDIX I – Proposed Drainage Layout



Private Drainage Notes:

1. All private drainage works to comply with the typical drainage construction details and to be in accordance with Part H of the current Building Regulations & BS EN 752.
2. All private drainage pipework to be either:–
   uPVC to BS EN 1401,
   Vitrified Clayware to BS EN 295,
   Concrete to BS 5911 OR,
   Twin Walled Plastic to BS EN 13476,
3. All new adoptable drainage and laterals to the public sewer are to be constructed in accordance with the DCG 2022 by Water UK.
4. All underslab drainage shall be laid at gradients of 1:40 min for foul pipework and 1:80 min for surface water UNO.
5. All rest bends at upstream end of underslab drainage to be 450mm below SSL UNO.
6. RWP lateral connections are to be sized to suit RWP size as designed by specialist. Gully laterals to be sized to suit gully outlets. All other pipes 100mm diameter UNO.
7. All underslab drainage shall be installed in straight runs and be clear of foundations UNO, with long radius bends kept to a minimum and used where unavoidable. Long radius bends along length of runs shall be a maximum of 30 degrees.
8. Where sewers cross and there is less than 200mm clearance, both runs are to be encased in concrete for a minimum of 1m in all directions.
9. All RWP, SVP, plant gully and all other foul drainage positions are to be set out by the Architect.
10. Where RWPs and foul pipes are connected direct to drain, rodding access plates are to be provided above ground (by others).
11. At least one soil pipe at the head of each foul run shall be vented to the atmosphere.
12. All internal access covers shall be double sealed.
13. Contractor to ensure that manhole covers are orientated to suit pavement finishes and set flush with surrounding levels.
14. Contractor to ensure that any part of the existing drainage system to be retained as part of the new scheme shall be cleaned and inspected by CCTV survey. Any structural defects shall be repaired or replaced as may be required using appropriate and approved methods. Where existing manholes are to be retained the cover and frames shall be checked to ensure they are in suitable condition for re–use and if required cover levels adjusted to suit proposed finished ground levels.
15. No allowance has been made for grease traps below ground. Management of grease and fats from kitchens to be provided above ground by others.
16. Refer to PTA Drainage Maintenance Schedule for maintenance of the drainage system during and for the end user post construction.

Notes:

1. Do not scale from this drawing.
2. In case of any discrepancies in drawings, details or bills, refer to engineers for clarification: unilateral decisions by the Contractor will not be accepted.
3. This drawing is to be read in conjunction with all related Architects, Consultants & Sub–Contractors drawings and specifications.
4. The Contractor is advised that all design drawings and information are to be read concurrently and any discrepancies or omissions reported directly to PTA's Civil Engineering Department.

Key:

- Site Boundary
- Existing Public Foul Water Drainage
- Existing Public Storm Water Drainage
- Existing Public Combined Drainage
- Proposed Private Foul Water Drainage
- Proposed Private Surface Water Drainage
- Existing Private Storm Water Drainage
- RG – Road Gully with 150mmø Outlet
- TG – Trapped Gully
- RWP – Rain Water Pipe & FDP – Foul Drain Point
- Exceedance Route
- DC – Drainage Channel with Sump Unit (SU)
- Filter Drain with Perforated Distribution Pipe Laid at Base

Drainage Abbreviations:

F	=	Foul Water
S	=	Surface Water
C	=	Combined Water
SW	=	Southern Water
CL	=	Cover Level in mAOD
IL	=	Invert Level in mAOD
USIL	=	Upstream Invert level for lateral pipe in mAOD

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DRAWING STATUS / PURPOSE OF ISSUE
PRELIMINARY
COMMENT/COSTING/APPROVAL
NOT FOR CONSTRUCTION

ISO 19650 STATUS CODE: S3

REV	DESCRIPTION	BY	DATE	CHKD
P02	General Updates	DH	21.02.25	AH
P01	First Issue	ADC	28.11.24	AH

PROJECT TITLE
Milton Place, Ordnance Road, Gravesend

DRAWING TITLE
Proposed Drainage Layout

DATE	Nov 24
DRAWN	ADC
SCALE	1:250
DRG SIZE	A1

This drawing is issued only for the purposes described in the drawing status box.

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APPENDIX J – Below Ground Drainage Maintenance Plan

Powell Tolner & Associates Ltd

BELOW GROUND DRAINAGE MAINTENANCE PLAN

Project: Milton Place, Gravesend
PTA Project Ref: 10109

Document Ref: 10109-PTA-XX-XX-RP-C -9078

Status: Issue for Planning
Revision: P01
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Client: Gravesham Community Investment Partnership LLP

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For and on behalf of Powell Tolner & Associates Limited				

Revision	Date	Description	Prepared	Reviewed
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1 INTRODUCTION

Project Name: Milton Place, Gravesend - 10109

Project Location: Milton Place, Gravesend, Kent, DA12 2BT

Job Number: 10109

This document has been prepared to provide a maintenance methodology to the surface water drainage elements proposed for this development. If any discrepancies from manufactures guidance is encountered, the proprietary system guidance should be adopted.

The drainage networks are comprised of gullies, basins, together with connecting pipe network, manholes & inspection chambers and filter strips. Refer to drawing 10109-PTA-XX-XX-DR-C-9300 for the Proposed Drainage Layout.

Any man-entry into the system and silt removal should be by trained personnel with adequate personal protective equipment. Approved safety procedures must be followed in accordance with the Health and Safety Act.

This drainage systems maintenance will be the responsibility of the project developer or by an appointed maintenance company and as such an appropriated maintenance regime should be implemented (as below).

2 Manholes, Inspection Chambers, Pipe Work, Drainage Channels & Gullies

The surface water drainage system should be inspected and maintained periodically, primarily to check for silt sedimentation within the system or ingress of any detritus or debris which would decrease system performance. Table 1 sets out the recommended maintenance actions and frequency.

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Remove manhole and chamber covers to sewers and flow control on network– inspect to ensure water is flowing freely and that the water flow route is unobstructed. Remove debris and silt as required. Traps of the internal gullies within the carpark.	Half Yearly Undertake one of these inspections after leaf fall in autumn
Occasional Maintenance	None required	
Remedial Actions	Re-line or replace pipework if unable to clear blockages by jetting.	As required
Monitoring	Inspect chambers for build-up of silt and debris	Half yearly

Table 1 – Operation & maintenance requirements for pipe network, manholes & inspection chambers, drainage channels & gullies - Based on CIRIA SuDS Manual 2015

3 Infiltration Basins

These are profiled basins which are designed to discharge water to the ground via infiltration.

Table 2 sets out the recommended maintenance actions and frequency for infiltration basins.

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Remove litter, debris and trash	Monthly
	Cut grass – for landscaped areas and access routes	Monthly (during growing season) or as required)
	Cut grass – meadow grass in and around basin	Half yearly: spring (before nesting season) and autumn
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
Occasional Maintenance	Replace malfunctioning parts or structures.	As required
	Prune and trim trees and remove cuttings	As required
	Remove sediment from pre-treatment system when 50% full	As required
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realign the rip-rap	As required
	Repair or rehabilitate inlets, outlets and overflows	As required
	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates	As required
	Relevel uneven surfaces and reinstate design levels	As required
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and pre-treatment systems for silt accumulation; establish appropriate silt removal frequencies	Half yearly
	Inspect infiltration surfaces for compaction and ponding	Monthly

Table 2 – Operation & maintenance requirements for Infiltration Basins –

Based on CIRIA SuDS Manual 2015

4 Filter Strips

The following Table 3 sets out the recommended maintenance actions and frequency for filter strips.

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Litter and debris removal.	Monthly (or as required)
	Cut the grass - to retain grass height within specified design range	Monthly during growing season, or as required
	Manage other vegetation and remove nuisance plants	Monthly or as required.
	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (eg oils)	Monthly, or as required.
	Check flow spreader and filter strip surface for even gradients	Monthly, or as required.
	Inspect gravel flow spreader upstream of filter strip for clogging	Monthly
	Inspect silt accumulation rates and establish appropriate removal frequencies	Monthly
Occasional maintenance	Reseed areas of poor vegetation growth- alter plant types to better suit conditions, if required	As required or if bare soil is exposed over > 10%of the filter strip area.
Remedial actions	Repair erosion or other damage by returfing or reseeding	As required.
	Relevel uneven surfaces and reinstate design levels	As required.
	Scarify and spike topsoil layer to improv infiltration performance, break up silt deposits, and prevent compaction of the soil surface.	As required.
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required.
	Remove and dispose of oils or petrol residues using safe standard practices	As required.

Table 3 – Operation & maintenance requirements for attenuation pond (Based on CIRIA SuDS Manual 2015)

5 CONSTRUCTION STAGE

All recently installed drainage is to be checked at least once weekly via walkover survey during the full period of construction. All excess silts and debris to be removed and disposed of appropriately. Temporary covers to be installed in order to avoid any site debris entering the newly installed chambers, linear channel drains & pipework. Excavated materials should be placed in such a manner that any instability will not result in them directly entering the drainage network.