FLOOD RISK ASSESSMENT

McDonald's, Farnham (ST1765)

Prepared for: McDonald's Restaurant Ltd
Ref: 002_MD4220349_HG_FRA
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Document History

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1	27 Feb 2023	First Issue	Howard Gell	Fredi Giliberti
2	10 August 2023	Site layout updated	Fredi Giliberti	Fredi Giliberti
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1.0 Introduction

Purpose

1.1 This Flood Risk Assessment has been prepared by Glanville Consultants Ltd on behalf of McDonald's Restaurants Limited to support a planning application for the development of a site which is currently undeveloped. The proposed layouts for the restaurant shown in this report are outline ones, but accurately reflect the proposal from a drainage impact assessment point of view. The outline drawings exclude signage.

Site Location & Description

1.2 The site is located 4.2km northeast of the centre of Farnham, as shown in Figure 1. The site is surrounded undeveloped grassland, trees with river beyond to the North, a balancing pond to the east, Tongham Services to the south and undeveloped grassland with some trees to the west.

Data Sources

1.3 Data used for this report is as follows:

- Topographical survey & sub scan of the site
- On-line Flood Maps -. Gov
- Existing drainage network data
- Geotechnical & Geo-environmental data – ST Consult
- Google Earth observations - Glanville
- Guildford Borough Council Level 1 - Strategic Flood Risk Assessment 2017
- Guildford Borough Council Level 2 - Strategic Flood Risk Assessment 2017

1.4 All the level information quoted in this report refers to the Ordnance Datum Newlyn, defined as the mean sea level recorded at Newlyn in Cornwall.

2.0 Flood Risk & Sustainable Drainage Systems (SuDS Planning Policy)

National Policy

2.1 NPPF Paragraph 167 in respect of planning applications is summarised below:

- Local Authorities should ensure that flood risk is not increased elsewhere.
- Applications for development within Zones 3 and 2, including minor development and for any development located in a critical drainage area should be supported by a site-specific Flood Risk Assessment (FRA).
- Development should only be allowed in areas at risk of flooding where the FRA (& Sequential & Exception Tests as appropriate) has demonstrated:
  - Within the site, the most vulnerable development is located in areas of lowest flood risk.
  - The development is appropriately flood resistant and resilient.
  - Unless inappropriate, the development incorporates SuDS
  - Any residual risk can be safely maintained.
  - Safe access and escape routes are included where appropriate.

2.2 NPPF Paragraph 168 does not require Sequential or Exception test for Minor Development.

2.3 NPPF Paragraph 169 states that 'Major Developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate.'

2.4 For commercial development a Major Development is defined as: a floor space over 1,000m^2 or a site area of one hectare or more. The proposed development is therefore considered a **Minor Development**.

2.5 Planning Practice Guidance provides guidance on what information needs to be submitted in relation to SuDS with a planning application. This suggests that a Sustainable Drainage Strategy is submitted where SuDS are required by NPPF para 167 or 169.

2.6 In respect of these policies the proposed development is: -

- Classified as Minor Development, therefore Sequential and Exception tests are not required.
- Located within Zone 2, therefore a site-specific FRA is required.
- As the development is within Zone 2, in accordance with PPG a Sustainable Drainage Strategy will be required and can be combined with the FRA.

Local Policy

2.7 The Guildford Borough Local Plan polices on Flooding, flood risk and groundwater protection zones (Policy P4) is shown below: -

POLICY P4: Flooding, flood risk and groundwater protection zones

(1) Flood zones in the borough of Guildford are defined based on definitions contained within national planning practice guidance and the Council's Strategic Flood Risk Assessment (Level 1).

(2) Development in areas at medium or high risk of flooding, as identified on the latest Environment Agency flood risk maps and the Council's Strategic Flood Risk Assessment, including the 'developed' flood zone 3b (functional floodplain), will be permitted provided that:

a) the vulnerability of the proposed use is appropriate for the level of flood risk on the site
b) the proposal passes the sequential and exception test (where required) as outlined in the NPPF and Government guidance
c) a site–specific flood risk assessment demonstrates that the development, including the access and egress, will be safe for its lifetime, taking into account climate change, without increasing flooding elsewhere, and where possible, will reduce flood risk overall
d) the scheme incorporates flood protection, flood resilience and resistance measures appropriate to the character and biodiversity of the area and the specific requirements of the site
e) when relevant, appropriate flood warning and evacuation plans are in place and approved and
f) site drainage systems are appropriately designed, taking account of storm events and flood risk of up to 1 in 100 year chance with an appropriate allowance for climate change.

(3) Development proposals in the 'developed' flood zone 3b will also only be approved where the footprint of the proposed building(s) is not greater than that of the existing building(s) and there will be no increase in development vulnerability. Proposals within these areas should facilitate greater floodwater storage.

(4) With the exception of the provision of essential infrastructure, 'undeveloped' flood zone 3b will be safeguarded for flood management purposes.

(5) All development proposals are required to demonstrate that land drainage will be adequate and that they will not result in an increase in surface water run-off. Proposals should have regard to appropriate mitigation measures identified in the Guildford Surface Water Management Plan or Ash Surface Water Study. Priority will be given to incorporating SuDs (Sustainable Drainage Systems) to manage surface water drainage, unless it can be demonstrated that they are not appropriate. Where SuDs are provided, arrangements must be put in place for their management and maintenance over their full lifetime.

(6) Development within Groundwater Source Protection Zones and Principal Aquifers will only be permitted provided that it has no adverse impact on the quality of the groundwater resource and it does not put at risk the ability to maintain a public water supply.

2.8 In respect of these policies the proposed development is: -

- Not within an area at risk of surface water flooding and therefore policy NE7 does not apply.
- A greenfield site and therefore the peak run off rate from the development must not exceed the greenfield run-off rate (defined as "**Qbar**").

Relevant Planning History

2.9 The site is located within the boundary of a recent planning application as described below: -

17/P/01879 | Erection of a roadside services facility with vehicular access/egress, car parking, landscape/habitat enhancements, and associated site works (including changes to land levels) | Euro Garages, Blackwater Valley Road, Tongham, Farnham, GU10 1FP

2.10 Planning Condition 10 included requirements in relation to flood risk as follows: -

10. The development hereby permitted shall be carried out in accordance with the

Guildford Borough Council
Millmead House, Millmead, Guildford, Surrey GU2 4BB

Flood Risk Assessment (FRA) Addendum Ref 066717-CUR-00-XX-RP-D-002 V01 issue date 23 May 2018 by Curtins inclusive of the following mitigation measures as detailed within the FRA addendum:

- Compensatory flood plain storage as shown detailed in the Flood Risk Assessment (FRA) Addendum Ref 066717-CUR-00-XX-RP-D-002 V01 and drawing titled Proposed Flood Analysis Flood Levels Post Development 82002 P04 dated 02/02/2018.

The mitigation measures shall be fully implemented prior to occupation and subsequently in accordance with the timing / phasing arrangements embodied within the scheme, or within any other period as may subsequently be agreed, in writing, by the local planning authority.

Reason: To prevent flooding elsewhere by ensuring that compensatory storage of flood water is provided.

2.11 The approved Flood Risk Assessment Addendum contains the following important facts: -

- The approved fluvial climate change threshold is 35%.
- Flood levels agreed with the EA are: -
  - 1:100 + 35% = **71.86m AOD**
  - 1:100 = 71.81m AOD
- The approved Proposed Flood Analysis plan (82002 P04 dated 2-02-18) demonstrates the proposed McDonald's site is outside of the 1:100 year plus 35% climate change flood plain.

2.12 EA letter of the 25th June 2018, see Appendix D, confirms: -

- The correct climate change level is 35%.
- The 1:100 year plus 35% climate change level is 71.86m AOD.

3.0 Existing Conditions and Sources of Flooding

Topography

3.1 The site has levels ranging from 71.88 to 72.48 on the southwest boundary. The site is relatively flat overall, with only a slight fall to the north, towards the Blackwater River. Refer to Figure 2 for the existing site survey. There is a mound, estimated to be 2-7m high outside the northwest corner of the site and an attenuation pond immediately outside the site's western boundary. The pond's top of bank level is currently circa 71.8m. The bottom of the pond is recorded as 70.3 – 70.1. We understand that further works may be required to the adjacent attenuation pond as part of planning application reference 17/P/01879. Any such works would be completed outside of the site boundary identified for the McDonald's Restaurant, as shown in Figure 3.

3.2 There is only grass within the site. Bushes and trees lay well beyond the north and east boundaries but closer (within 10-20m) of the western boundary.

Geology

3.3 The British Geological Survey (BGS) mapping indicates the site consists of River Terrace deposits over Lambeth Group (Superficial deposits) over Lewes Nodular Chalk (Bedrock). The extract of the intrusive investigation showing the ground conditions in Table 1 below can be found in Appendix A.

Table 1: Summary of Intrusive Geo-Environmental Investigation

Intrusive Investigation Summary: (m = metres below ground level)		
Strata top (m)	Strata base (m)	Description of Strata
0.0	0.3-2.4	MADE GROUND – Sandy gravelly CLAY, clayey gravelly SAND or sandy GRAVEL.
0.3-2.4	2.6-7.5	RIVER TERRACE DEPOSITS – Sandy, gravelly CLAY. A 200-300mm band of slightly clayey to clayey organic SILT noted in TP03, TP04, TP05, TP06 at 2.0-2.4m depth.
2.6-7.5	3.5+ to 9.7	RIVER TERRACE DEPOSITS – Loose to medium dense very sandy GRAVEL of fine to course flint.
7.8-9.7	16.5 to20+	LEWES NODULAR CHALK – Chalk composed of silty fine to course GRAVEL COBBLES. Occasional fine to course flint.
16.5-17.5	20+	LEWES NODULAR CHALK
Infiltration tests		Soakaway drainage is not recommended due to relatively shallow groundwater and deep made ground.
Contamination		No visual or olfactory signs of contamination but made ground found in all trial holes.
Groundwater		Monitoring levels 3.6m - 4.0m BGL (3 readings September & October)

Groundwater Quality

3.4 The Environment Agency define groundwater source protection zones as either:

- Inner Zone (Zone 1)
- Outer Zone (Zone 2)
- Total Catchment (Zone 3)
- Special Interest (Zone 4)

3.5 The Environment Agency defines Source Protection Zones (SPZs) for groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity to the groundwater source, the greater the risk. The application site is currently defined by the Environment Agency on-line mapping as being outside of any source protection zone.

3.6 The superficial stratum has been designated as a Secondary A Aquifer – secondary A aquifers comprise permeable layers that can support local water supplies, and may form an important source of base flow to rivers.

3.7 The bedrock stratum has been designated as a Principal Aquifer. Principal Aquifers are defined by the Environment Agency as; layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

Fluvial Flooding

3.8 Flood Zone definitions are set out in the National Planning Policy Guidance:

- Flood Zone 1 - land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%)
- Flood Zone 2 - land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year
- Flood Zone 3 - land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year

Note: Flood zones refer to the probability of river and sea flooding, ignoring defences.

Image 1: Gov.UK Fluvial Flood Risk Map

3.9 The Environment Agency flood map, of which an extract is shown in Image 1, indicates the site to be located within Zone 2, defined as land having between a 1:100 and 1:1000 annual probability of flooding. Similar information with the proposed McDonald's site boundary can been seen in Figure 7. Figure 7 also includes a more accurate depiction of the zone 3/2 boundary and the 1:100 year plus 35% climate change boundary based on the latest topographic survey of the site.

3.10 The nearest watercourse is the Blackwater River, 75m north of the site. Flood data was obtained for this site in 2016 and detailed in the Flood Risk Assessment for the service station development, as detailed in section 2.0 of this report. This data has been provided by the vendor of this site for reference in this planning application and the details are summarised below.

- 71.81 - 1:100 yr
- 71.86 - 1:100 yr + 35% climate change level.

3.11 Current topographic survey information suggests the average site level is now 72.15m. The lowest point on the site of 78.78m is a small depression near the central western boundary, with higher levels around it on all sides, suggesting this cannot be part of the 1:100 year plus climate change flood plain. See Figures 2 and 8.

Groundwater Flooding

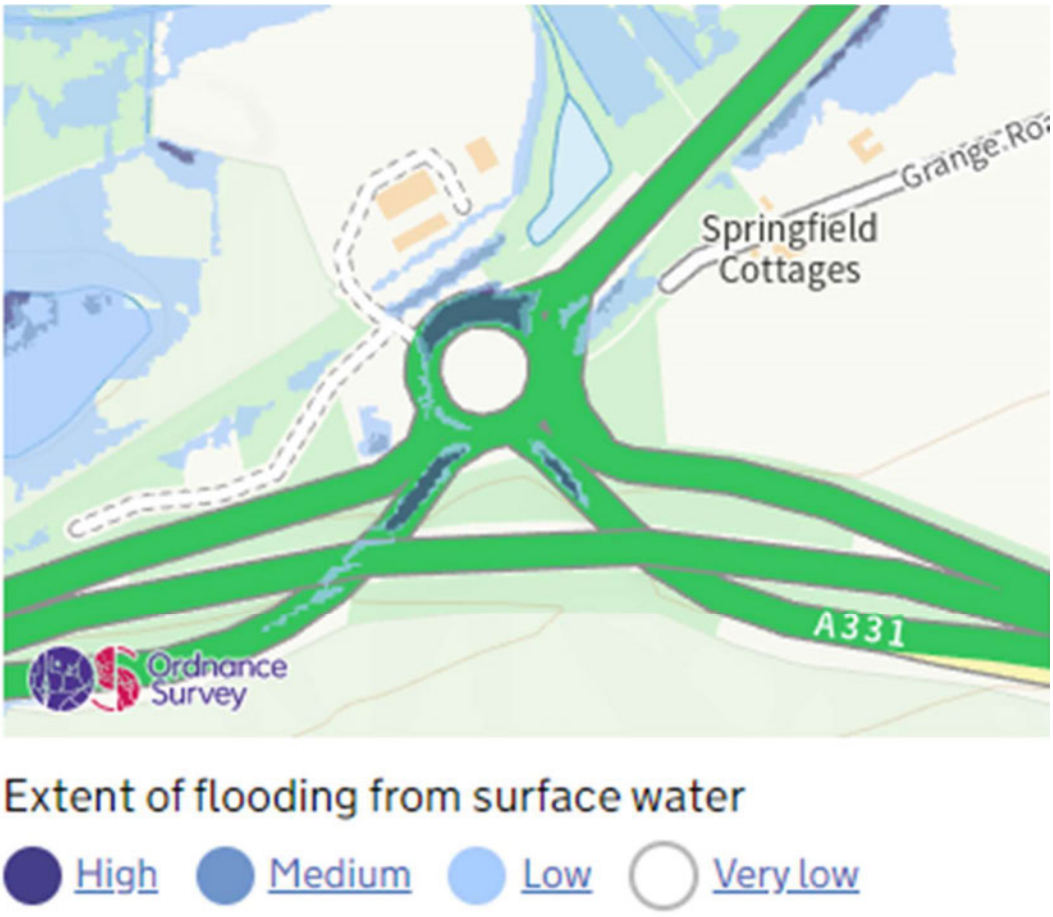
3.12 The geotechnical report desk study indicates potential for groundwater flooding to occur at surface. This is also confirmed in the Level 1 SFRA appendices. This information is intended only to give a strategic overview and should not be used to assess flood risk for individual properties.

3.13 The site investigation's groundwater monitoring recorded groundwater levels between 3.6m and 4.0m below ground level during the months of September and October. Levels could be higher during very wet periods, typically December to February.

Overland (Pluvial) Flooding

3.14 The Flood Warning Information Service website, see Image 2, indicates the entire site area to have a very low risk of flooding. There are no obvious pluvial flood routes nearby which could create a potential flood risk to the site.

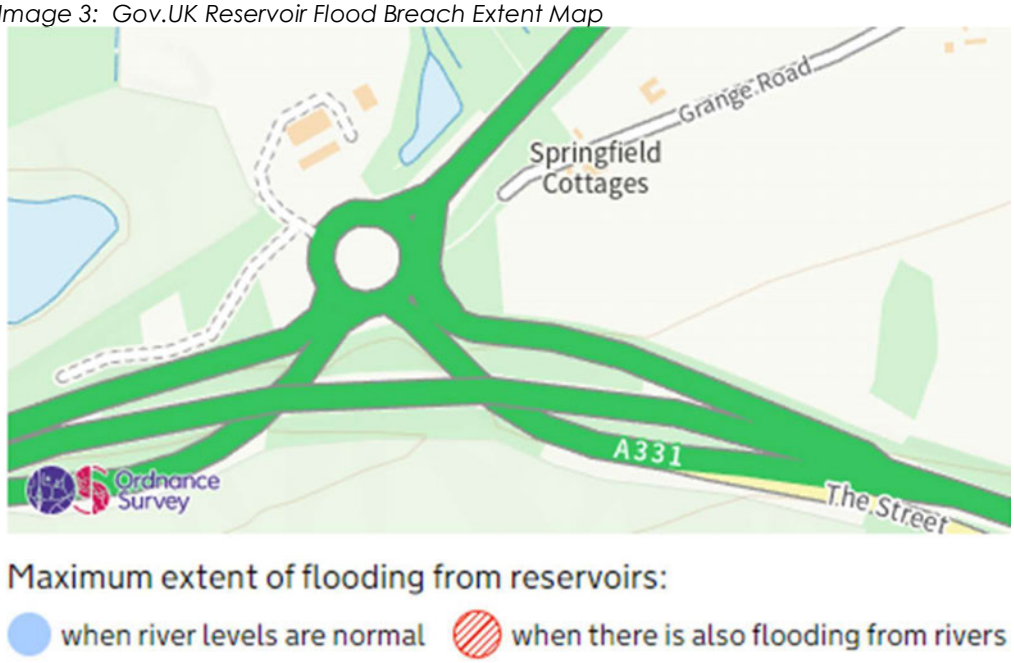
Image 2: Gov.UK Surface Water Flood Risk Map



Flooding from Reservoirs, Canals and other Artificial Sources

3.15 The Flood Warning Information Service website indicates the site to have no risk of reservoir flooding as shown in Image 3.

Image 3: Gov.UK Reservoir Flood Breach Extent Map

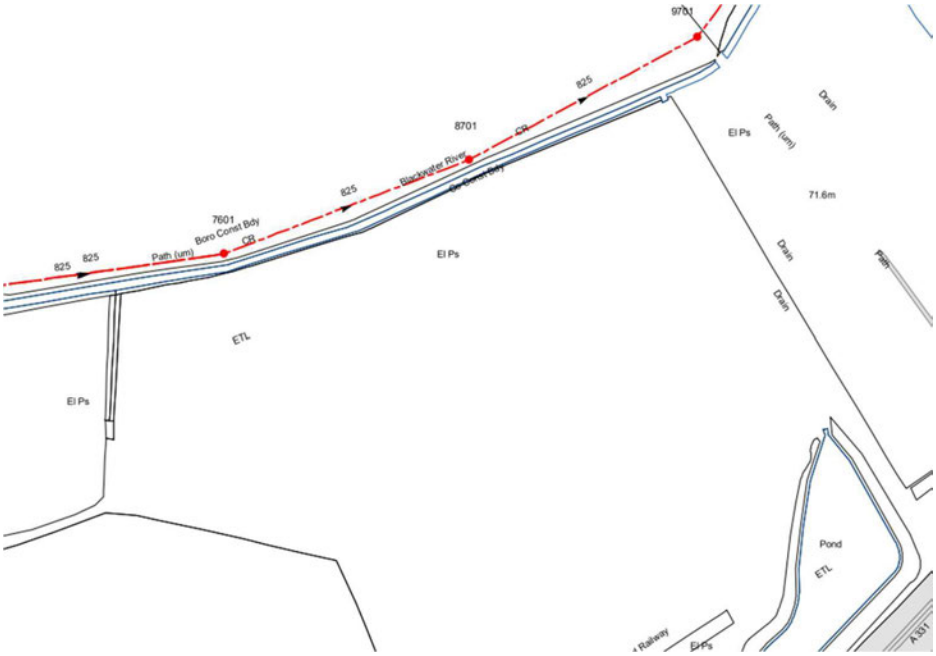


Existing Sewer Flooding

3.16 The Level 1 SFRA appendices indicate only 3 recorded incidents of sewer flooding in the GU10 post code area which includes the site.

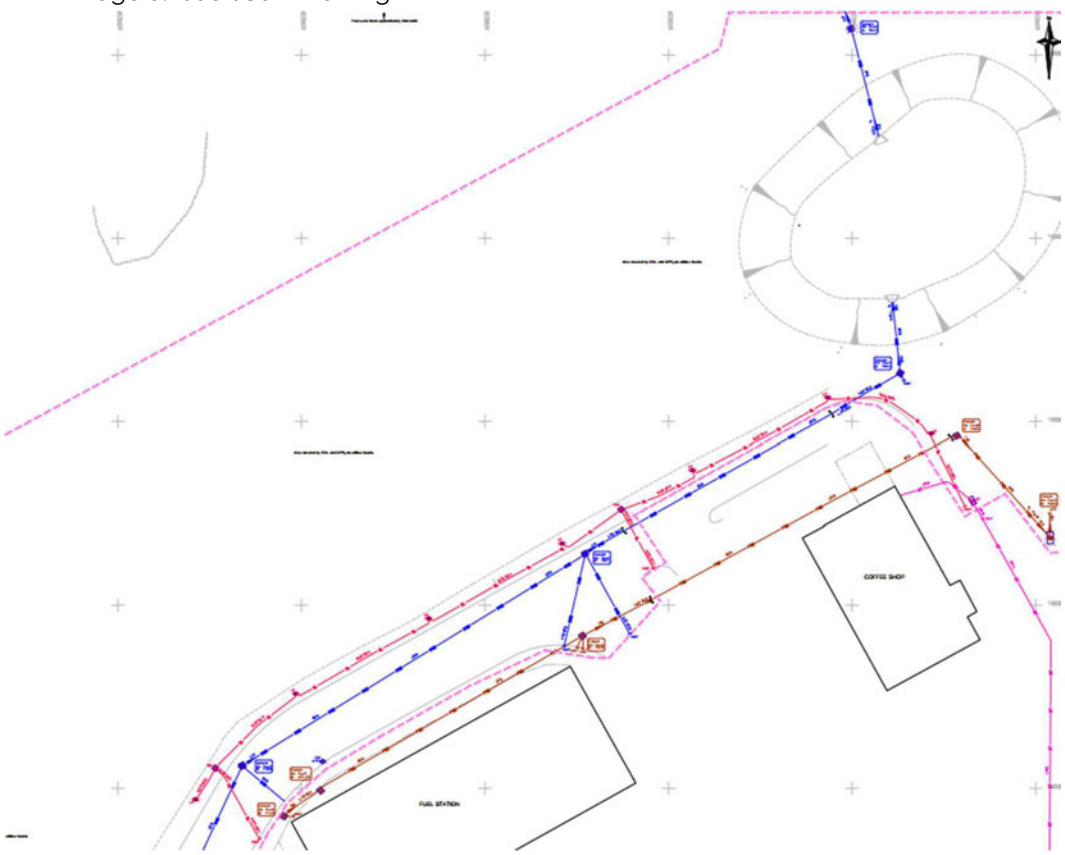
3.17 Utility undertaker records, refer to the extract in Image 4, indicate an ø825mm foul water sewer on the north side of the Blackwater River, flowing east. The invert level of this sewer is 69.4m at manhole 9701 located to northeast of the path located to the east of the site. Utility records also indicate surface water sewers to the southeast of the A31 / A331 roundabout.

Image 4: Utility Undertaker Sewer Records



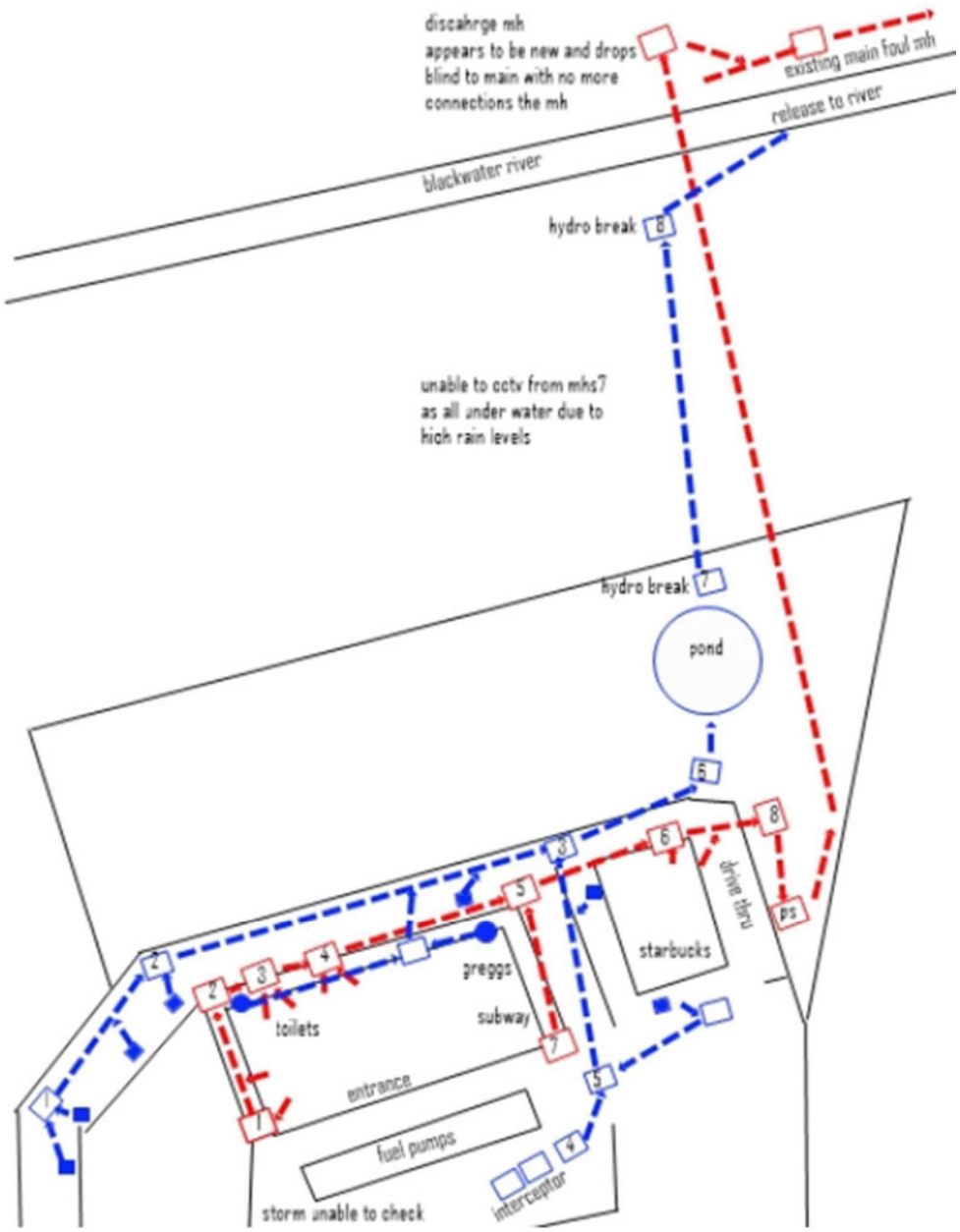
3.18 The sub scan, as shown in Image 5, shows a ø150mm foul water pipe flowing west to east between the PFS and access road, which turns southeast once past the coffee shop then north. The sub scan shows a ø225mm diameter surface water pipe under the service station access road with road gullies and pipes leading from the service station area. The main drainage discharges to the attenuation pond, via a ø225mm outfall pipe, flowing north towards the Blackwater River.

Image 5: Sub Scan Drawing



3.19 The CCTV drainage survey plan, as shown in Image 6, shows the service station's foul water discharge connecting into the existing ø825mm adopted sewer on the north side of the Blackwater River. The surface water drainage discharges via the attenuation basin to the river, as shown in image 5.

Image 6: CCTV Drainage Survey Plan



4.0 Development Flood Risk

Development Proposals

4.1 The proposed development consists of a McDonald's Restaurant with associated drive through lane and car park. The development layout can be seen in Figure 3.

Flood Risk Management

4.2 The development design includes flood risk reducing features which are listed in Table 2. The following sub sections of this chapter describe in more detail each of the potential sources of flooding and how the development design features will reduce these risks.

Table 2: Flood Risk Reducing Design Features

Possible Design Features	In this Design	Description of Feature	Flood Risk Reduction
Surface levels & FFL	Yes	Surfaces drained into the SuDS. Exceedance flow routes are checked to ensure they do not create a flood risk.	Pluvial flooding
SuDS Drainage	Yes	1:100 + climate change allowance included within drainage system.	Pluvial /drainage flooding
Flood Resilience	No	Not required, buildings not expected to flood.	N/A
Flood Compensation	No	Not required, not developing in floodplain.	N/A
Flow Control Devices	Yes	Infiltration is not suitable and thus Flow Control Devices are required limiting surface water discharge to greenfield (Qbar)	Fluvial
Safe Pedestrian Escape Route	Yes	The site is dry and proposed levels designed to ensure overland surface water flow routes do not create a flood risk.	Pluvial flooding
Safe Escape Route Vehicular	Yes	The site is dry and proposed levels designed to ensure overland surface water flow routes do not create a flood risk.	Pluvial flooding
Dry parking area	Yes	Proposed levels designed to ensure overland surface water flow routes do not create a flood risk.	Pluvial flooding
Flood Plan & Warning	No	Not required, development outside floodplain.	N/A

Fluvial Flooding

4.3 The development and the access road are outside the floodplain and therefore no design features are required to address fluvial flood risks to the development. Hence, the risk of fluvial flooding will remain very low.

Groundwater Flooding

4.4 The site level design will ensure that in the unlikely event that any groundwater does flood at surface level, the proposed overland flow routes do not create a risk to the development (refer to Figure 6).

Overland Surface Water Flooding (Pluvial) On Site

4.5 The proposed overland flow paths and levels are shown in Figure 6 with the existing flow path shown in Figure 2. In addition, the improved on-site drainage and raised building FFL, the site level design will ensure that any pluvial flooding is routed to avoid a risk to the development.

Overland Surface Water Flooding from the Site onto Surrounding Land

4.6 The proposed on-site drainage system will be designed to accommodate a 1 in 100 plus climate change rainfall event, without creating a flood hazard. If an exceedance event occurs (greater magnitude than 1 in 100 plus climate change storm event) then the existing overland flood routes on and off the site will not be changed by the development, so the development cannot adversely impact surrounding land, see Figures 2, 5 and 6.

Flooding from Reservoirs, Canals and other Artificial Sources

4.7 No existing flood risks have been identified and the development will not change this situation.

Sewer Flooding

4.8 The proposed development surface and foul water drainage layouts are shown in Figure 5. The new foul drainage infrastructure on the site will be designed in accordance with Building Regulations and therefore no significant flood risk is expected from the proposed on-site foul water drainage.

4.9 The new on-site surface water drainage is going to be designed to accommodate a 1 in 100 year plus climate change event without creating a flood hazard and therefore the risk of flooding is low.

4.10 Existing drainage in close proximity to the site is relatively new and designed to modern standards and therefore the risk of flooding low. Any flooding from existing sewers will be routed through design of exceedance flow routes to avoid creating a flood risk to the development.

Flood Impacts, Mitigation and Residual Effects

4.11 Table 3 below rates the different flood risks to the development, taking into account the development design proposals as described in this report. Design proposals are not considered to be mitigation, but any action required in addition to the current design proposals is considered mitigation and listed in the table. We have rated the risks as none, low, medium and high based on our assessment of the facts relating to each source of flooding and the potential hazards.

Table 3: Residual Flood Risk

Type of Flood Risk	Flood Risk Rating None Low Med High	Mitigation required	Mitigation Measure
Fluvial Flooding	Low	No	None
Groundwater flooding	Low	No	None
Overland SW flooding from adjacent land	Low	No	None
Overland SW flooding onto adjacent land	Low	No	None
Flooding from artificial sources	None	No	None
Flooding from sewers	Low	Yes	Normal maintenance of drainage systems

5.0 Proposed Sustainable Drainage

Site Specific Sustainable Drainage System

5.1 The Ciria SuDS Manual describes the four main categories of benefits that can be achieved by SuDS as water quantity, water quality, amenity and biodiversity: also known as the four Pillars of SuDS. The SuDS Manual Box 1.2 describes the SuDS approach to managing surface water runoff as follows: -

- use surface water runoff as a resource
- manage rainwater close to where it falls (at source)
- manage runoff on the surface (above ground)
- allow rainwater to soak into the ground (infiltration)
- promote evapotranspiration
- slow and store runoff to mimic natural runoff rates and volumes
- reduce contamination of runoff through pollution prevention and by controlling the runoff at source
- treat runoff to reduce the risk of urban contaminants causing environmental pollution.

Depending on the characteristics of the site and local constraints, these may be used in combination and to varying degrees.

5.2 Table 4 below is a version of the Ciria SuDS Manual Table 1.1 'Types of SuDS Components with a comment on the suitability of each component for this site.

Table 4: SuDS Component Suitability Assessment

Component Type	Description	Suitability for This Site
Rainwater Harvesting	Rainwater collected from roof and paved surfaces in a tank. The system may include treatment elements and should include specific storage provision if it is to be used to manage runoff to a design standard.	The restaurant is of modular construction to a standard design which is not set up for rainwater recycling. Water demand is also high so any recycling would need to be accompanied by a backup water supply and a very large recycling tank, negating the environmental benefits.
Green /Blue Roofs	A planted soil layer constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation. Blue roofs store water at roof level, without the use.	The restaurant is a lightweight modular construction, produced in a factory and transported to site. This form of construction has many environment benefits but is not currently capable of supporting green or blue roofs for the McDonald's standard unit.
Infiltration System	Collects and stores runoff allowing it to infiltrate into the ground. Overlying vegetation and underlying unsaturated soils can	Infiltration is not possible within the geology at this site.

	offer protection to groundwater from pollution risks.	
Proprietary Treatment System	These structures provide treatment of water through the removal of contaminants.	These systems are suitable for this site
Filter Strips	Runoff from an impermeable area is allowed to flow across a grassed or otherwise densely planted area for sedimentation & filtration.	Space for filter strips is very limited, so they are unlikely to have much benefit
Filter Drains	Runoff is temporarily stored below the surface in a trench filled with stone, providing attenuation, conveyance & treatment (via filtration).	May be suitable subject to space/layout requirements. As infiltration is not possible, they would need to be connected to a positive drainage system
Swales	A vegetated channel is used to convey & treat runoff (via filtration). These can be "wet", where water will remain permanently at the base of the swale (lined), or "dry" where water is only present temporarily after rainfall events (unlined).	The site area is too small to accommodate swales in any significant form
Bioretention Systems	A shallow landscaped depression allows runoff to pond temporarily on the surface, before filtering through vegetation and underlying soils prior to collection or infiltration. In its simplest form it is often referred to as a rain garden. Engineered soils (gravel and sand layers) and enhanced vegetation may improve treatment performance.	Space for Bioretention systems is very limited, so they are unlikely to have much benefit
Rills	Formal linear drainage features in which surface water can be stored or conveyed. They can be incorporated with water features such as ponds or waterfalls where appropriate.	Unsuitable due trip/wheel hazard & high pedestrian & vehicle traffic. Unsuitable for disabled access. Channels incorporating a heel guard grating are an acceptable alternative
Trees	Trees within a range of infiltration SuDS components improve their performance, as root growth & decomposition increase soil infiltration capacity. Alternatively, as standalone features within soil filled tree pits, tree planters or structural soils, collecting and storing runoff and providing treatment (via filtration and phytoremediation.	There is space for planting in some small areas around the edge of the site, but unlikely to be sufficient space for trees
Pervious Pavements	Runoff soaks through structural paving. This can be paving blocks with gaps between solid blocks, or porous paving where water filters through the block itself. Water can be stored in the sub-base &	Porous paving has been used extensively by McDonald's in the past, but the daily jet washing of pavements consistently led to early failure of the pavement. Porous paving is not deemed suitable for this reason.

	potentially allowed to infiltrate into the ground	
Attenuation storage tanks	Large, below-ground voided spaces used to temporarily store runoff before infiltration, controlled release or use. E.g., a geo-cellular system, concrete tank or oversized pipes.	These systems are suitable for this site.
Detention Basins	During a rainfall event, runoff drains to a landscaped depression with an outlet that restricts flows, so that the basin fills and provides attenuation. Generally, basins are dry, except during & immediately following the rainfall event. If vegetated, runoff will be treated as it is conveyed & filtered across the base of the basin.	Insufficient site area for a basin.
Ponds & Wetlands	Features with a permanent pool of water can provide attenuation & treatment of runoff, where outflows are controlled & water levels are allowed to increase following rainfall. They can support emergent & submerged vegetation along their shoreline & in shallow, marshy zones, which enhances treatment & biodiversity.	Insufficient site area for a pond or wetland.

Available Surface Water Discharge Options

5.3 The geotechnical investigation for this site indicates that the underlying site geology is unsuitable for infiltration drainage of any type.

5.4 There is a watercourse nearby.

5.5 There are no public surface water or combined sewers nearby.

5.6 Due to the topography and the geology of the site it is concluded that the most suitable option is to use a positive discharge to the watercourse to the north.

Selected Sustainable Drainage Measures

5.7 The selection of SuDS techniques for this site has followed the SuDS management train concept explained in the SuDS Manual. The concept is to use drainage techniques in series to incrementally reduce pollution, flow rates and volumes. The hierarchy of techniques to be used are as follows:

- Prevention - prevent runoff and pollution e.g., by rainwater re-cycling and road sweeping.
- Source Control - control runoff at or near its source e.g., local infiltration methods.
- Site Control - routing water to site controls e.g., pipes to a large detention basin.
- Regional Control - routing water from several sites to regional controls e.g., pipes to a balancing pond or wetland.

5.8 The proposed surface water drainage layout is shown in Figure 5 and includes the following features: -

- Rainfall will be collected from roofs and the main car park / patio by rainwater pipes, gullies and channels. It will discharge via pipework to the below ground cellular storage.
- Cellular storage is used for attenuation of run-off which is released slowly through a flow control device into a petrol interceptor incorporating filters and coalescers.
- The petrol interceptor will discharge treated run-off into the Blackwater River to the north.

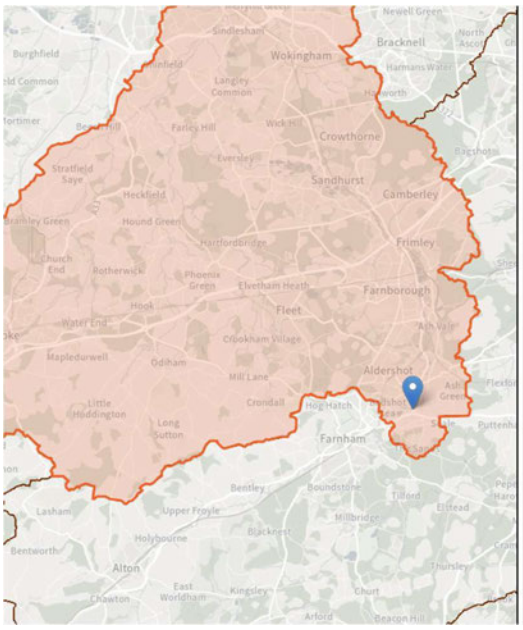
5.9 These sustainable drainage measures have been selected for the site conditions and are suitable for the constant use and daily maintenance required for a McDonald's site. These systems are tried and tested on similar sites where permeability is poor, and the site area cannot accommodate larger open drainage features.

Climate Change

5.10 Climate Change allowances were updated on the 10th of May 2022. The new climate change allowances map places the site within the Loddon & tributaries Management Catchment, see Image 7. The design life for the proposed development is circa 50 years which places it within 2070's epoch and the central allowance. For Flood Risk Assessments, the advice is to design developments to cater for the 1% annual exceedance probability for events so:

- there is no increase in flood risk elsewhere and
- your development will be safe from surface water flooding

Image 7: Gov.UK Climate Change Allowances



Loddon and tributaries Management Catchment peak rainfall allowances

3.3% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	20%	35%
2070s	25%	35%

1% annual exceedance rainfall event

Epoch	Central allowance	Upper end allowance
2050s	20%	40%
2070s	25%	40%

*Use '2050s' for development with a lifetime up 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

5.11 Development drainage is therefore designed for no flooding in the 1:100 year plus **25% climate change** event.

Flow Rates & Attenuation

5.12 Proposed impermeable areas have been calculated and are shown in Figure 4. These areas have been used to calculate the proposed discharge from the site and attenuation storage requirements for a range of storm events and the calculations are summarised in Table 5

5.13 Table 5 shows the greenfield runoff rates and the proposed discharge from the drainage system with attenuation to cater for the surface water storm events up to a 1 in 100yr storm event plus climate change. The calculations are shown in Appendix B.

Table 5: Existing & Proposed Flows & Attenuation

Storm Event (Annual Exceedance Probability)	Greenfield Runoff Rate (l/s)	Proposed Discharge Rate	Attenuation Storage Provided (m^3)
1 in 1 (100% AEP)	1.7	2.0	32 x 10 sqm x 400mm
1 in 2.3 (QBAR)	2.0	2.0	
1 in 30 (3.3% AEP)	4.59	2.0	
1 in 100 (1% AEP)	6.36	2.0	
1 in 100 (1% AEP) + 25 % CC	-	2.0	

Pollution Control

5.14 Ciria pollution treatment measures have been applied to ensure treatment of the surface water. The pollution control measures are designed to minimise the transmittal of any pollutants, collected by runoff flowing over hard paved areas, to the public sewers and to ground. Pre-treatment is provided with gullies and catchpit manholes to remove silt and prolong the life of the pollution control treatment media. Pollution control measures for this site include a proprietary SPEL ESR 25/C1 petrol interceptor with coalescer prior to discharge into the Blackwater River.

5.15 The suitability of the pollution control measures is quantified in accordance with CIRIA 753, pollution hazard indices. Comparing the pollution hazard indices in Table 6, for each catchment type, with the total pollution mitigation indices in Table 7, it can be seen that the suggested drainage system will be sufficient to mitigate the expected pollution from roofs and paved areas. See mitigation formula below, Appendix B for calculations and Appendix C for the product details and mitigation indices: -

Total SuDS Mitigation Index must be ≥ Each Catchment's Pollution Hazards Index (for each contaminant type)

Total SuDS Mitigation Index = 1st Stage Mitigation Index + 0.5 (2nd Stage Mitigation Index)

Table 6: Pollution Hazard Indices

Catchment Type	Pollution Hazard Level	Requirements for Discharge to Groundwater	Pollution Hazard Indices		
			Suspended solids	Metals	Hydrocarbons
Restaurant Roof	Low	Simple index approach	0.3	0.4	0.05
Restaurant parking	Medium	Simple index approach	0.7	0.6	0.7

Table 7: Total Pollution Mitigation Indices

Type of Pollution Mitigation (SuDS)	Pollution Mitigation Indices		
	Suspended solids	Metals	Hydrocarbons
1. SPEL Petrol interceptor with coalescer ESR 25/C1	0.8	0.6	0.9
Total treatment indices	0.8	0.6	0.9

Maintenance

5.16 Refer to the separate Glanville report entitled 'Drainage Maintenance Plan'.

Foul Water (FW) Drainage Strategy

5.17 The development will discharge foul flows, via a private on site pumping station, to the existing foul water sewer to the north of the river as shown in Figure 5. This is the nearest practical point of connection. A pre-development enquiry has been submitted to Thames Water to determine an acceptable discharge rate for the foul water discharge. Their response is awaited.

5.18 The restaurant drainage includes an alarmed grease trap for all the kitchen waste pipework to ensure drains do not lose capacity due to grease build up and to prevent grease entering the public sewers.

6.0 Further Investigations & Approvals

6.1 The information in this report is sufficient to demonstrate the suitability of the proposed development in respect of Flood Risk and Sustainable Drainage. It is expected that planning conditions will be imposed requiring drainage proposals to be in accordance with this Flood Risk Assessment, and that details of the on-site foul and surface water drainage designs will need to be provided prior to occupation.

6.2 The detailed drainage design must comply with the Building Regulations and approval will be required from a qualified Building Inspector.

6.3 Prior to construction a formal application will need to be submitted to obtain consent for physical connections (direct or indirect) and the discharge of flows to the adopted sewer. This applies to the foul flows from this development.

6.4 Prior to construction an application must be made to the Environment Agency to construct the surface water headwall and outfall pipe into the Blackwater River.

7.0 Conclusion

7.1 The development proposals have been designed after consideration of national and local planning policy and best practice guidance, in the context of the proposed use and site conditions.

7.2 Flood risks within the site have been assessed and are minimal. The proposed design ensures that flood risks are not increased by the development.

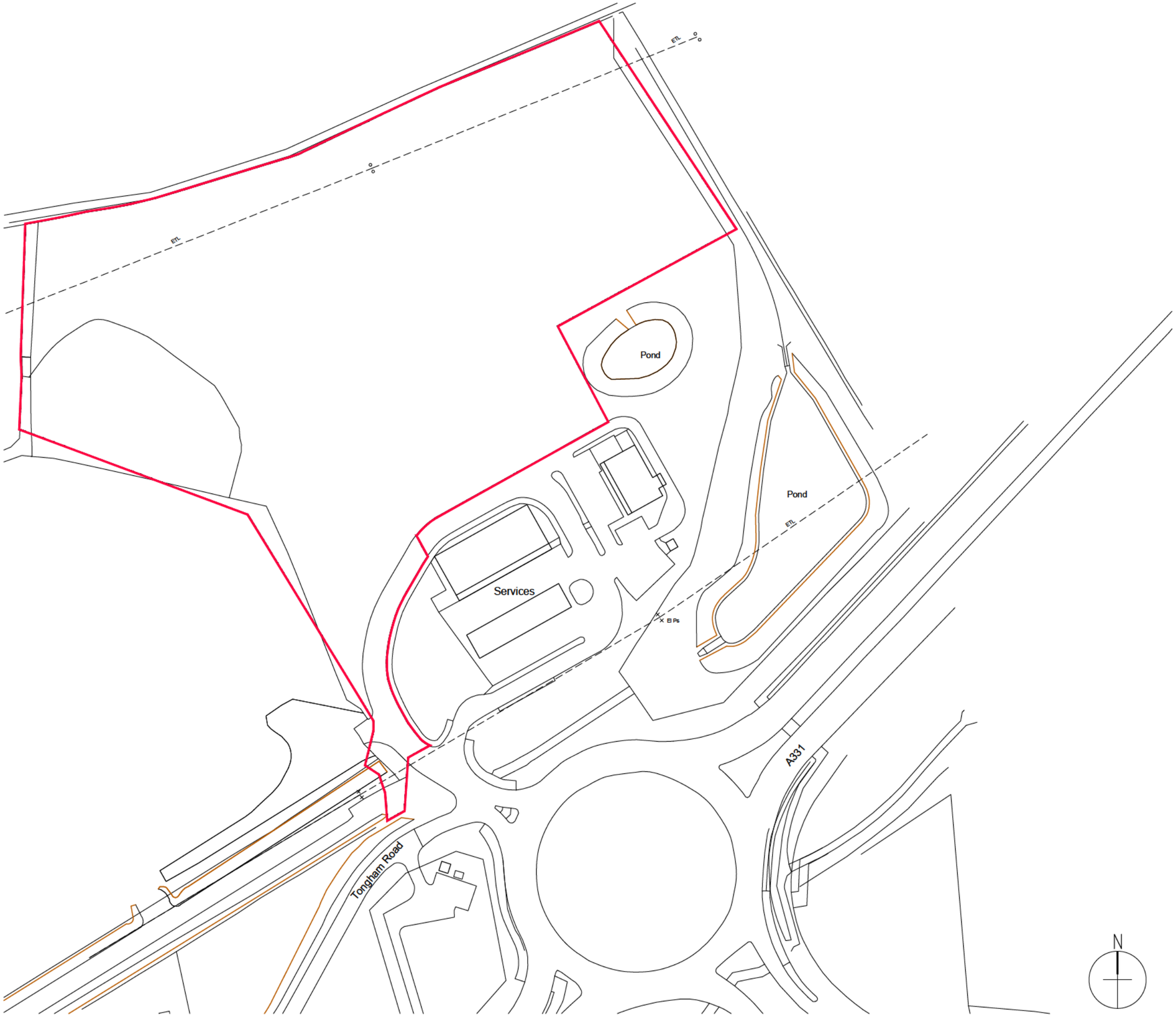
7.3 The development's surface water drainage strategy follows sustainable drainage guidance. As infiltration is unsuitable for this site, run-off will be attenuated, cleaned and discharged to the watercourse at a restricted rate (Qbar). The sustainable surface water drainage system is designed to accommodate a 1:100-year event plus the appropriate climate change allowance for this site, without flooding.

7.4 A SuDS maintenance schedule has been provided to demonstrate adoption and maintenance proposals in a separate Glanville report entitled 'Drainage Maintenance Plan'.

7.5 The development's foul water drainage strategy utilises a private pumping station to take foul water to the nearest foul sewer, north of the site, and passing under the Blackwater River. The design includes many access points for maintenance and an alarmed grease trap to ensure downstream sewers are protected from cooking waste / grease.

7.6 In summary, the development proposals comply with relevant standards for flood risk and sustainable drainage.

Figures



0 10 20 30 40 50

Scale in metres

Scurr Architects
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Harpenden
Hertfordshire
AL5 1PR
T: 01582 763099
email: scurr@scurr.co.uk
www.scurr.co.uk
architects ■ designers ■■ project managers

Notes:
All drawings to be read in conjunction with all other drawings as noted on issue sheet.

Application Boundary = 25916m2

REV.	DATE.	DRAWING REVISIONS.	BY.	CHECKED
B	11.09.23	Application Boundary amended.	JK	
A	08.08.23	Application Boundary amended.	JK	

GENERAL NOTES:
All works are to be undertaken in accordance with the Building Regulations and the latest British Standards.
All proprietary materials and products are to be used strictly in accordance with the manufacturer's recommendations.
All dimensions to be checked on site prior to construction.
All risks assessed to comply with the designer's responsibility under the Construction (Design Management) Regulations 2015.

PROPOSED DEVELOPMENT AT
Tongham Services, A31
TONGHAM GU10 1DN

STORE No :-
ST 1765

ON BEHALF OF :-
McDonald's Restaurants Ltd

DRAWING TITLE :-
Site Loaction Plan

DRAWN BY	CHECKED BY	DRAWING No.
JK		8383-SA-1765-AL01 B
SCALE & SIZE: 1:1250@A3	DATE: July 2023	

Scurr Architects
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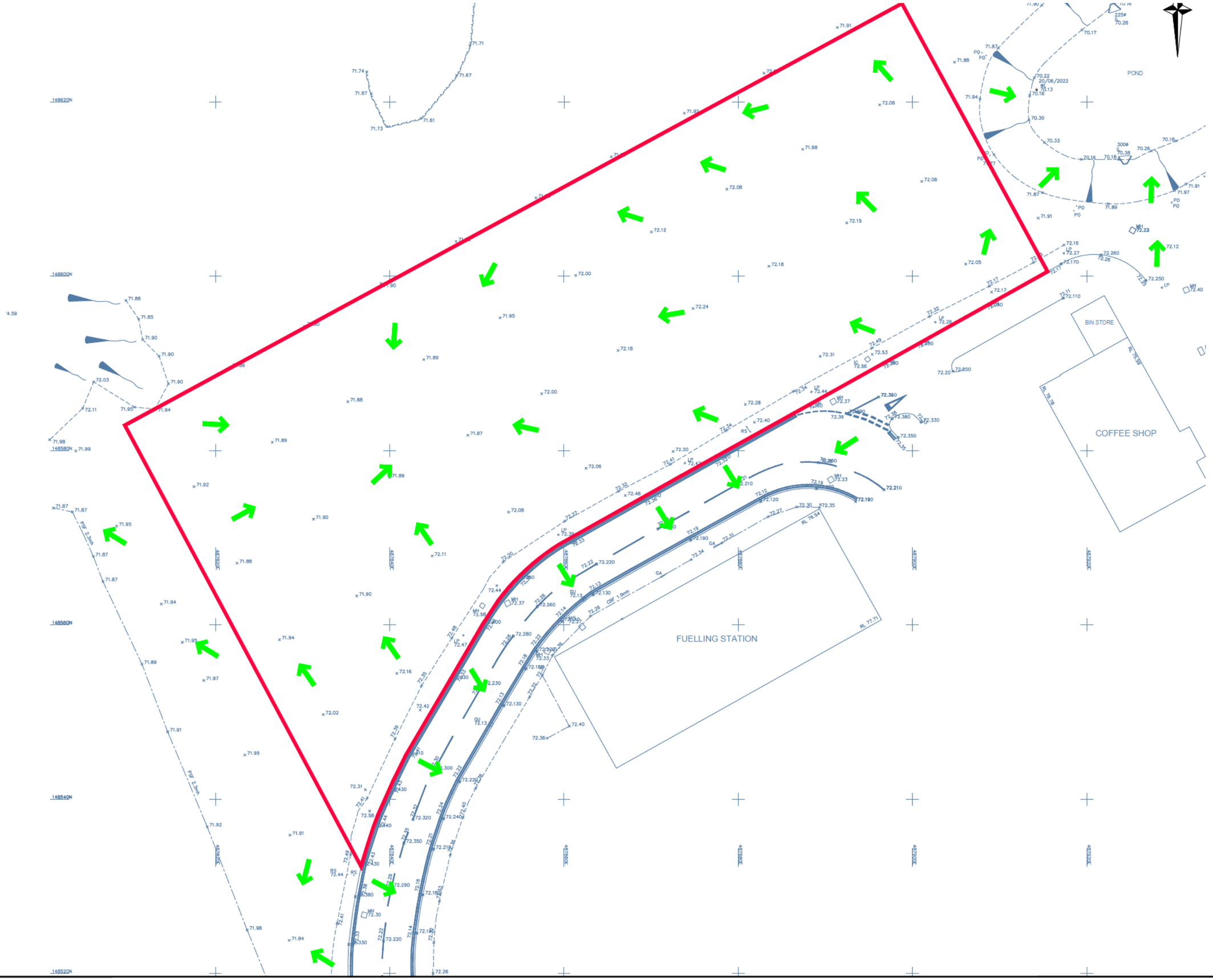
architects ■ designers ■■ project managers



NOTES

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KEY

SITE BOUNDARY

EXISTING SURVEY

OVERLAND FLOW DIRECTION

Rev.	Description	Date	Chkd
P1	PRELIMINARY ISSUE	23/02/23 GM	FG

Glanville
3 Grovelands Business Centre
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www.glanvillegroup.com

Client : McDonald's RESTAURANT

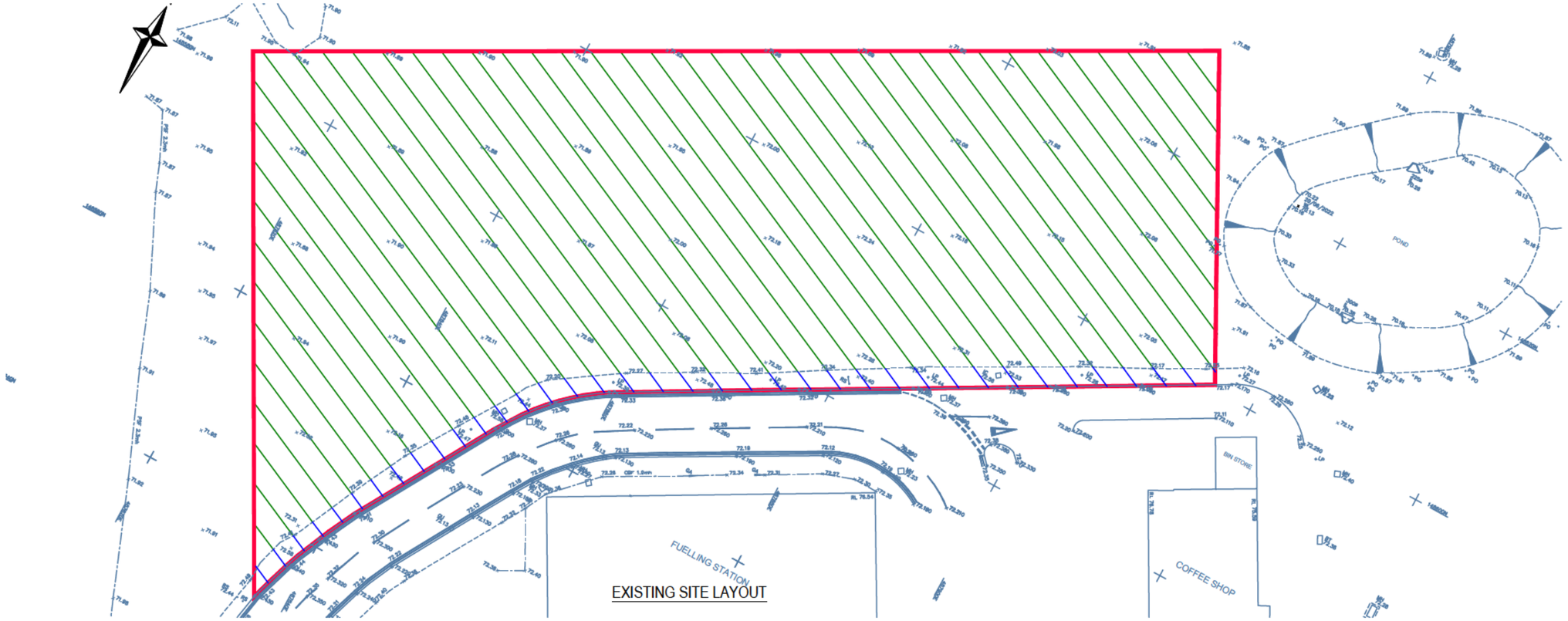
Project : McDONALD'S RESTAURANT
TONGHAM SERVICES, A31
FARNHAM GU10 1FP (NB8251)

Title : EXISTING SITE AND OVERLAND FLOW ROUTES

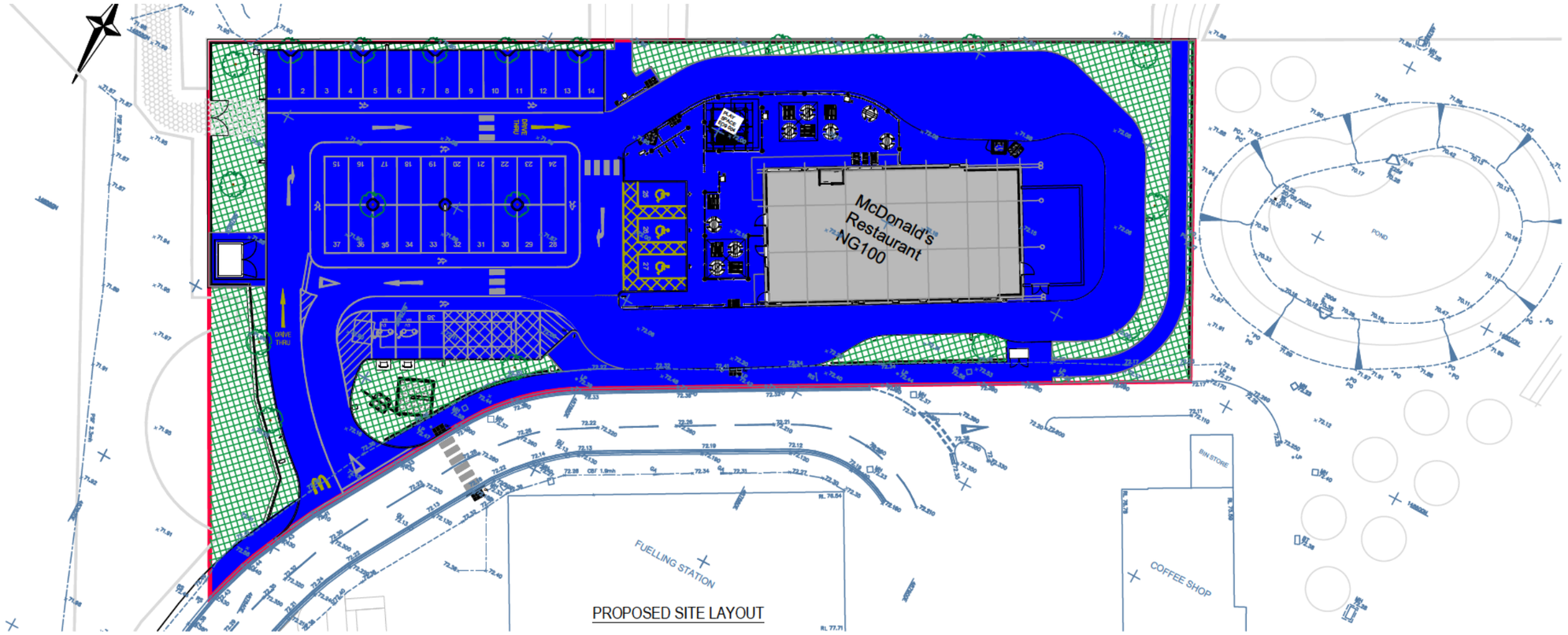
Project Engineer :	FG	Scale :	1:200 @ A1
Project Director :	HBG	Date :	Feb' 2023
Status :	PRELIMINARY		

Drawing No. 4220349-SK03 Rev P1


Proposed Wildlife / Ecology Site (Separate Application)
Pond
Patio
Corral
Entrance
McDonald's Restaurant NG100
Delivery
Patio
Fast Forward Lane
Grill Bay
Coffee Drive Thru
ETL
PFS Kiosk
Pumps / Canopy
Proposed EV Hub (Separate Application)
KEEP SLOW
ELEVATION
PLAN
PEDESTRIAN GUARD NG
Scale 1:50
ELEVATION
TYPICAL KNEE RA L FENCE
Scale 1:50
ELEVATION
POST & RAIL FENCE
Scale 1:50
NG100



EXISTING SITE LAYOUT



PROPOSED SITE LAYOUT

NOTES

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KEY

- SITE BOUNDARY
- EXISTING SURVEY
- PROPOSED SITE LAYOUT
- EXISTING PERMEABLE AREA 3766m²
- EXISTING IMPERMEABLE AREA 224m²
- PROPOSED IMPERMEABLE AREA 3193m²
- PROPOSED PERMEABLE AREA 734m²

Rev.	Description	Date	Chkd
P3	REVISED TO LATEST SITE LAYOUT	09/10/23 GM	FG
P2	REVISED TO LATEST SITE LAYOUT	10/08/23 GM	FG
P1	PRELIMINARY ISSUE	23/02/23 GM	FG

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www.glanvillegroup.com

Client : McDonald's RESTAURANT

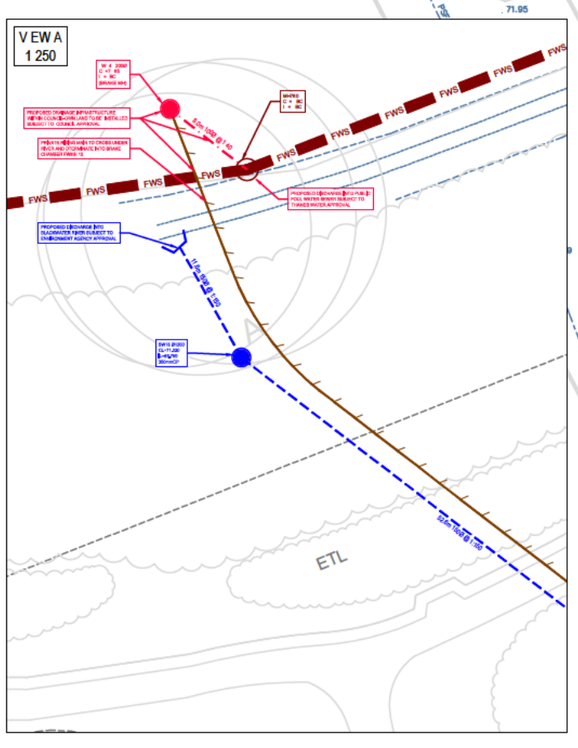
Project : McDONALD'S RESTAURANT
TONGHAM SERVICES, A31
FARNHAM GU10 1FP (NB8251)

Title : PROPOSED PERMEABLE AND IMPERMEABLE AREAS

Project Engineer :	FG	Scale :	1:250 @ A1
Project Director :	HBG	Date :	Feb' 2023
Status :	PRELIMINARY		

Drawing No. 4220349-SK05 Rev P3

SEE V EW A FOR CONTINUATION



McDonalds Restaurant NG100

PLAY SPACE ECO-DD

DRIVE THRU

PFS Kiosk
FUELLING STATION

PFS Pumps

ENSURE ALL TOILET RUN INLETS ARE STRAIGHT THROUGH OR AT 45 DEGREES DO NOT USE THE 90 DEGREE INLETS AND INSTALL BLANKING FLANGES ON ALL UNUSED INLETS

NOTES

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KEY

- SITE BOUNDARY
- EXISTING SURVEY
- PROPOSED SITE LAYOUT
- SW Ø1200 CL=106.57 IL=104.70 300mmCP — DRAINAGE LABEL CP=CATCHPIT
- PROPOSED GULLEY WITH 150ø PIPE
- 15m-150Ø 1:80 — PROPOSED SURFACE WATER DRAINAGE PIPEWORK SHOWING LENGTH, PIPE DIAMETER AND GRADE
- PROPOSED BUILDING SURFACE WATER CATCHPIT CHAMBER 300mm SUMP
- RWP — PROPOSED 100ø RAINWATER DOWN PIPE INVERT LEVEL 500mm BELOW PROPOSED EXTERNAL LEVEL WITH RODDING ACCESS
- ACO MONODRAIN DRAINAGE CHANNEL (BLACK) PD100 10.1
- SPEL ESR TREATMENT UNIT WITH HARD WIRE TO MANAGER'S OFFICE
- 15m-150Ø 1:80 — PROPOSED FOUL WATER DRAINAGE PIPEWORK SHOWING LENGTH, PIPE DIAMETER AND GRADE
- PROPOSED BUILDING FOUL WATER DRAINAGE INSPECTION CHAMBER
- 15m-150Ø 1:80 — PROPOSED GREASE WATER DRAINAGE PIPEWORK SHOWING LENGTH, PIPE DIAMETER AND GRADE
- PROPOSED BUILDING GREASE WATER DRAINAGE INSPECTION CHAMBER
- ALARMED 2000l SPEL GREASE TRAP WITH HARD WIRE TO MANAGERS OFFICE
- POLYTRAP GTI 150L GREASE TRAP
- 110ø DUCTS FOR GREASE TRAP/ CABLES TO INCOMING ELECTRICS CUPBOARD
- IMPERMEABLY LINED HEAVY DUTY CELLULAR TANK
- FOUL RISING MAIN
- FOUL PUMPING CHAMBER
- HYDROBRAKE FLOW CONTROL (2.0 L/sec)
- EXISTING THAMES WATER FOUL SEWER

Rev.	Description	Date	Chkd
P3	REVISED TO LATEST SITE LAYOUT	09/10/23 GM	FG
P2	REVISED TO LATEST SITE LAYOUT	09/08/23 DMH	FG

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Client : McDonald's RESTAURANT

Project : McDONALD'S RESTAURANT
TONGHAM SERVICES, A31
FARNHAM GU10 1FP (NB8251)

Title : PROPOSED DRAINAGE

Project Engineer :	FG	Scale :	1:200 @ A1
Project Director :	HBG	Date :	Nov' 2022
Status :	PRELIMINARY		

Drawing No. 4220349-1200 Rev P3

McDonald's
Restaurant
NG100

FUELLING STATION

COFFEE SHOP

BIN STORE

POND

DRIVE THRU

DRIVE THRU

PLAY SPACE EQ5-00

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KEY

SITE BOUNDARY

EXISTING SURVEY

OVERLAND FLOW DIRECTION

PROPOSED LEVELS

Rev.	Description	Date	Chkd
P3	REVISED TO LATEST SITE LAYOUT	09/10/23 GM	FG
P2	REVISED TO LATEST SITE LAYOUT	10/08/23 GM	FG
P1	PRELIMINARY ISSUE	23/02/23 GM	FG

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www.glanvillegroup.com

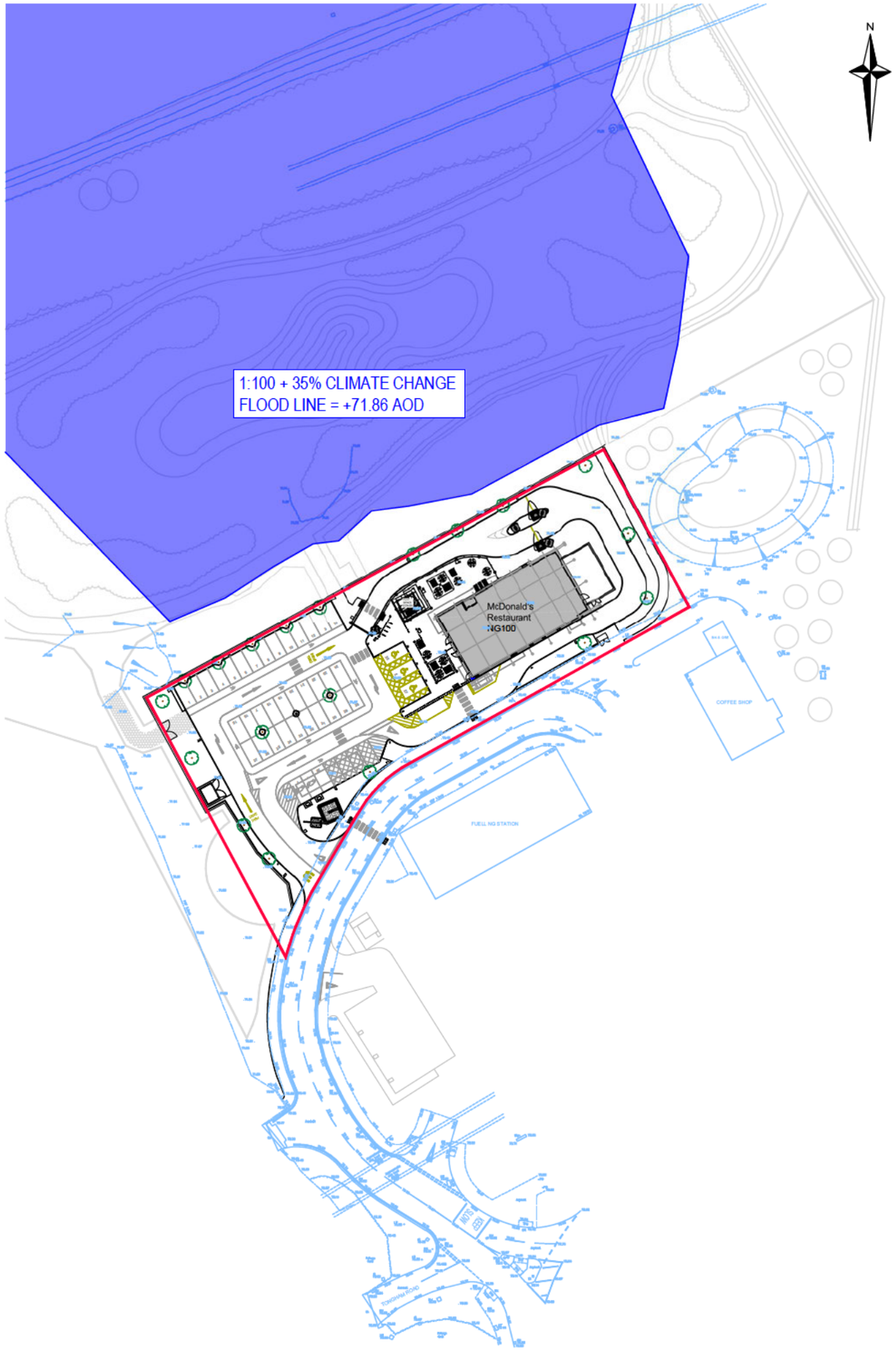
Client : McDonald's RESTAURANT

Project : McDONALD'S RESTAURANT
TONGHAM SERVICES, A31
FARNHAM GU10 1FP (NB8251)

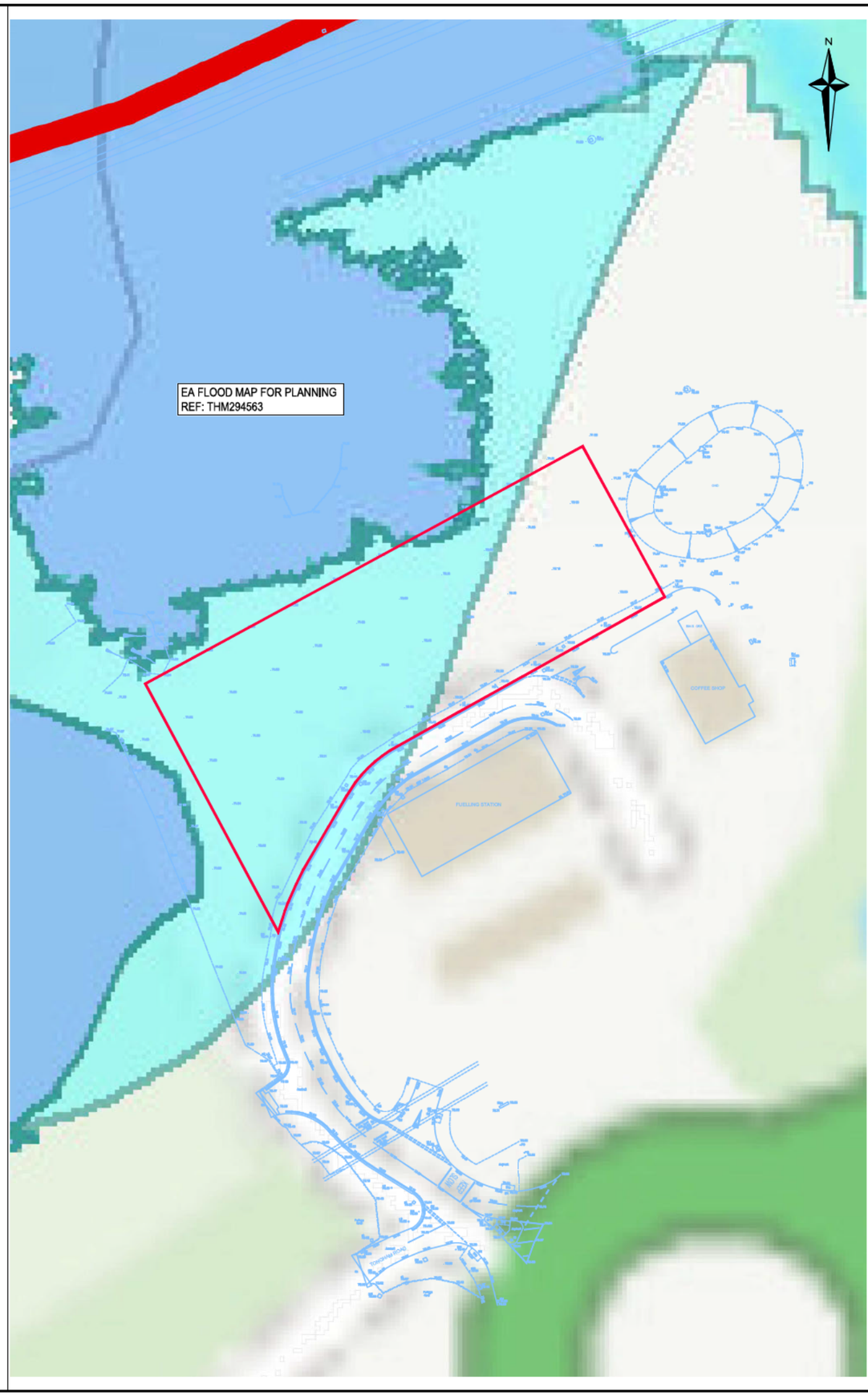
Title : PROPOSED LEVELS AND
OVERLAND FLOW ROUTES

Project Engineer :	FG	Scale :	1:200 @ A1
Project Director :	HBG	Date :	Feb' 2023
Status :	PRELIMINARY		

Drawing No. 4220349-SK06 Rev. P3



FLOOD LINE DRAWN ON TOPOGRAPHICAL SURVEY



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KEY

- SITE BOUNDARY
- EXISTING SURVEY
- PROPOSED SITE LAYOUT
- FLOOD ZONE 2
- FLOOD ZONE 1

Rev.	Description	Date	Chkd
P1	REVISED TO LATEST SITE LAYOUT	09/10/23 GM	FG
I2	REVISED TO LATEST SITE LAYOUT	10/08/23 GM	FG
I1	INFORMATION ISSUE	24/02/23 FC	FG

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Client : McDonald's RESTAURANT

Project : McDONALD'S RESTAURANT FARNHAM

Title : FLOOD PLAN EXTENTS

Project Engineer :	FG	Scale :	NTS
Project Director :	HBG	Date :	FEB 2023
Status :	INFORMATION		

Drawing No. 4220349-SK20 Rev P1

Appendices

Appendix A:
Geotechnical Investigation

Southern Testing
Environmental & Geotechnical

ST Consult
Environmental & Geotechnical

Site Investigation & Risk Assessment Report

Project Name: Tongham Services

Location: Farnham, GU10 1FP

Client: McDonald's Restaurants Ltd. co.
Glanville Consultants Ltd.

Project ID: J15226-SI

Report Date: 09 November 2022

Report Issue: 1

SUMMARY

The site comprises an area of shrubland to the north of Tongham Services. It is proposed to redevelop the site with a new McDonalds, together with associated car parking and a drive-thru lane.

Geological records indicate the site to be underlain by superficial River Terrace Deposits over the Lambeth Group over Lewes Nodular Chalk. The site is also mapped within an area of 'worked ground'. The land immediately adjacent to the northern boundary is also mapped as Made Ground and superficial Alluvial deposits.

A single phase of intrusive investigation, comprising trial pits and cable percussive boreholes, was carried out. All areas of the site were accessible during the fieldwork.

The soils encountered comprised a covering of Made Ground (up to a depth of 2.4m) over River Terrace Deposits (clay, silt, sand and gravel) over Lewes Nodular Chalk. A summary is given below.

Groundwater seepages were encountered around 3.5-4.0m within the trial pits. A water strike was noted at 4.5m in BH2. During return monitoring visits, standing groundwater levels have been recorded between 3.61m to 4.0mbgl.

For conventional foundations (if utilised) an allowable bearing capacity of 110kPa is recommended. NHBC Low Volume Change Potential precautions will apply. Given the depth of Made Ground encountered in the vicinity of the proposed building (up to 2.4m), a piled foundation solution may be more appropriate for the site. Preliminary estimated CFA pile capacities are provided.

The sulphate content of the fill and natural soil was found to fall within Class DS-1. The ACEC classification for the site is AC-1.

Significant inflows of groundwater into excavations would not be anticipated within the upper 3.5m, however seepage of groundwater into excavations should be anticipated; these should be managed with simple pumping methods.

Suspended ground floor slabs are advised.

Detailed information on the proposed development, such as detailed final layout, loadings and serviceability limits was not provided. Accordingly, where geotechnical design advice is provided it is on the prescriptive basis allowed for by Eurocode 7: employing conventional and conservative design rules.

Apart from slightly elevated concentrations of carbon dioxide, no relevant pollutant linkages, for which remedial action will be required, have been identified in the revised conceptual model.

Slightly elevated carbon dioxide concentrations were measured in BH2 during two of the three monitoring visits. Based on the results to date some gas protection measures, in accordance with Characteristic Situation 2 would be required. However, a further three monitoring visits should be carried out (in line with CIRIA guidance) to confirm a final site characterisation and gas screening value.

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

As with any site, areas of contamination not identified during investigation works may come to light during the course of redevelopment. Accordingly, a discovery strategy must be in place during the redevelopment to ensure that any hitherto unknown contamination is identified and dealt with in an appropriate manner. Depending on the nature of any such contamination, it may prove necessary to reassess the remedial strategy for the site. The presence of contamination may affect the classification of waste soils, or the potential for their re-use.

A formal remediation strategy and verification plan should be agreed with the regulatory authorities prior to commencement of any remedial works (if required).

The investigation was conducted and this report has been prepared for the sole internal use and reliance of Clanville Consultants Limited and their appointed Engineers. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The findings and opinions conveyed via this investigation report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd. believes are reliable. Nevertheless, Southern Testing Laboratories Ltd. cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

Author	V Francis BSc MSc FGS	
Check / Review	C Lennard BEng (Hons)	

For and on behalf of Southern Testing Laboratories Limited

DOCUMENT HISTORY AND STATUS

Issue No.	Date	Purpose or Status	Author	Check / Review
1	09/11/2022	First Issue	VF	CL

TABLE OF CONTENTS

TABLE OF APPENDICES

A INTRODUCTION

1 Authority

Our authority for carrying out this work is contained in a completed Southern Testing project order form signed by Mr D Hart on behalf of Glanville Consultants Limited, dated 21st July 2022, in relation to our quotation STL ref. Q220918, dated 12th July 2022.

2 Location

The site is an open parcel of land to the north of Tongham Service Station, located at the junction of A31 and A331 (as indicated on Figure 1 within Appendix A). The approximate National Grid Reference of the site is SU 87872 48595.

3 Proposed Construction

It is proposed to construct a new McDonalds, together with associated car parking and a drive-thru lane.

In the absence of an applicable generic land use, for the purposes of the contamination risk assessment in relation to the proposed development, a combined Public Open Space (Park) and Commercial/Industrial classification has been used CLEA Model [1] / C4SL Report [2].

The gas sensitivity of the proposed development is rated as Low CIRIA C665 Ref [3]

4 Object

Further to our Phase I Desk Study Report (ref. J15186), undertaken in June 2022, this is a Phase II geotechnical and contamination (risk estimation and evaluation) investigation (Tier 1).

The object of the investigation was to assess foundation bearing conditions and other soil parameters relevant to the proposed development, and to assess the likely nature and extent of soil, groundwater and soil gas contamination on the site.

5 Scope

This report presents our exploratory hole logs, test results and our interpretation of these data.

A UXO risk assessment was not requested within our brief for the investigation.

As with any site there may be differences in soil conditions between exploratory hole positions.

This report is not an engineering design and the figures and calculations contained in the report should be used by the Engineer, taking note that variations will apply, according to variations in design loading, in techniques used, and in site conditions. Our figures therefore should not supersede the Engineer's design.

The ground/site investigation has been completed with reference to BS 5930 Ref [4] and BS 10175 Ref [5].

Waste Classification of soils has not been included within the brief for the investigation.

The findings and opinions conveyed via this investigation report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd. believes are reliable. Nevertheless, Southern Testing Laboratories Ltd. cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

The investigation was conducted and this report has been prepared for the sole internal use and reliance of McDonald's Restaurants Ltd. and their appointed Engineers. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The recommendations contained in this report may not be appropriate to alternative development schemes.

Detailed information on the proposed development, such as detailed final layout, loadings and serviceability limits was not provided. Accordingly, where geotechnical design advice is provided it is on the prescriptive basis allowed for by Eurocode 7: employing conventional and conservative design rules.

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

B BACKGROUND INFORMATION

6 Desk Study

A desk study was carried out by Southern Testing Laboratories Limited in June 2022 (report ref. J15186) and indicates that the was part of field, which remain generally unchanged until around 1999 where from aerial imagery the ground appears to have been worked; potentially used as part of the adjacent quarry site. Between 2000 and 2018 the site becomes grassed/vegetated, before the ground being reworked again during the construction of Tongham Services around 2019/2020.

This report concluded that considering the site is to be predominantly hard covered, with buildings, parking and roadways, the overall risk to the proposed end users from on-site and off-site contamination associated with both historical and current land uses is considered negligible, as the Source-Pathway-Receptor pollutant linkage is broken by the permanent hard barrier. However, there would be considered a very low to low risk to site workers during the development works and for any soft-landscaped areas, if proposed as part of the site development proposals.

In addition a very low to low risk of ground gases has been identified due to potential made ground and infilled drainage ditch, as well as an historic landfill, identified within the near vicinity of the site.

The reader is referred to our Desk Study Report (J15186) for more detail. The following is given for reference.

7 Geology

The British Geological Survey Map No. 285 (Guildford) indicates that the site geology consists of superficial River Terrace Deposits over the Lambeth Group over Lewes Nodular Chalk. The site is also mapped within an area of ‘worked ground’. The land immediately adjacent to the northern boundary is also mapped as Made Ground and superficial Alluvial deposits, therefore, these have been included below.

7.1.1 Made Ground

"Fill" and "made ground" are terms which are used interchangeably to describe material which has been placed by man. It may have been placed in a controlled or uncontrolled manner and, if the latter term applies, then very great variations in material type, depth and density are likely to occur.

7.1.2 River Terrace Deposits

Terrace Gravels are sheets of irregular and sub-rounded gravel and sand, laid down as terraces alongside rivers. Lenses of silt, clay or peat may also be present. Their composition reflects the geology of the river catchment area.

Terrace Gravels were commonly worked in the past, often on a piecemeal basis in ‘borrow pits’ as well as larger mineral workings. Old pits may have been infilled with poor quality or waste materials, and can contain contamination.

7.1.3 Alluvium

Alluvium is a geologically recent deposit found in association with watercourses. It is typically soft to firm normally consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. A stronger, desiccated surface zone may be present.

Running sand or silt may be encountered. Excavations are often unstable. Bottom heave may be encountered in clayey soils below 3m.

It is inherently variable and rapid lateral transitions in soil type should be anticipated.

7.1.4 Lambeth Group

The Lambeth Group comprises a vertically and laterally very variable sequence of multicoloured and mottled clays and sands. The sands are greenish yellow or brown, and generally alternate with the multicoloured mottled clays and sometimes bands of lignite. Pebble Beds, locally cemented into conglomerate, and some bands of concretionary ironstone may also be present. Shells are frequently found in the clays and are sometimes locally cemented into a limestone bed that may form an obstruction to pile borings. At the base of the formation there can be layer of greenish sands with flint pebbles where they rest directly above the Thanet Beds.

Clays within this group are known to contain pyrite.

7.1.5 Lewes Nodular Chalk Formation

The Lewes Nodular Chalk Formation is characterised by bands of orange-stained, hard, medium to very high density chalk interbedded with soft greyer low density chalk. There are some well-developed hardgrounds noted such as the Top Rock and Chalk Rock. A number of persistent marl and flint horizons are included within this formation. Fracturing is variable, although commonly steeply inclined and curvilinear in nature. Horizons of sub-horizontal sheet flints are also present.

The White Chalk outcrop in particular is frequently highly fractured and highly permeable, and usually has good infiltration characteristics. On the other hand, Chalk Head, highly weathered Chalk and Chalk under a low permeability superficial cover may have very poor infiltration characteristics.

Chalk is slightly soluble in water and, while it has excellent bearing properties when unweathered, this solubility can lead to deep weathering and softening, and the upper layers of chalk often have an irregular boundary with overlying strata.

The Chalk may be softened by solutioning to a depth of 5 to 15 metres and bearing capacities and engineering properties generally improve with depth. Where there is an outcrop of impermeable soil overlying the chalk there may be a dramatically increased solution effect due to concentrated surface water flow to the Chalk close to the outcrop boundary.

Solution features are common in the Chalk, and these can present significant difficulties to development on affected sites. Some risk of structural damage due to solution features must be accepted when developing sites on Chalk even where intensive site investigation work has been carried out.

Man has also worked the chalk for flints, and for other purposes, for thousands of years and any signs of old workings should be carefully investigated.

8 Site Description

A detailed site description is provided within the walkover survey section of our Desk Study Report, but in general the site comprises an area of shrubland to the north of Tongham Services. The site is currently vacant with rough grassland and paths/dirt tracks around the periphery.

The south of the site is bounded by the entrance road to the service station and the east is bounded by a pond. There are no distinct northern and western boundaries as the site just extends into further shrubland.

C GROUND INVESTIGATION

9 Strategy and Method

The strategy adopted for the intrusive investigation comprised the following:

Activity / Method	Purpose	Max Depth Range (bgl)	Notes
BH1-BH3 (Cable Percussive)	Boreholes to investigate the deeper ground conditions within external areas. To allow SPT's and collection of samples for geotechnical and contamination testing. Installation of shallow land gas and groundwater monitoring wells.	20.0m	50mm gas / groundwater monitoring wells installed within all boreholes.
TP01-TP08 (JCB 3CX)	Trial pit to investigate the shallow ground conditions and collection of samples for geotechnical and contamination testing.	3.0m	Backfilled with arisings.
CBR1-CBR6 (DCP CBRs)	In-situ DCP CBR tests along proposed drive-thru and parking areas.	1.0m	

Exploratory hole locations are shown in Figure 2 in Appendix A.

In-situ test and sampling methods descriptions employed are given in Appendix B together with the test results.

10 Weather Conditions

The trial pitting was carried out on 2nd August 2022, at which time the weather was generally sunny and dry.

The subsequent cable percussive boreholes were carried out between 30th August and 5th September 2022, at which time the weather was generally overcast but dry.

From Met Office data, the rainfall in the south of England was approximately 70% the normal average for June, 10% the normal average for July and 50% the normal average for August.

11 Soils as Found

The soils encountered are described in detail in the attached exploratory hole logs (Appendix A), but in general comprised a covering of Made Ground over River Terrace Deposits (clay, silt, sand and gravel) over Lewes Nodular Chalk. A summary is given below.

Depth (m)	Thickness (m)	Soil Type	Description
GL to 0.3/2.4m	0.3m to 2.4m	Made Ground	Variable; dark greyish brown, sandy gravelly CLAY, clayey gravelly SAND or sandy GRAVEL. Gravel consist of fine to coarse flint and anthropogenic materials including brick, concrete and clinker.
0.3/2.4m to 2.6/7.5	2.2m to 5.1m	River Terrace Deposits	Firm greyish brown, sandy gravelly CLAY. Gravel consist of fine to coarse subangular to subrounded flint and chalk. Medium dense, light brown/orangish brown, clayey gravelly fine to coarse SAND. A 200-300mm band of pale grey slightly clayey to clayey organic SILT was noted in TP03, TP04, TP05 and TP06 at around 2.0-2.4m depth.
2.6/7.5m to 3.5+/9.7m	0.1m+ to 5.5m		Loose to medium dense, orangish brown, very sandy GRAVEL of fine to coarse subangular to subrounded flint.

Depth (m)	Thickness (m)	Soil Type	Description
7.8/9.7m to 16.5/20m+	7.8m to 12.2m+	Lewes Nodular Chalk Formation	CHALK composed of silty fine to coarse subangular to subrounded GRAVEL/COBBLES. Gravel is off-white. Occasional fine to coarse subangular flint.
16.5m/17.5m to 20m+ (BH1 & BH3 only)	2.5m+ to 3.5m+		CHALK composed of light greyish white with occasional orange patches, gravelly SILT. Gravel is fine to coarse, off-white. Occasional fine to coarse subangular flint.

The soils found are generally in accordance with those anticipated.

11.1 Visual and Olfactory Evidence of Contamination

No visual or olfactory evidence of significant contamination was identified during the ground investigation works. Made ground was, however, encountered within all of the trial holes undertaken and contained anthropogenic materials including brick, concrete, tile, clinker, plastic and wood. Such soils can sometimes contain elevated concentrations of some contaminants including heavy metals, asbestos, Polyaromatic Hydrocarbons (PAHs) and oil/fuel hydrocarbons etc.

12 Groundwater Observations

During the ground investigation groundwater was observed in the exploratory holes as tabulated below. Monitoring wells have been installed in BH1, BH2 and BH3, with the water levels measured during our monitoring visits included in Section 15.

Hole ID	Water Strike Depth (m)	Comment	Stratum
TP01	-	No groundwater encountered (to 1.5m).	n/a
TP02	-	Seepage at base of trial pit (3.5m) on completion.	River Terrace Deposits
TP03	-	Seepage at base of trial pit (3.9m) on completion.	River Terrace Deposits
TP04	-	Seepage at base of trial pit (4.0m) on completion.	River Terrace Deposits
TP05	-	Seepage at base of trial pit (4.0m) on completion.	River Terrace Deposits
TP06	-	Seepage at base of trial pit (4.0m) on completion.	River Terrace Deposits
TP07	-	No groundwater encountered (to 1.7m).	River Terrace Deposits
TP08	-	No groundwater encountered (to 1.5m).	River Terrace Deposits
BH1	-	End of shift 30/08/2022 borehole at 9m, casing to 9m, water at 4.3m. Start of shift 31/09/2022 water at 3.4m. End of shift 31/08/2022 borehole at 20m, casing at 19.5m, water at 6.4m.	River Terrace Deposits
BH2	4.5m	Water strike recorded at 4.5m. Rose to 3.7m in 20 minutes. End of shift 01/09/2022 borehole at 16.5m, casing at 16.5m, water at 6.8m. Start of shift 02/09/2022 water at 4.3m. End of shift 02/09/2022 borehole at 20m, casing at 19.5m, water at 5.4m.	River Terrace Deposits

Hole ID	Water Strike Depth (m)	Comment	Stratum
BH3	-	End of shift 02/09/2022 borehole at 9.0m, casing at 9.0m, water at 3.8m. Start of shift 05/09/2022 water at 4.6m. End of shift 05/09/2022 borehole at 20m, casing at 19.5m, water at 6.3m.	River Terrace Deposits

D DISCUSSION OF GEOTECHNICAL TEST RESULTS AND RECOMMENDATIONS

13 Geotechnical Laboratory Tests

The following geotechnical laboratory testing was carried out on selected samples in order to aid material classification and characterise soil properties. The test method references and results are given in Appendix C.

Laboratory Test	Number of Samples Tested	Stratum
Moisture Content	10	River Terrace Deposits
Atterberg Limit	10	River Terrace Deposits
Particle Size Distribution (Wet Sieve)	12	River Terrace Deposits
Saturation Moisture Content (Chalk)	7	Lewes Nodular Chalk
BRE SD1 Suite	2 11 4	Made Ground River Terrace Deposits Lewes Nodular Chalk

14 Soil Classification and Properties

14.1 Made Ground

Made ground was encountered to depths of between 0.3m to 2.4m(bgl) within all of the trial holes undertaken during this investigation.

The made ground materials were variable, comprising sandy gravelly clays, clayey gravelly sands and sandy gravels. These contained various anthropogenic materials, including brick, concrete, tile, clinker, plastic and wood.

The made ground should be anticipated to be very variable in both composition and thickness across the site and potentially having a high compressibility.

14.2 River Terrace Gravels

These deposits were seen to be variable, with soils ranging from sandy gravelly clays to sandy gravels, not untypical of fluvial deposits. The distribution of individual soil types across the site is not predictable and rapid changes in soil type should be anticipated both vertically and laterally.

The clay materials were found to be firm in nature with two SPT N values of 6. Unconfined compressive strength values, measured using a hand penetrometer on disturbed samples of clay, varied from 140-360kPa, which is the equivalent to undrained shear strength values of approximately 70-160kPa.

Ten Atterberg test was undertaken within clay materials which indicated a clay of low plasticity, with Liquid Limits of 25-34%, Plastic Limits of 12-16% and modified Plasticity Indices of 3-19%, indicating a negligible to low volume change potential.

Within TP03, TP04, TP05 and TP06, a 200-300mm band of pale grey slightly clayey to clayey organic SILT was noted at depths of 2.0-2.4m.

The sand and gravel materials were found to be loose to medium dense in nature with SPT N values of N=7-40. Although an SPT N value of N=3 was recorded at 4.5m in borehole BH1. In addition, during the trial pitting, limited Perth Penetrometer measurements were carried out on the shallow clayey gravelly sand, indicating N values of 11-23.

The samples of sand and gravel materials tested had the following range of particle size distribution results.

Hole ID / Depth (m)	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Cobbles (%)
TP02 0.6m	22		24	24	0
TP04 1.5m	18		62	20	0
TP03 1.5m	26		58	16	0
TP05 2.0m	24		60	16	0
BH3 3.0m	16		78	5	0
BH2 3.0m	3		24	73	0
TP02 3.1m	7		21	73	0
TP05 3.8m	8		32	60	0
BH1 4.0m	1		42	56	0
BH2 6.0m	0		6	94	0
BH3 6.0m	6		70	23	0
BH1 7.0m	1		28	71	0

Seven of the gravel samples tested had very low fines content and are likely to be fairly free-draining. Other more clayey materials will have substantially lower permeability values.

The more cohesive soils within the terrace deposits are likely to have high to medium compressibility characteristics, the dense sandy gravels will have low compressibility.

14.3 Lewes Nodular Chalk

The Lewes Nodular Chalk soils at the site were generally recovered as an off-white clayey silty medium and coarse gravel. Gravel is off-white chalk and occasional fine to coarse subangular flint. In boreholes BH1 and BH3 the chalk was recovered as a clayey gravelly SILT.

Seven saturation moisture content tests were carried out on intact fragments of chalk. CIRIA C574 Engineering Chalk provides density scales for chalk based on its intact dry density (based on Mortimore et al. 1990 and Mathews et al, 1993). This indicates a classification of medium density chalk gravel with intact dry densities in the range of 1.60-1.70 Mg/m^3 and saturation moisture contents of 22-25%.

SPT N values in the chalk were generally in the range of 5 to 33, generally increasing with depth.

It should be noted that the cable percussive drilling technique can destroy most of the structure of the chalk. Any chalk recovered may be unrepresentatively stronger than the whole chalk mass. It is not usually possible to classify chalk or log in any particular detail solely with this technique.

15 Groundwater Levels

Monitoring wells were installed within the three deep boreholes. The sanding water levels from the 3 No. groundwater monitoring visits, undertaken to date, are summarised in the table below.

Hole ID	Standing Groundwater Level (bgl)		
	20th September 2022	5th October 2022	21st October 2022
BH1	3.70m	3.61m	3.71m
BH2	3.84m	3.74m	3.84m
BH3	3.68m	3.88m	4.00m

Groundwater levels vary considerably from season to season and year to year, often rising close to the ground surface in wet or winter weather, and falling in periods of drought. Long-term monitoring from boreholes or standpipes is required to assess the ground water regime.

Based on the observations to date, allowance should be made for seepages within the River Terrace Deposits. Where seepages are encountered the soils will soften rapidly.

It is envisaged that seepages above the water table could be controlled within excavations by locally pumping from sumps.

16 Swelling and Shrinkage

Shrinkable soils are subject to changes in volume as their moisture content is altered. Soil moisture contents vary from season to season and can be influenced by a number of factors including the action of roots. The resulting shrinkage or swelling of the soil can cause subsidence or heave damage to foundations, the structures they support and services.

The designer should be aware that precautions regarding swelling and shrinkage are applicable, and in this respect NHBC precautions provide a helpful guide with respect to minimum foundation depths and deepening particularly within the zone of influence of vegetation.

Assessment of foundation depths should take into account trees, hedgerow and shrubs which are to be removed, are to remain or are proposed in any planting scheme; and which may be allowed to reach maturity.

We would recommend that on balance a NHBC LOW Volume Change Potential site classification be adopted for design purposes covering clay materials within the River Terrace Deposits.

Full details of protective measures are given in NHBC Standards Ref [6], Chapter 4.2 to which the reader is referred.

17 Lateral Pressure & Heave

Where foundations are more than 1.5m deep, and are within the zone of influence of existing or removed trees, then precautions will also need to be taken against the effects of lateral swelling of soils beneath house units due to removal of trees, or cutting tree roots.

A helpful guide with respect to requirements for the relief of lateral pressure is set out in the NHBC Standards Ref [6], Chapter 4.2 to which the reader is referred. The basic requirement is that compressible material or void former should be installed on the inner face of external foundation walls. With piled foundations additional voids are required below ring beams.

18 Soakaways

Whilst soakage testing was outside the scope of this investigation, soakaways are not recommended for this site due to the presence relatively shallow groundwater, together with the significant depth of Made Ground present and cohesive shallow soils.

In Made Ground there is a significant risk of inundation collapse of these materials if water was to be concentrated into the ground (i.e. should soakaways be used). Therefore, it is recommended that all surface water drainage is disposed of off-site, utilising the existing drainage system (if present and suitable).

19 Sulphates and Acidity

Chemical analysis of the underlying soils has been undertaken to establish the aggressive chemical environment for concrete in accordance with the BRE Special Digest 1, Ref [7]. The site category determined is that of a natural ground location except those containing pyrites (or potential pyrites), as the underlying soils form part of the River Terrace Deposits and Lewes Nodular Chalk.

Source	pH	Water Soluble Sulphate SO4 mg/l
Made Ground (2 samples)	7.4 & 7.9	3.9 & 7.5
Kempton Park Gravels (11 samples)	7.4 – 9.0	3.2 – 11.6
Lewes Nodular Chalk (4 samples)	8.8 - 9.0	8.4 - 8.6

Given the sample numbers tested the characteristic value for sulphate concentration has been determined from the mean of highest 20% of measured concentrations. The Design Sulphate Class is DS-1. Groundwater should be assumed to be mobile. The ACEC site classification is AC-1.

Potential sulphates were also assessed for the five samples tested, in accordance with the guidance within BRE SD1. The highest value calculated for total potential sulphates does not change the above classification.

20 Foundation and Bearing Capacity

All loadings for strip/pad foundations (if proposed) should be transferred beneath any fill or made ground, topsoil, soft or disturbed soils and be placed within the underlying natural soils. Based on the results of this investigation, an allowable bearing capacity of 110kN/m^2 could be adopted for foundations set on these soils.

However, within the vicinity of the proposed building, Made Ground was encountered to 1.4-1.5m depth in TP04 and TP05, and to 2.4m depth in BH3. Based on this a piled foundation solution may be most appropriate for this site. See section 21 below.

Strip or trench-fill foundations should be kept at a maximum width of 1.2m or less, and pads to a maximum plan dimension of 3.0m in order to help keep settlements tolerable. Detailed settlement analysis would be required for any foundations beyond these sizes.

Due to the variability of the River Terrace Deposits, allowance should be made for nominal mesh reinforcement in all shallow foundations to cater for differential movement where they span differing materials.

A minimum foundation depth of 750mm is anticipated for NHBC Low Volume Change Potential soils. However, the designer should be aware that precautions regarding swelling and shrinkage are applicable and in this respect NHBC precautions provide a helpful guide with respect to minimum foundation depths and deepening particularly within the zone of influence of trees hedgerows or shrubs; existing, proposed or removed.

Subject to the Engineers final design excessive foundation deepening may be required. Based on NHBC guidance, foundations below 2.5m must be designed individually by an engineer on an individual property basis taking into account soil desiccation, heave, lateral pressure, trench stability and workmanship. At depths in excess of 2.5m a piled foundation is usually the most appropriate foundation option.

Given the inherent variability of soil conditions, it is recommended that inspections for shallow foundations (if utilised) be undertaken during construction by a suitably qualified engineer to confirm that the recommendations within this report are appropriate to the foundations.

21 Piling

As with any piling scheme, discussions should be held with selected piling contractors to discuss the technical and financial merits of their various systems. With respect to overall resources, the equipment available should be appropriate for the soils described and anticipated and be able to achieve the depths and diameters considered with an appropriate safety margin.

Noting that seepages/inflows were noted and standing water levels were measured, the specialist contractor should take appropriate measures to ensure that his system caters for the ingress of groundwater.

From the viewpoint of pile type and given the close proximity of adjacent structures, a bored pile solution is considered to be a more appropriate pile type. In terms of bored piles and, noting the presence of potentially unstable soils (made ground and sandy gravels), and groundwater, a continuous flight auger grout injected pile (CFA) would be best suited to the ground conditions encountered. Careful monitoring during construction of these pile types is however required.

Piles on this site will derive a majority of their capacity from skin friction, base resistance will provide a much smaller contribution.

For the purpose of providing preliminary estimates of pile capacities, we have assumed the following conservative crude soil model, which is based on the findings of our boreholes.

Depth to base (bgl)	Soil Type
GL – 2.4m	Made Ground – nil skin friction assumed
2.4 – 9.0m	Medium dense sands and gravels – SPT N value of N=6 at 2.4m, increasing to an N value of 15 at 9.0m.
9.0 – 20.0m	Chalk – SPT N value of 5 at 9m, increasing to an N value of N=30 at 20.0m.

A standing water table of 3.5m has been assumed at this stage, based on the groundwater depths monitored.

Based on the above, a series of preliminary estimated CFA pile capacities have been tabulated below, assuming an overall factor of safety of 2.5.

Preliminary Pile Capacities, kN				
Pile length (mbgl)	Pile Diameter			
	300mm	350mm	400mm	450mm
13m	230	285	345	405
14m	265	325	395	465
15m	300	370	445	525

The above noted pile capacities are for individually loaded piles. It is anticipated that the final design will be subject to more detailed calculations and structural analysis; as such our preliminary assumed parameters and calculated values should therefore not supersede the Engineer's or specialist piling Contractors final design.

Whilst the site is not located within a groundwater Source Protection Zone (SPZ), the Lewes Nodular Chalk Formation is classified as a principal aquifer and, therefore, a piling risk assessment may be required by the Environment Agency. Notwithstanding, the chosen piling method should be selected to ensure that a preferential pathway is not created between the made ground soils and the river terrace deposits/chalk at depth.

22 Floor Slabs

Due to the presence of Made Ground to depths of generally greater than 600mm and shallow clay soils, allowance should be made for fully suspended ground floor slabs. However, it is understood that floor slabs for a typical McDonalds building are suspended regardless.

Gas protection measures may also be required within the floor slab (see Section 27.3). However, further monitoring visits are to be carried out and a final site characterisation and gas screening value will be provided, within a separate letter report, upon completion of the land gas monitoring.

23 Excavations and Dewatering

Statutory support will be required in all excavations where personnel must work.

The made ground materials will be prone to instability in open excavations during wet weather or where seepages are encountered. The more cohesive materials will soften rapidly if exposed to moisture or the elements and the granular materials may run and be highly unstable in excavations or boring operations below the water table.

Significant inflows of groundwater into excavations would not be anticipated within the upper 3.5m, however seepage of groundwater into excavations should be anticipated; these should be managed with simple pumping methods.

24 Pavement Construction

Based on the available data, it is anticipated that the formation to proposed pavement areas will comprise the River Terrace Deposits (generally sandy gravelly clays clayey gravelly sands) and/or Made Ground soils.

The results of in-situ DCP CBR testing generally indicated CBR values in the range of 4.8 to 36% at the anticipated formation level of 0.5 to 1.0mbgl. However, it should be noted that in-situ CBR readings can vary significantly depending on a number of factors, including the presence of granular materials and the moisture content of the soil, and this can in turn vary depending on the weather and other site conditions leading up to and during testing. For these reasons it is deemed that the results of in-situ DCP CBR testing alone represent the CBR value only on the day of the test, and under the conditions prevailing at the time, and should not, in isolation, be considered as being equivalent to the Design CBR value.

The results of Atterberg Limit tests on the clay materials indicate modified plasticity indices in the range of 3-19%, with an average value of 10%. On the basis of guidance in the DMRB Ref [8] and assuming a natural sand clay soil, a CBR value of about 2.5-4.0% is estimated for a thin pavement construction for poor construction conditions with a low water table.

Taking these factors into consideration, a preliminary design CBR value of 3% can be assumed for pavement foundation design purposes. However, given that the soils are likely to be disturbed by construction plant during demolition and construction it would be suggested that the CBR value is reassessed as construction progresses. Further sampling and laboratory testing may be necessary to satisfy Local Highway Authority design guidance, in terms of frequency and types of testing, if roads are to be submitted for adoption.

The formation should be considered potentially frost-susceptible.

Given the potential presence of Made ground soils at formation level it is suggested the formation is inspected for soft spots, and that these are removed and filled to a minimum of 500mm and proof-rolled prior to construction. Consideration could be given to the inclusion of a geo-grid within the road/carpark construction to minimise the effects of any differential settlement.

24.1 Pavement Construction – General Guidance

The most important element of any road construction is drainage and attention must be given not only to the drainage of the subsoil but to the various layers of construction. To this end, the formation should be shaped to a camber or crossfall to allow water movement out of the sub-base.

Sub-base and coarse capping materials tend to segregate during placing operations, particularly when end tipped. On soft clay subgrades this can lead to punching and softening of the formation. The use of an appropriate geotextile or geofabric, laid in accordance with manufacturer's recommendations/guidance, should help to minimise this.

The formation should be proof-rolled in a manner appropriate to the subgrade soils, and any soft spots found should be excavated and replaced with compacted granular material. The surface of the formation should then be appropriately compacted, prior to laying the capping layer and/or sub-base.

Construction traffic should be kept off formations and it is often advisable to leave a protective layer of soil above formation level until the last moment before reducing to formation level and placing the capping and/or sub-base.

E DISCUSSION OF GEOENVIRONMENTAL TEST RESULTS AND RECOMMENDATIONS

25 Analytical Framework

There is no single methodology that covers all the various aspects of the assessment of potentially contaminated land and groundwater. Therefore, the analytical framework adopted for this investigation is made up of a number of procedures, which are outlined below. All of these are based on a Risk Assessment methodology centred on the identification and analysis of Source – Pathway – Receptor linkages.

The CLEA model Ref [1], provides a methodology for quantitative assessment of the long-term risks posed to human health by exposure to contaminated soils. Toxicological data is used to calculate a Soil Guideline Value (SGV) for an individual contaminant, based on the proposed site use; these represent minimal risk concentrations and may be used as screening values.

In the absence of any published SGVs for certain substances, Southern Testing have derived or adopted Tier 1 screening values for initial assessment of the soil, based on available current UK guidance including the LQM/CIEH S4UL's Ref [9] and CL:AIRE Soil Generic Assessment Criteria Ref [10]. In addition, in 2014, DEFRA Ref [11] published the results of a research programme to develop screening values to assist decision making under Part 2A of the Environmental Protection Act. Category 4 screening levels were published for 6 substances, with reference to human health risk only. This guidance includes revisions of the CLEA exposure parameters, presenting parameters for public open space land use scenarios, and also of the toxicological approach. The screening levels represent a low risk scenario, based on a 'Low Level of Toxicological Concern' rather than the 'Minimal Risk' of CLEA, and the analytical results of this investigation may be considered relative to these levels.

Site-specific assessments are undertaken wherever possible and/or applicable.

CLEA requires a statistical treatment of the test results to take into account the normal variations in concentration of potential contaminants in the soil and allow comparisons to be made with published guidance.

The results of any groundwater analyses are compared to relevant quality criteria, e.g. Environmental Quality Standards (EQS) or Drinking Water Standards (DWS).

Ground gases are assessed in accordance with the guidance given in CIRIA C665 Ref [3] and BS8485 Ref [12].

The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based upon them. Their validity should be confirmed at the time of site development.

26 Site Investigation – Soils

26.1 Sampling Regime

The number of sample locations was limited and was partly targeted at potential sources of contamination and also intended to provide general coverage.

26.2 Testing

Given the potential for elevated contaminant concentrations within the Made Ground soils encountered (including a possible infilled drain), the following tests were selected to provide general coverage of the site and as an initial assessment of the soils. There was no visual and olfactory evidence of significant contamination in the majority of the trial holes to suggest an alteration was necessary to the analytical strategy, which covered a good range of general contaminants.

Test Suite	Number of Samples	Soil Tested
STL Key Contamination Suite	15	12 No. Made Ground 3 No. Natural Soils
Asbestos Screen	15	12 No. Made Ground 3 No. Natural Soils
TPH Texas Split C6-C40	9	Made Ground
TPH CWG with Ali/Aro Split and BTEX and MTBE	2	Made Ground

The test results are presented in full in Appendix E. A summary and discussion of the significance of the results and identified contamination sources is given below.

26.3 Test Results and Identified Contamination Sources

26.3.1 General Contaminants

The results of the key contaminant tests have been analysed in accordance with the CLEA methodology. The samples have been grouped into two populations comprising made ground and natural soil. For each parameter in each population the sample mean is calculated and compared to a Tier 1 screening value. If the sample mean exceeds the screening value, the soil may be regarded as contaminated and further assessment may be required. If neither the sample mean nor any single value exceeds the screening value, the soil may be regarded as not contaminated, though further confirmatory assessment may be required. Where any single parameter value exceeds the screening value but the sample mean does not, further statistical analysis may be applied to that parameter if the available data is suitable. Such analysis would include an assessment of the Normality of the distribution of the data, consideration of the presence of outliers, and the calculation of a UCL estimate of the mean.

Summary data is presented in the tables below and the laboratory analysis is included in Appendix E. The screening values and source notes are presented in Table 1 "Tier 1 Screening Values" at the front of Appendix E.

In the absence of an applicable generic land use, for the purposes of the contamination risk assessment in relation to the proposed development, a combined Public Open Space (Park) and Commercial/Industrial classification has been used. The screening values for Public Open Space (park) are the lower of these two classifications and therefore have been included in the table below.

Soil Type: Made Ground

(TP01 at 0.3m, TP02 at 0.3m, TP03 at 0.3m, TP04 at 0.2m, TP04 at 0.7m, TP05 at 0.6m, TP06 at 0.5m, TP07 at 0.5m, TP08 at 0.3m, BH1 at 0.3m, BH2 at 0.2m, BH3 at 1.5m)

Contaminants	Units	No of Samples Tested	Range	Sample Mean	Tier 1 Screening Values
Arsenic (As)	mg/kg	12	18-30	24	170
Cadmium (Cd)	mg/kg	12	<0.2	<0.2	190
Trivalent Chromium (CrIII)*	mg/kg	12	27-39	30.9	8600
Hexavalent Chromium (CrVI)	mg/kg	12	<1.8	<1.8	33
Lead (Pb)	mg/kg	12	8.1-15	10.5	1300
Mercury (Hg)	mg/kg	12	<0.3	<0.3	29
Selenium (Se)	mg/kg	12	<1.0	<1.0	1,800
Nickel (Ni)	mg/kg	12	22-36	27.6	980

Contaminants	Units	No of Samples Tested	Range	Sample Mean	Tier 1 Screening Values
Copper (Cu)	mg/kg	12	4.2-12	6.7	44,000
Zinc (Zn)	mg/kg	12	28-45	39.3	170,000
Phenol	mg/kg	12	<1.0	<1.0	440
Benzo(a)pyrene (BaP)	mg/kg	12	<0.05-0.33	0.07	10
Naphthalene	mg/kg	12	<0.05	<0.05	77
Total Cyanide (CN)	mg/kg	12	<1.0	<1.0	/
Acidity (pH values)	pH Units	12	7.4-9.1	8.2	/
Soil Organic Matter	%	12	<0.1-3.4	1.1	/

** Assumed as Total Cr minus CrVI*

Based on the laboratory testing undertaken the Made Ground soils would be considered uncontaminated when compared to Tier 1 screening values used for McDonalds contamination assessments (included in Appendix E). Generally, background concentrations were reported for the samples tested. This concurs with the visual and olfactory evidence.

Soil Type: Natural Soils

(TP01 at 0.75m, TP06 at 0.65m, TP03 at 0.6m)

Contaminants	Units	No of Samples Tested	Range	Sample Mean	Tier 1 Screening Values
Arsenic (As)	mg/kg	3	20-25	22	170
Cadmium (Cd)	mg/kg	3	<0.2	<0.2	190
Trivalent Chromium (CrIII)*	mg/kg	3	26-30	28	8600
Hexavalent Chromium (CrVI)	mg/kg	3	<1.8	<1.8	33
Lead (Pb)	mg/kg	3	8.3-9.4	9.0	1300
Mercury (Hg)	mg/kg	3	<0.3-0.4	0.3	29
Selenium (Se)	mg/kg	3	<1.0	<1.0	1,800
Nickel (Ni)	mg/kg	3	24-26	25.3	980
Copper (Cu)	mg/kg	3	5.3-7.6	6.6	44,000
Zinc (Zn)	mg/kg	3	31-39	34	170,000
Phenol	mg/kg	3	<1.0	<1.0	440
Benzo(a)pyrene (BaP)	mg/kg	3	<0.05	<0.05	10
Naphthalene	mg/kg	3	<0.05	<0.05	77
Total Cyanide (CN)	mg/kg	3	<1.0	<1.0	/
Acidity (pH values)	pH Units	3	8.4-8.6	8.5	/
Soil Organic Matter	%	3	0.5-1.6	0.9	/

** Assumed as Total Cr minus CrVI*

Based on the laboratory testing undertaken the Made Ground soils would be considered uncontaminated when compared to Tier 1 screening values used for McDonalds contamination assessments (included in Appendix E). Generally, background concentrations were reported for the samples tested. This concurs with the visual and olfactory evidence.

26.3.2 Asbestos Containing Materials

Fifteen samples of soil were sent for asbestos screening. No asbestos containing materials were detected in the samples analysed and none were observed in the exploratory holes. However, it should be noted that the exploratory holes are of small size relative to the area investigated. Therefore, the samples obtained may not reflect the full composition of the soils on the site, and there is always the potential for pockets of asbestos or for asbestos containing materials to be present, which have not been detected in the sampling.

26.3.3 Organic Contaminants

The following tables summarise the results of the analysis for petroleum hydrocarbons.

Hydrocarbon Substance or Fraction	Measured Concentrations in mg/kg (µg/kg)								
	TP01 0.3m	TP02 0.3m	TP03 0.3m	TP04 0.7m	TP06 0.5m	TP08 0.5m	BH1 0.3m	BH2 0.2m	BH3 1.5m
C6-C8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C8-C10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
C10-C12	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
C12-C16	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
C16-C21	<10	<10	<10	<10	<10	<10	<10	<10	<10
C21-C40	<10	<10	<10	<10	<10	<10	<10	<10	<10
C6-C40	<10	<10	<10	<10	<10	<10	<10	<10	<10

Hydrocarbon Substance or Fraction	Measured Concentrations in mg/kg (µg/kg)	
	TP01 0.3m	TP05 0.6m
BTEX		
Benzene	<1.0	<1.0
Toluene	<1.0	<1.0
Ethy benzene	<1.0	<1.0
Xylenes	<1.0	<1.0
MTBE	<1.0	<1.0
Aliphatics		
>EC5-EC6	<0.001	<0.001
>EC6-EC8	<0.001	<0.001
>EC8-EC10	<0.001	<0.001
>EC10-EC12	<1.0	<1.0
>EC12-EC16	<2.0	<2.0
>EC16-EC21	<8.0	<8.0
>EC21-EC35	<8.0	<8.0
Aromatics		

Hydrocarbon Substance or Fraction	Measured Concentrations in mg/kg (µg/kg)	
	TP01 0.3m	TP05 0.6m
EC5-EC7 (Benzene)	<0.001	<0.001
>EC7-EC8 (Toluene)	<0.001	<0.001
>EC8-EC10	<0.001	<0.001
>EC10-EC12	<1.0	<1.0
>EC12-EC16	<2.0	<2.0
>EC16-EC21	<10	<10
>EC21-EC35	<10	<10
Hazard Index	<0.003	<0.003

No petroleum hydrocarbon fractions above the limit of detection have been measured within the samples of Made Ground tested. This concurs with the visual and olfactory evidence during the investigation and the site history. Therefore, none of the samples analysed would be considered contaminated with respect to human health.

Petroleum hydrocarbon mixtures are assessed using the Hazard Index approach. The calculated Hazard Index values are less than 1, indicating that the recorded concentrations are within tolerable limits for long term exposure with regards to human health.

27 Site Investigation - Gas

27.1 Gas Sources

The desk study identified potential gas sources in the form of a potentially infilled former drain onsite and infilled ground/made ground, a landfill and possible alluvium in the near vicinity of the site.

These types of sources are characterised as being of Very Low to Low generation potential, Wilson and Haines Ref [13].

Given the strata encountered (sand & gravels) there is a potential pathway for ground gases to migrate onto the subject site.

27.2 Sampling Strategy

The number and spacing of the gas monitoring wells was to provide general coverage for the development, predominantly located in the vicinity of the proposed building.

27.3 Monitoring Programme and Results

The sensitivity of the proposed development is rated as Low. At the time of writing three fortnightly gas monitoring visits have been undertaken, with a further three visits scheduled which will be reported within a separate letter report, upon completion of the land gas monitoring.

The results of the monitoring undertaken to date are given in full in Appendix F and are summarised below.

Borehole Gas Monitoring Results			
Monitoring well	BH1	BH2	BH3
Response zone / Stratum	1m – 9m bgl Terrace Gravel & Chalk	1m to 8m bgl Terrace Gravel & Chalk	1m – 7m bgl Made Ground, Terrace Gravel & Chalk
Evidence of contamination	None	None	None

Borehole Gas Monitoring Results			
No. of Monitoring Events	3	3	3
Methane range CH_4 (%)	0.0	0.0	0.0
Carbon dioxide range CO_2 (%)	0.1 – 1.3	4.7 – **7.5**	0.8 - 2.5
Oxygen range O_2 (%)	18.3 – 20.6	5.5 – 10.1	15.9 - 20.2
Flow rate range l/hr	0.0	0.0	0.0 - 0.3
BH differential pressure range (Pa)	0.0	0.0	0.0 – 1.0
PID measurement (ppm)	0.0 – 0.2	0.2 – 0.5	0.0 – 0.3
Water level (mbgl)	3.61 – 3.71	3.74 – 3.84	3.68 – 4.0
Atmospheric pressure during monitoring (mb)	995 – 1021	994 – 1019	994 - 1020

No methane concentrations above the instrument's detection limit were recorded within any of the boreholes over the three visits undertaken to date.

Similarly, in borehole BH1 and BH3 no carbon dioxide concentrations have been recorded above 5.0%. However, in BH2 the carbon dioxide concentrations were recorded between 4.7 and 7.5%, exceeding 5% on two occasions.

On the second visit only a differential borehole pressure of 1.0Pa and flow rate of 0.3l/hr was recorded in BH3; no differential pressures or flow rates above the instrument's detection limit were recorded within the other two boreholes.

No significant concentration of volatile organic vapours (VOC's) were recorded within the boreholes, with PID measurements recorded as 0.0-0.5ppm. This concurs with the visual and olfactory evidence and the results of the petroleum hydrocarbon testing carried out on selected soils.

Standing water levels were recorded between 3.61m and 4.0mbgl.

However, further monitoring visits are to be carried out and a final site characterisation and gas screening value will be provided, within a separate letter report, upon completion of the land gas monitoring.

27.3.1 Site Characterisation & Gas Screening Values (preliminary)

Based on the results to date, gas screening values together with characteristic situations have been calculated for the measured methane and carbon dioxide concentrations in each borehole. The table below shows the determined characteristic situations.

Borehole	Maximum Peak Concentrations (%)		Max flow (l/hr		Qhg – CH_4 (l/hr)	Qhg – CO_2 (l/hr)	Characteristic Situation – CH_4	Characteristic Situation – CO_2
	CH_4	CO_2	Peak	Steady	CH_4	CO_2		
BH1	<0.1	1.3	<0.1	<0.1	0.0001	0.0013	1	1
BH2	<0.1	7.5	<0.1	<0.1	0.0001	0.0075	1	1
BH3	<0.1	2.5	0.3	0.3	0.0003	0.0075	1	1

On the basis of the measurements in the above table, the site GSV is taken to be 0.0075 l/h, which is the worst case for methane and carbon dioxide. A GSV of 0.0075 l/h indicates a characteristic situation 1 (CS1; GSV <0.07 l/hr). However, as carbon dioxide above 5% was recorded, consideration should be given to increasing the categorisation of the site to the next level (CS2).

Based on the results to date some protective measures, in accordance with Characteristic Situation 2, would be required. However, a further three monitoring visits should be carried out (in line with CIRIA guidance) to confirm a final site characterisation and gas screening value.

28 Summary of Identified Contamination

Based on the site investigation works and laboratory testing undertaken to date, no significant contamination has been identified within the Made Ground or Natural soils across the site.

Slightly elevated levels of carbon dioxide have been measured in BH2 during two of the three monitoring visits.

29 Risk Evaluation

The object of the risk evaluation is to assess the pollution linkages for specific contaminant groups considered in the conceptual model, identify any unacceptable risks and, therefore establish whether there is a need for further investigation and/or remedial action.

The risks are considered in the context of the specific development proposals for the site and, therefore, the conclusions may not be appropriate for alternative schemes.

29.1 Revised Conceptual Model

The preliminary site model has been refined in light of the findings of this investigation and is summarised below.

Metals	Petroleum Hydrocarbons	PAH Compounds	Land Gas	Asbestos	Pathways	Receptors
N	N	N	n/a	N	Ingestion and inhalation of contaminated soil and dust	Human Health
N	N	N	n/a	n/a	Dermal contact with contaminated soil and dust	
n/a	N	N	P	n/a	Inhalation of vapours or gases	
N	N	N	n/a	n/a	Uptake into edible fruit and vegetables	
N	N	N	n/a	n/a	Surface water run-off into surface water features	Water Environment
N	N	N	n/a	n/a	Migration through ground into surface water or groundwater	
N	N	N	n/a	n/a	Off-site migration of contaminated groundwater	
N	N	N	n/a	n/a	Vegetation on site growing in contaminated soil	Flora and Fauna
N	N	N	n/a	n/a	Aquatic life in affected waters	
N	N	N	n/a	n/a	Contact with contaminated soils	Building materials / buried services
n/a	N	N	P	n/a	Fire or explosion	

Key:

Y	Pollutant linkage likely
N	Pollutant linkage not likely
P	Pollutant linkage possible
n/a	Pathway not applicable to contaminant

30 Discussion and Conclusions

On the basis of the investigation and laboratory testing undertaken to date, apart from slightly elevated concentrations of carbon dioxide, no relevant pollutant linkages, for which remedial action will be required, have been identified in the revised conceptual model.

Slightly elevated carbon dioxide concentrations were measured in BH2 during two of the three monitoring visits. Based on the results to date some gas protection measures, in accordance with Characteristic Situation 2 would be required. However, a further three monitoring visits should be carried out (in line with CIRIA guidance) to confirm a final site characterisation and gas screening value.

As with any site, areas of contamination not identified during site investigation works may come to light in the course of redevelopment. Accordingly, a discovery strategy must be in place during the redevelopment to ensure that any hitherto unknown contamination is identified and dealt with in an appropriate manner. Depending on the nature of any such contamination, it may prove necessary to reassess the remedial strategy for the site.

A formal remediation strategy and verification plan should be agreed with the regulatory authorities prior to commencement of any remedial works.

31 General Guidance

Allowance should be made for experienced verification of any remedial works (if required).

It may be that specific local requirements apply to this site, of which we are not aware at this time.

In general terms, the workforce and general public should be protected from contact with contaminated material, if found to be present. There is a range of relevant documents published by the Health and Safety Executive, and organisations such as CIRIA, and the BRE.

31.1 Soil Waste Management

31.1.1 Re-use of Soils

It is anticipated that the arisings from groundworks on this site will comprise Made Ground and River Terrace Deposits.

Clean natural arisings from groundworks may be re-used on site without further testing, where there is a definite use for such materials, e.g. raising levels or construction of landscaping layers or bunds as set out in the approved plans for the development.

Treated contaminated soils may be reused on site under an appropriate Materials Management Plan, where certain criteria are met, in accordance with the CL:AIRE Definition of Waste Code of Practice, Ref [14].

31.1.2 Disposal of Soils

Some soils will require removal from site and disposal to suitably licensed landfills. Different guidelines and charges will apply to different waste classifications. As waste producers, the Developer holds responsibilities under the various governing regulations, particularly the Waste Duty of Care Code of Practice under the Environmental Protection Act 1990, Ref [15].

The chemical analyses appended to this report can be used to inform the initial classification of the soils as either Hazardous or Non-Hazardous, and derive the appropriate EWC code, for offsite disposal or transfer. Two samples of soil (one made ground, one natural) were sent for Waste Acceptance Criteria (WAC) testing, the results can be found in Appendix E. Further WAC testing may be needed for confirmation of the material's classification, and will be required to demonstrate an inert classification.

There are strict requirements in place for the accurate description of wastes using EWC codes and, therefore, it is essential that materials that would be given different descriptions (e.g. blacktop, made ground and natural soils), as well as those with different classifications, are carefully segregated during excavation and storage on site. This will also ensure the most cost effective disposal. Mixing these materials can give rise to significant difficulties in disposal and also substantially increase costs.

Soil arisings may be transferred to other development sites under a Materials Management Plan, where certain criteria are met, in accordance with the CL:AIRE Definition of Waste Code of Practice Ref [14].

All soils leaving site will need to be pre-treated. Waste minimisation by selective excavation is a recognised form of pre-treatment.

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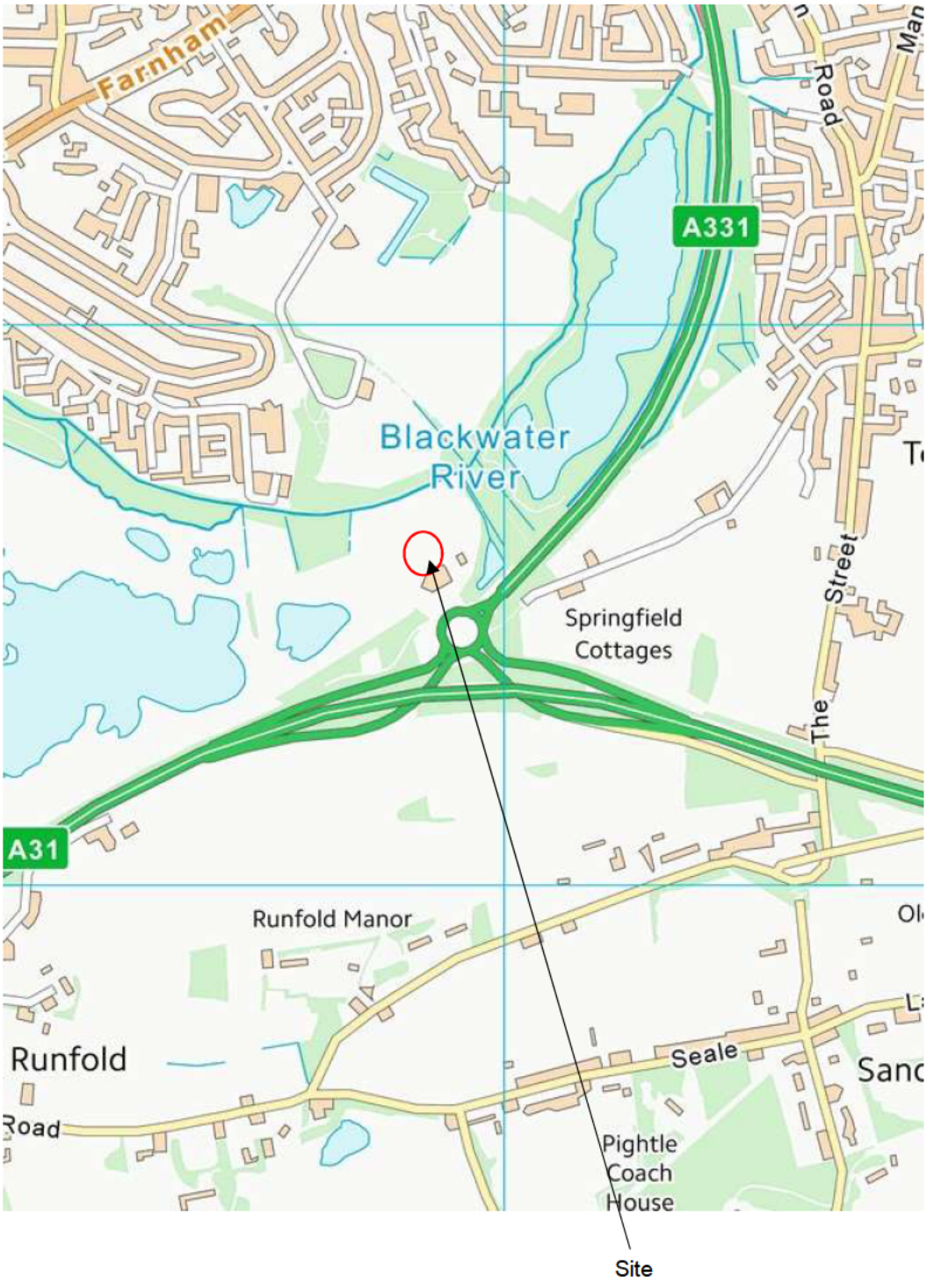
APPENDIX A

Site Plans and Exploratory Hole Logs

A



Site:	Tongham Services, Farnham, GU10 1FP	Project ID	J15226
Figure 1	Site Location Plan	Date:	26/10/2022

NB: Positions of exploratory holes / test positions are only indicative unless dimensioned.

Site:	Tongham Services, Farnham	Project ID	J15226
Figure 2	Site Investigation Layout Plan	Date:	26/10/2022

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Start - End Date	Project ID:	Hole Type:	BH1
30/08/2022 - 31/08/2022	J15226	CP	Sheet 1 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level:	Logger:
				71.80	VF
Location:	Farnham, GU10 1FP	Hand dug to 1 2m Start of shift 30/08/2022 End of shift 30/08/2022 borehole at 9m, casing at 9m, water at 4 3m Start of shift 31/08/2022 water at 3 4m End of shift 31/08/2022 borehole at 20m, casing at 19 5m, water at 6 4m Installed with 50mm gas & groundwater monitoring well with response zone between 1m and 9mbgl Levels are approximate, taken from topographic survey plan provided by Client			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Well	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (mAOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		0.30	ES		71.4	(0.40)		0.40	Stiff, dark brown, silty slightly sandy CLAY with fine to coarse angular to subrounded gravel of flint, brick and chalk. MADE GROUND
		1.00	B ES		71 0	(0.40)		0.80	Firm, mid brown, sandy CLAY with occasional fine to coarse subangular to subrounded flint gravel.
		1.50	SPT(C)	N=6 (1,1/1,1,2,2)					Firm, greenish brown, very sandy gravelly CLAY. Sand is fine to coarse grained. Gravel consists of fine to medium angular to subrounded flint.
		2.00	B			(1.80)			*From 2.0m, sand becoming fine grained.*
		2.50	SPT(C)	N=10 (1,1/1,1,2,6)	69 2			2.60	Medium dense, orangish brown, very sandy fine to coarse subangular to subrounded flint GRAVEL with occasional clayey patches. Sand is fine to coarse grained.
		3.00	B ES						
		3.50	SPT(C)	N=25 (2,2/2,5,8,10)					
		4.00	B						
		4.50	SPT(C)	N=3 (1,1/1,0,1,1)					*At 4.5m, soil very loose.*
		5 00	B			(5.50)			
		6 00	B ES SPT(C)	N=40 (2,3/7,8,11,14)					
		7 00	B						
		7 50	SPT(C)	N=17 (3,4/4,4,4,5)					
		8.10	D		63.7	(0.30)		8.10	Firm, pale orangish brown, sandy slightly gravelly CLAY with occasional chalk. Sand is fine to coarse grained. Gravel consists of fine to medium subangular to subrounded flint.
		8 50	D		63.4			8.40	CHALK composed of off-white, clayey silty medium and coarse subangular to subrounded GRAVEL. Gravel is medium density, off-white chalk and occasional fine to coarse subangular flint.
		9 00	ES SPTLS SPT(S)	N=8 (1,1/1,2,2,3)					
		10.00	D						

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
9.00	200	9.00	200										
20.00	150	20.00	150										

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Start - End Date	Project ID:	Hole Type:	BH1
30/08/2022 - 31/08/2022	J15226	CP	Sheet 2 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level:	Logger:
				71.80	VF
Location:	Farnham, GU10 1FP	Hand dug to 1 2m Start of shift 30/08/2022 End of shift 30/08/2022 borehole at 9m, casing at 9m, water at 4 3m Start of shift 31/08/2022 water at 3 4m End of shift 31/08/2022 borehole at 20m, casing at 19 5m, water at 6 4m Installed with 50mm gas & groundwater monitoring well with response zone between 1m and 9mbgl Levels are approximate, taken from topographic survey plan provided by Client			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Well	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		10.50	SPTLS SPT(S)	N=8 (1,2/2,2,2,2)					CHALK composed of off-white, clayey silty medium and coarse subangular to subrounded GRAVEL. Gravel is medium density, off-white chalk and occasional fine to coarse subangular flint.
		11.50	D						
		12.00	SPTLS SPT(S)	N=8 (1,2/2,2,2,2)					
		13.00	D ES			(8.10)			
		13.50	SPTLS SPT(S)	N=7 (1,2/1,2,2,2)					
		14.50	D						
		15.00	SPTLS SPT(S)	N=12 (3,3/2,2,3,5)					
		16.00	D						
		16.50	SPTLS SPT(S)	N=22 (5,5/6,6,5,5)	55 3			16 50	CHALK composed of light greyish white with occasional orange patches, clayey gravelly SILT. Gravel is medium density, off-white, fine to coarse subangular to subrounded chalk and occasional fine to coarse subangular flint.
		17.50	D						
		18.00	SPTLS SPT(S)	N=33 (5,9/11,7,7,8)		(3.50)			
		19.00	D						
		19.50	SPTLS SPT(S)	N=33 (5,8/8,7,8,10)					
					51 8			20 00	End of Borehole at 20 00m

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
9.00	200	9.00	200										
20.00	150	20.00	150										

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Start - End Date	Project ID:	Hole Type:	BH2
01/09/2022 - 02/09/2022	J15226	CP	Sheet 1 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level:	Logger:
				72.00	VF
Location:	Farnham, GU10 1FP	Hand dug to 1.2m. Start of shift 01/09/2022. Water strike recorded at 4.5m rose to 3.7m in 20 mins. End of shift 01/09/2022 borehole at 16.5m casing at 16.5m water at 6.8m. Start of shift 02/09/2022 water at 4.3m. End of shift 02/09/2022 borehole at 20m casing at 19.5m water at 5.4m. Installed with 50mm gas & groundwater monitoring well with response zone between 1m and 8mbgl. Levels are approximate taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Well	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		0.20	ES		71.7	(0.30)		0.30	Stiff, brown, sandy CLAY with occasional fine to coarse angular to subrounded gravel of flint, brick and chalk. MADE GROUND
		1.00	B ES						Firm, mid brown, very sandy gravelly CLAY. Sand is fine to coarse grained. Gravel consists of fine to coarse subangular to subrounded flint.
		1.50	SPT(C)	N=6 (1,1/1,2,2,1)		(2.30)			
		2.00	B						
		2.50	SPT(C)	N=18 (1,1/4,4,4,6)	69.4			2.60	
		3.00	B						Loose, orangish brown, clayey very sandy GRAVEL of fine to coarse subangular to subrounded flint. Sand is fine to coarse grained.
		3.50	SPT(C)	N=9 (1,1/1,2,1,5)					
		4.00	B			(2.40)			
		4.50	SPT(C)	N=7 (1,0/1,1,2,3)					
		5.00	B ES		67.0			5.00	Medium dense, orangish brown, very sandy GRAVEL of fine to coarse subangular to subrounded flint. Sand is fine to coarse grained.
		6.00	B						
			SPT(C)	N=12 (1,1/2,3,3,4)		(2.80)			
		7.00	ES						
		7.50	B						
			SPT(C)	N=36 (5,8/11,10,8,7)	64.2			7.80	
		7.80	D						CHALK composed of off-white clayey silty medium and coarse subangular to subrounded GRAVEL. Gravel is medium density, off-white chalk and occasional fine to coarse subangular flint.
		9.00	SPTLS						
			SPT(S)	N=5 (1,1/1,1,2,1)					
		10.00	D						

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
9.00	200	9.00	200	01-09-2022	4.50	4.50		3.70	20				
20.00	150	20.00	150										

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Start - End Date	Project ID:	Hole Type:	BH2
01/09/2022 - 02/09/2022	J15226	CP	Sheet 2 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level:	Logger:
				72.00	VF
Location:	Farnham, GU10 1FP				
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Hand dug to 1.2m.
Start of shift 01/09/2022. Water strike recorded at 4.5m rose to 3.7m in 20 mins. End of shift 01/09/2022 borehole at 16.5m casing at 16.5m water at 6.8m. Start of shift 02/09/2022 water at 4.3m. End of shift 02/09/2022 borehole at 20m casing at 19.5m water at 5.4m.
Installed with 50mm gas & groundwater monitoring well with response zone between 1m and 8mbgl.
Levels are approximate taken from topographic survey plan provided by Client.

Well	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		10.50	SPTLS SPT(S)	N=5 (1,1/1,2,1,1)					CHALK composed of off-white clayey silty medium and coarse subangular to subrounded GRAVEL. Gravel is medium density, off-white chalk and occasional fine to coarse subangular flint.
		11.50	D						
		12.00	ES SPTLS SPT(S)	N=8 (2,1/2,2,2,2)					
		13.00	D SPTLS						
		13.50	SPTLS SPT(S)	N=15 (2,3/2,4,4,5)					
		14.50	D						
		15.00	SPTLS SPT(S)	N=17 (5,4/5,4,4,4)		(12.20)			
		16.00	D						
		16.50	SPTLS SPT(S)	N=25 (3,4/4,6,6,9)					
		17.50	D						
		18.00	SPTLS SPT(S)	N=22 (4,5/4,6,6,6)					
		19.00	D						
		19.50	SPTLS SPT(S)	N=30 (2,6/7,7,7,9)	52 0			20 00	End of Borehole at 20 00m

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
9.00 20.00	200 150	9.00 20.00	200 150	01-09-2022	4.50	4 50		3.70	20				

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Start - End Date	Project ID:	Hole Type:	BH3
02/09/2022 - 05/09/2022	J15226	CP	Sheet 1 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level:	Logger:
				71.90	VF
Location:	Farnham, GU10 1FP	Hand dug to 1 2m Start of shift 02/09/2022 End of shift 02/09/2022 borehole at 9 0m, casing at 9 0m, water at 3 8m Start of shift 05/09/2022 water at 4 6m End of shift 05/09/2022 borehole at 20m, casing at 19 5m, water at 6 3m Installed with 50mm gas & groundwater monitoring well with response zone between 1m and 7mbgl Levels are approximate, taken from topographic survey plan provided by Client			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Well	Water Strikes	Samples and Insitu Testing: Depth (m bgl)	Type	Results	Level (mAOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		0.50	ES			(1.30)			Dark greyish brown, very sandy slightly gravelly CLAY. Sand is fine to coarse grained. Gravel consists of fine to coarse angular to subrounded flint and brick. MADE GROUND
		1.00	B						
					70.6			1.30	
		1.50	ES SPT(C)	N=11 (2,3/3,3,3,2)					Greenish grey, very sandy gravelly CLAY. Sand is fine to coarse grained. Gravel consists of fine to coarse angular to subrounded flint and brick. MADE GROUND
		2.00	B			(1.10)			
					69 5			2.40	
		2.50	SPT(C)	N=11 (2,3/3,2,3,3)		(0.30)			Greyish brown, sandy gravelly CLAY. Sand is fine to coarse grained. Gravel consists of fine to coarse subangular to subrounded flint.
					69 2			2.70	
		3.00	B ES			(0.70)			Medium dense, pale orangish brown, slightly clayey slightly gravelly fine to coarse SAND. Gravel consists of fine to coarse subangular to subrounded flint.
					68 5	(0.10)		3.40	
		3.50	SPTLS SPT(S)	N=11 (1,1/2,3,3,3)	68.4			3.50	Brown, sandy gravelly CLAY.
		4.00	B			(1.50)			Medium dense, clayey very sandy fine to coarse subangular to subrounded flint GRAVEL. Sand is fine to coarse grained.
		4.50	SPT(C)	N=10 (1,1/2,1,3,4)					
		5.00	B ES		66 9	(1.00)		5.00	Medium dense, orangish brown, clayey gravelly fine to coarse SAND. Gravel consists of fine to coarse angular to subrounded flint.
		6.00	B SPT(C)	N=16 (1,2/4,4,4,4)	65 9	(1.50)		6.00	Medium dense, orangish brown, very gravelly coarse SAND. Gravel consists of fine to medium angular to subrounded flint.
		7.50	B SPT(C)	N=25 (3,5/6,6,7,6)	64.4	(2.20)		7.50	Medium dense, brown, sandy fine to coarse subangular to subrounded flint GRAVEL. Sand is fine to coarse grained. *From 8.6m, occasional flint cobbles recorded by driller.*
		9 00	B SPT(C)	N=10 (1,1/2,2,3,3)					
		9.70	D		62 2			9.70	CHALK composed of pale orangish white, clayey

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
10.00	200	10.00	200										
20.00	150	20.00	150										

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Start - End Date	Project ID:	Hole Type:	BH3
02/09/2022 - 05/09/2022	J15226	CP	Sheet 2 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level:	Logger:
				71.90	VF
Location:	Farnham, GU10 1FP	Hand dug to 1 2m Start of shift 02/09/2022 End of shift 02/09/2022 borehole at 9 0 m, casing at 9 0 m, water at 3 8m Start of shift 05/09/2022 water at 4 6m End of shift 05/09/2022 borehole at 20m, casing at 19 5m, water at 6 3m Installed with 50mm gas & groundwater monitoring well with response zone between 1m and 7mbgl Levels are approximate, taken from topographic survey plan provided by Client			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Well	Water Strikes	Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		Depth (m bgl)	Type	Results					
		10.50	ES SPTLS SPT(S)	N=8 (2,1/3,2,1,2)					CHALK composed of pale orangish white, clayey silty medium and coarse subangular to subrounded GRAVEL. Gravel is medium density, off-white speckled black chalk and occasional fine to coarse subangular flint.
		11.50	D						
		12.00	SPTLS SPT(S)	N=8 (1,1/2,2,2,2)					
		13.00	D						
		13.50	SPTLS SPT(S)	N=21 (4,6/6,6,4,5)		(7.80)			
		14.50	D						
		15.00	ES SPTLS SPT(S)	N=8 (3,3/3,2,2,1)					
		16.00	D						
		16.50	ES SPTLS SPT(S)	N=24 (4,4/3,4,9,8)					
		17.50	D		54.4			17 50	CHALK composed of light greyish white with occasional orange patches, clayey gravelly SILT. Gravel is medium density, off-white, fine to coarse subangular to subrounded chalk and occasional fine to coarse subangular flint.
		18.00	SPTLS SPT(S)	N=37 (6,7/7,9,9,12)					
		19.00	D			(2.50)			
		19.50	SPTLS SPT(S)	N=31 (6,7/10,7,6,8)					
					51 9			20 00	End of Borehole at 20 00m

Hole Details		Casing Details		Waterstrike (m bgl)						Standing/Chiselling (m bgl)			
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
10.00	200	10.00	200										
20.00	150	20.00	150										

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Start - End Date:	Project ID:	Machine Type:	TP01
02/08/2022	J15226	JCB 3CX	Sheet 1 of 1

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				72.00	MS
Location:	Farnham, GU10 1FP	Backfilled with arisings. Levels are approximate, taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
							Light brown very sandy GRAVEL. Gravel is fine to coarse angular of flint, brick and chalk. Frequent roots. MADE GROUND
0.30	ES			(0.50)			
			71.5			0.50	Light brown gravelly clayey medium SAND. Gravel is fine to medium sub-rounded to angular of flint.
0.75	ES			(0.30)			
0.80	B		71.2			0.80	Soft greyish brown gravelly sandy CLAY. Gravel is fine to medium sub-angular of flint
1.00	HP	UCS(kPa)=180					
1.20	D			(0.70)			
			70.5			1.50	Pit terminated at 1.50m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.60	Trial pits sides stable.	No groundwater encountered.
Length:	2.00		
Depth:	1.50		

1. Trial Pit TP01

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP01
	J15226	Tongham Services	Farnham, GU10 1FP	

2. TP01 Arisings

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP01
	J15226	Tongham Services	Farnham, GU10 1FP	

Southern Testing ST Consult	Start - End Date:	Project ID:	Machine Type:	TP02
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Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				71.85	VF
Location:	Farnham, GU10 1FP	Backfilled with arisings. Levels are approximate, taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
0.30	ES			(0.50)			Brown, clayey very gravelly fine to coarse SAND. Gravel consists of fine to coarse angular to subrounded flint and occasional brick and tile. MADE GROUND
			71.4			0.50	
0.60	B ES						Medium dense, orangish brown, slightly clayey very gravelly fine to coarse SAND with occasional roots. Gravel consists of fine to coarse subangular to subrounded flint. Roots at 0.5m located on the western face of trial pt.
							From 0.8m, becoming clayey and occasional cobble sized lumps of firm sandy gravelly CLAY.
1.00	ES						
	HP	UCS(kPa)=180					
1.10	PPT	N=18(450)		(1.50)			
1.50	B HP	UCS(kPa)=160					
2.00	ES		69.8			2.00	Firm to stiff, bluish grey and dark grey/ black very silty CLAY.
2.10	D HP	UCS(kPa)=300	69.6	(0.20)		2.20	Medium dense, yellowish/orangish brown, gravelly fine to coarse SAND with occasional patches of dark orange coarse sand and occasional clayey patches.
2.50	PPT	N=11(450)					
2.60	B			(0.80)			
			68.8			3.00	

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.60	Trial pits sides unstable below 3m.	Groundwater seepage at base of trial pit.
Length:	2.20		
Depth:	3.50		

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Start - End Date:	Project ID:	Machine Type:	TP02
02/08/2022	J15226	JCB 3CX	Sheet 2 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				71.85	VF
Location:	Farnham, GU10 1FP	Backfilled with arisings. Levels are approximate, taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
3.10	B		68.4	(0.50)		3.50	Greyish brown and orangish brown, sandy fine to coarse subangular to subrounded flint GRAVEL. Sand is fine to coarse grained. Soil wet.
							Pit terminated at 3.50m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.60	Trial pits sides unstable below 3m.	Groundwater seepage at base of trial pit.
Length:	2.20		
Depth:	3.50		

1. Trial Pit TP02

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP02
	J15226	Tongham Services	Farnham, GU10 1FP	

2. TP02 Arisings

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP02
	J15226	Tongham Services	Farnham, GU10 1FP	

Southern Testing ST Consult	Start - End Date:	Project ID:	Machine Type:	TP03
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Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				71.85	VF
Location:	Farnham, GU10 1FP	Backfilled with arisings. Levels are approximate, taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description	
Depth (m)	Type	Results						
0.30	ES			(0.50)			Pale orangish brown, slightly clayey very gravelly fine to coarse SAND with roots/rootlets. Gravel consists of fine to coarse subangular to subrounded flint and rare brick and plastic. MADE GROUND	
			71.4			0.50		
0.60	B						Medium dense, orangish brown, gravelly fine to coarse SAND. Gravel consists of fine to coarse angular to subrounded flint. Occasional clayey patches.	
	ES							
1.00	ES							1
	PPT	N=23(450)						
				(1.30)			From 1.1m, becoming clayey and greyish brown.	
1.50	B							
			70.0			1.80		
1.90	HP	UCS(kPa)=360		(0.20)			Firm to stiff, dark bluish grey mottled dark orangish brown and dark grey, silty sandy CLAY. Sand is fine to medium grained.	
2.00	D		69.8			2.00	Pale grey, slightly clayey to clayey SILT.	2
				(0.20)				
			69.6			2.20		
2.30	HP	UCS(kPa)=150					Firm, greyish brown, silty sandy slightly gravelly CLAY with occasional patches of dark orange coarse sand. Sand is fine to coarse grained. Gravel consists of fine to coarse subangular to subrounded flint.	
2.50	B							
	HP	UCS(kPa)=180		(1.30)				
2.80	HP	UCS(kPa)=180						
3.00	ES							3

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.60	Trial pit sides unstable below 3.5m.	Groundwater seepage at base of trial pit.
Length:	2.40		
Depth:	3.90		

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Start - End Date:	Project ID:	Machine Type:	TP03
02/08/2022	J15226	JCB 3CX	Sheet 2 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				71.85	VF
Location:	Farnham, GU10 1FP	Backfilled with arisings. Levels are approximate, taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
	HP	UCS(kPa)=210					Firm, greyish brown, silty sandy slightly gravelly CLAY with occasional patches of dark orange coarse sand. Sand is fine to coarse grained. Gravel consists of fine to coarse subangular to subrounded flint.
3.20	HP	UCS(kPa)=200					
			68.4			3.50	
							Greyish brown, fine to coarse SAND and fine to coarse angular to subrounded flint GRAVEL. Soil wet.
3.70	B			(0.40)			
			68.0			3.90	
							Pit terminated at 3.90m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.60	Trial pit sides unstable below 3.5m.	Groundwater seepage at base of trial pit.
Length:	2.40		
Depth:	3.90		

1. Trial Pit TP03

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP03
	J15226	Tongham Services	Farnham, GU10 1FP	

2. TP03 Arisings

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP03
	J15226	Tongham Services	Farnham, GU10 1FP	

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Start - End Date:	Project ID:	Machine Type:	TP04
02/08/2022	J15226	JCB 3CX	Sheet 1 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				71.90	MS
Location:	Farnham, GU10 1FP	Backfilled with arisings. Levels are approximate, taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
0.20	ES			(0.50)			Light brown, very sandy fine to coarse subangular to subrounded GRAVEL of flint and brick. Sand is fine to coarse grained. MADE GROUND
0.50	B ES		71.4			0.50	Brown, clayey gravelly fine to medium SAND. Gravel consists of fine to coarse subangular to subrounded flint and brick. MADE GROUND
0.70	ES			(0.40)			
			71.0			0.90	Greenish grey, sandy gravelly CLAY with occasional rootlets. Sand is fine to coarse grained. Gravel consists of fine to coarse angular to subrounded flint, chalk and brick. MADE GROUND
				(0.50)			
			70.5			1.40	Medium dense, light brown, clayey gravelly fine to medium SAND. Gravel consists of fine to coarse subangular to subrounded flint.
1.50	B						
				(0.75)			
			69.8			2.15	Light grey, clayey SILT with occasional soft brown clay lenses.
2.20	B			(0.20)			
			69.6			2.35	Firm, light brown, sandy slightly gravelly CLAY. Sand is fine to coarse grained. Gravel consists of fine to coarse angular to subrounded flint.
2.50	ES HP	UCS(kPa)=180					
				(0.85)			
2.80	HP	UCS(kPa)=150					
3.00	HP	UCS(kPa)=150					

1 2 3

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.60	Trial pit sides stable.	Groundwater seepage at base of trial pit.
Length:	2.30		
Depth:	4.00		

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Start - End Date:	Project ID:	Machine Type:	TP04
02/08/2022	J15226	JCB 3CX	Sheet 2 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				71.90	MS
Location:	Farnham, GU10 1FP	Backfilled with arisings. Levels are approximate, taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
			68.7			3.20	Firm, light brown, sandy slightly gravelly CLAY. Sand is fine to coarse grained. Gravel consists of fine to coarse angular to subrounded flint.
3.50	B			(0.70)			Light brown, clayey slightly gravelly fine to coarse SAND. Gravel consists of fine to coarse subrounded to angular flint.
			68.0	(0.10)		3.90	Greyish brown, clayey sandy fine to coarse subangular to subrounded flint GRAVEL. Sand is fine to coarse grained. Soil wet.
			67.9			4.00	Pit terminated at 4.00m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.60	Trial pit sides stable.	Groundwater seepage at base of trial pit.
Length:	2.30		
Depth:	4.00		

1. Trial Pit TP04

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP04
	J15226	Tongham Services	Farnham, GU10 1FP	

2. TP04 Arisings

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP04
	J15226	Tongham Services	Farnham, GU10 1FP	

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Start - End Date:	Project ID:	Machine Type:	TP05
02/08/2022	J15226	JCB 3CX	Sheet 1 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				71.95	VF
Location:	Farnham, GU10 1FP	Backfilled with arisings. Levels are approximate, taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
			71.4	(0.50)		0.50	Greyish and orangish brown, clayey gravely fine to coarse SAND. Gravel consists of fine to coarse subangular to subrounded flint and occasional brick, wood and tile. MADE GROUND
0.60	ES						Dark greyish brown, very sandy gravelly CLAY. Sand is fine to coarse grained. Gravel consists of fine to coarse angular to subrounded flint, tile, brick, clinker, wood, plastic and metal. MADE GROUND
0.75	ES						
				(1.00)			
1.50	ES		70.4			1.50	Medium dense, orangish brown, slightly clayey gravelly fine to coarse SAND. Gravel consists of fine to coarse subangular to subrounded flint.
2.00	B PPT	N=19(450)		(0.90)			
			69.6			2.40	Pale grey mottled dark brown, clayey SILT with dark brown slightly organic silty clay lenses.
2.50	D			(0.30)			
			69.2			2.70	Firm, grey brown with occasional dark brown staining, silty slightly sandy CLAY with occasional fine to coarse subangular to subrounded flint gravel.
2.80	HP	UCS(kPa)=120					
3.00	B						

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	2.30	Trial pit sides stable.	Groundwater seepage at base of trial pit.
Length:	0.60		
Depth:	4.00		

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Start - End Date:	Project ID:	Machine Type:	TP05
02/08/2022	J15226	JCB 3CX	Sheet 2 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				71.95	VF
Location:	Farnham, GU10 1FP	Backfilled with arisings. Levels are approximate, taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
	HP	UCS(kPa)=160					Firm, grey brown with occasional dark brown staining, silty slightly sandy CLAY with occasional fine to coarse subangular to subrounded flint gravel.
3.30	HP	UCS(kPa)=190		(1.00)			
3.50	HP	UCS(kPa)=220					
			68.2			3.70	
3.80	B			(0.30)			Dark grey and orangish brown, fine to coarse SAND and fine to coarse subangular to subrounded flint GRAVEL. Soil wet.
			68.0			4.00	Pit terminated at 4.00m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	2.30	Trial pit sides stable.	Groundwater seepage at base of trial pit.
Length:	0.60		
Depth:	4.00		

1. Trial Pit TP05

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP05
	J15226	Tongham Services	Farnham, GU10 1FP	

2. TP05 Arisings

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP05
	J15226	Tongham Services	Farnham, GU10 1FP	

Southern Testing ST Consult

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Start - End Date:	Project ID:	Machine Type:	TP06
02/08/2022	J15226	JCB	Sheet 1 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				72.10	MS
Location:	Farnham, GU10 1FP	Backfilled with arisings. Levels are approximate, taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
				(0.65)			Brown, slightly clayey gravelly fine to coarse SAND with frequent roots/rootlets. Gravel consists of fine to coarse subangular to subrounded flint, concrete and brick. MADE GROUND
0.50	ES						
0.65	ES		71.4			0.65	
0.70	B						Grey, clayey gravelly fine to coarse SAND. Gravel consists of fine to coarse subangular to subrounded flint.
				(0.45)			
			71.0			1.10	
							Firm, greyish brown, sandy gravelly CLAY. Sand is fine to coarse grained. Gravel consists of fine to coarse subangular to subrounded flint.
1.50	HP	UCS(kPa)=140					
				(1.30)			
1.80	HP	UCS(kPa)=160					
2.00	HP	UCS(kPa)=160					From 2.0m, becoming more of a medium dense clayey SAND.
2.10	B PPT						
			69.7			2.40	
2.50	B			(0.20)			Dark blueish grey, clayey SILT with dark brown organic clay lenses and frequent black rootlets.
			69.5			2.60	
							Firm, light brown silty gravelly CLAY. Gravel consists of fine to coarse angular to subrounded flint.
3.00	HP	UCS(kPa)=240					

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.60	Trial pit sides stable.	Groundwater seepage at base of trial pit.
Length:	2.10		
Depth:	4.00		

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Start - End Date:	Project ID:	Machine Type:	TP06
02/08/2022	J15226	JCB	Sheet 2 of 2

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				72.10	MS
Location:	Farnham, GU10 1FP	Backfilled with arisings. Levels are approximate, taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
				(1.20)			Firm, light brown silty gravelly CLAY. Gravel consists of fine to coarse angular to subrounded flint.
3.50	HP	UCS(kPa)=280					
3.80	B		68.3	(0.10)		3.80	Orangish brown, silty gravelly fine to coarse SAND. Gravel consists of fine to coarse subangular to subrounded flint.
			68.2			3.90	Pit terminated at 4.00m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.60	Trial pit sides stable.	Groundwater seepage at base of trial pit.
Length:	2.10		
Depth:	4.00		

1. Trial Pit TP06

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP06
	J15226	Tongham Services	Farnham, GU10 1FP	

2. TP06 Arisings

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP06
	J15226	Tongham Services	Farnham, GU10 1FP	

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Start - End Date:	Project ID:	Machine Type:	TP07
02/08/2022	J15226	JCB 3CX	Sheet 1 of 1

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				72.10	VF
Location:	Farnham, GU10 1FP	Backfilled with arisings. Levels are approximate, taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
				(0.60)			Orangish brown, clayey gravelly fine to coarse SAND. Gravel consists of fine to coarse subangular to subrounded flint and rare brick and clinker. MADE GROUND
0.50	ES		71.5			0.60	
0.70	ES						Medium dense, greyish brown, slightly clayey gravelly fine to coarse SAND. Gravel consists of fine to coarse subangular to subrounded flint.
1.00	B			(0.90)			
			70.6			1.50	
1.60	B HP	UCS(kPa)=150		(0.20)			Orangish brown, very sandy slightly gravelly CLAY. Sand is fine to coarse grained. Gravel consists of fine to coarse subangular to subrounded flint.
			70.4			1.70	Pit terminated at 1.70m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	0.60	Trial pit sides stable.	No groundwater encountered.
Length:	1.80		
Depth:	1.70		

1. Trial Pit TP07

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP07
	J15226	Tongham Services	Farnham, GU10 1FP	

2. TP07 Arisings

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP07
	J15226	Tongham Services	Farnham, GU10 1FP	

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Start - End Date:	Project ID:	Machine Type:	TP08
02/08/2022	J15226	JCB 3CX	Sheet 1 of 1

Project Name:	Tongham Services	Remarks:	Co-ordinates:	Level (m AOD):	Logger:
				72.05	MS
Location:	Farnham, GU10 1FP	Backfilled with arisings. Levels are approximate, taken from topographic survey plan provided by Client.			
Client:	McDonald's Restaurants Ltd. c/o Glanville Consultants Ltd.				

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
				(0.50)			Light brown, very sandy fine to coarse angular to subrounded GRAVEL of flint and chalk. Sand is fine to coarse grained. MADE GROUND
0.30	ES						
			71.6			0.50	
0.60	B						Medium dense, grey, clayey slightly gravelly fine to coarse SAND. Gravel consists of fine to coarse subangular to subrounded flint
	ES			(0.75)			
			70.8			1.25	
				(0.25)			Firm, brown, sandy slightly gravelly CLAY. Gravel consists of fine to coarse, angular to rounded flint.
1.40	HP	UCS(kPa)=130					
1.50	B		70.6			1.50	
							Pit terminated at 1.50m.

Pit Dimension (m)		Pit Stability:	Water Strikes:
Width:	1.80	Trial pit sides stable	No ground water encountered.
Length:	0.60		
Depth:	1.50		

1. Trial Pit TP08

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP08
	J15226	Tongham Services	Farnham, GU10 1FP	

2. TP08 Arisings

Southern Testing ST Consult	Project ID:	Project Name:	Location:	TP08
	J15226	Tongham Services	Farnham, GU10 1FP	

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Key to Exploratory Hole Logs, Plans and Sections

Backfill Symbols		Pipe Symbols		Principal Soil Types		Principal Rock Types		Drilling Records	
Arisings		Plain Pipe		Topsoil		Mudstone		Water Strike	
Concrete		Slotted Pipe		Made Ground		Claystone		Depth Water Rose	
Blacktop		Piezometer		Clay		Siltstone		Total Core Recovery (%) [TCR]	
Bentonite		Piezometer Tip		Silt		Sandstone		Solid Core Recovery (%) [SCR]	
Gravel Filter		Filter Tip		Sand		Limestone		Rock Quality Index (%) RQD]	
Sand Filter		Extensometer		Gravel		Chalk		Fracture Index (fractures / m) [FI]	
		Inclinometers		Peat					

All soil and rock descriptions are in general accordance with BS5930 2015, BS EN ISO 14688-1:2002+A1:2013 and BS EN ISO 14689-1:2003. Chalk descriptions are also based on CIRIA C574 and "Logging the Chalk – R N. Mortimer 2015". The Geology Code is only provided where a positive identification of the sample strata has been made.

Location / Method Identifiers	
BH	Borehole (undefined)
CP	Cable Percussive
RC	Rotary Core
RO	Rotary Open Hole
ODC	Rotary Odex/Symmetrix drilling cased
CP+RC	Cable Percussive to Rotary Core
SNC	Sonic
CFA	Continuous Flight Auger
FA	Flight Auger
VC	Vibro Core
WLS+RC	Windowless (Dynamic) Sampler to Rotary Core
WLS	Windowless Sampler
WS	Window Sampler
HA	Hand Auger
C	Road / Pavement Core
IP	Inspection Pit (Hand Excavation)
TP	Trial Pit (Machine Excavated)
OP	Observation Pit (Supported Excavation Hand or Machine)

In-situ Test Location / Method	
DP	Dynamic Probe
CPT	Cone Penetration Test
CBR	In-situ CBR Test
DCP	CBR using Dynamic Cone Penetrometer
CBRT	CBR using TRL Probe
PB	Plate Bearing Test
SPT (S)	Standard Penetration Test (Split Barrel Sampler)
SPT (C)	Standard Penetration Test (Solid Cone)
N	SPT Result
-/-	Blows/Penetration (mm) after seating drive
-*/-	Total Blows / Penetration (mm)
( )	Extrapolated Value
PPT	Perth Penetration (In-House Method - Equivalent N Value)
HP / UCS	Strength from Hand Penetrometer (kN/m^2)
IVN	Strength from Hand Vane ((kN/m^2) P = peak, R = residual
PID	Photo Ionisation Detector (ppm)
MEXE	Mexi-Cone CBR (%)

Samples / Test Type	
B	Bulk Sample
BLK	Block Sample
C	Core Sample
CBRS	CBR Mould Sample
D	Small Disturbed Sample
ES	Environmental Sample (Soil)
EW	Environmental Sample (Water)
GS	Environmental Sample (Gas)

Samples / Test Type	
SPTLS	Standard Penetration Test Split Barrel Sample
TW	Thin Wall Push In Sample (e.g. Shelby Sampler)
U	Undisturbed Open Drive Sample (blows to take)
UT	Thin Wall Undisturbed Open Drive Sample (blows to take)
W	Water Sample (Geotechnical)
SP	Sample from Stockpile
P	Piston Sample
AMAL	Amalgamated Sample

Appendix B:
Drainage Calculations

Print | Close Report

HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Fredi Giliberti
Site name:	McD Farnham
Site location:	A331

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

Site Details

Latitude:	51.22959° N
Longitude:	0.74297° W
Reference:	1633287508
Date:	Feb 22 2023 15:19

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.396

Methodology

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

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	726	726
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	2	2
1 in 1 year (l/s):	1.7	1.7
1 in 30 years (l/s):	4.59	4.59
1 in 100 year (l/s):	6.36	6.36
1 in 200 years (l/s):	7.46	7.46

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.600	Add Flow / Climate Change (%)	0
Ratio R	0.392	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.066	4-8	0.146	8-12	0.002	12-16	0.000	16-20	0.049	20-24	0.033

Total Area Contributing (ha) = 0.296

Total Pipe Volume (m³) = 132.296

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	32.401	0.001	32401.0	0.082	5.00	0.0		0.050	→[↓]		Cellular Storage	
S2.000	47.425	0.316	150.1	0.054	5.00	0.0	0.600		o	225	Pipe/Conduit	
S2.001	16.286	0.109	150.0	0.044	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.000	11.739	0.078	150.5	0.008	5.00	0.0	0.600		o	225	Pipe/Conduit	
S3.001	9.180	0.061	150.0	0.008	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.002	17.503	0.117	150.0	0.047	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.003	16.358	0.109	150.0	0.029	0.00	0.0	0.600		o	225	Pipe/Conduit	
S3.004	10.181	0.069	147.4	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	32.70	20.09	70.500	0.082	0.0	0.0	0.0	0.04	134.5	7.3
S2.000	50.00	5.74	71.010	0.054	0.0	0.0	0.0	1.06	42.3	7.3
S2.001	50.00	6.00	70.694	0.098	0.0	0.0	0.0	1.07	42.4	13.3
S3.000	50.00	5.18	71.019	0.008	0.0	0.0	0.0	1.06	42.3	1.1
S3.001	50.00	5.33	70.941	0.016	0.0	0.0	0.0	1.07	42.4	2.1
S3.002	50.00	5.60	70.880	0.063	0.0	0.0	0.0	1.07	42.4	8.5
S3.003	50.00	5.86	70.763	0.093	0.0	0.0	0.0	1.07	42.4	12.5
S3.004	50.00	6.02	70.654	0.093	0.0	0.0	0.0	1.07	42.7	12.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.002	12.843	0.086	149.3	0.023	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.001	4.785	0.032	149.5	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.002	2.502	0.017	147.2	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.003	52.452	0.350	149.9	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.004	52.601	0.351	149.9	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
S1.005	11.342	0.077	147.3	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.002	50.00	6.22	70.585	0.214	0.0	0.0	0.0	1.07	42.4	28.9
S1.001	32.62	20.16	70.499	0.296	0.0	0.0	0.0	1.07	42.4	28.9
S1.002	32.58	20.20	70.467	0.296	0.0	0.0	0.0	1.08	42.8	28.9
S1.003	31.79	21.02	70.450	0.296	0.0	0.0	0.0	1.07	42.4	28.9
S1.004	31.04	21.84	70.100	0.296	0.0	0.0	0.0	1.07	42.4	28.9
S1.005	30.88	22.02	69.749	0.296	0.0	0.0	0.0	1.08	42.7	28.9

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.003	0.003	0.003
	User	-	100	0.056	0.056	0.060
	User	-	100	0.022	0.022	0.082
2.000	User	-	100	0.004	0.004	0.004
	User	-	100	0.007	0.007	0.011
	User	-	100	0.018	0.018	0.029
	User	-	100	0.025	0.025	0.054
2.001	User	-	100	0.017	0.017	0.017
	User	-	100	0.027	0.027	0.044
3.000	User	-	100	0.008	0.008	0.008
3.001	User	-	100	0.008	0.008	0.008
3.002	User	-	100	0.031	0.031	0.031
	User	-	100	0.017	0.017	0.047
3.003	User	-	100	0.029	0.029	0.029
3.004	-	-	100	0.000	0.000	0.000
2.002	User	-	100	0.023	0.023	0.023
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.296	0.296	0.296

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.005	SHW	71.500	69.672	0.000	0	0

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SHB, DS/PN: S1.001, Volume (m³): 120.3

Unit Reference	MD-SHE-0076-2000-0401-2000
Design Head (m)	0.401
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	76
Invert Level (m)	70.499
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.401	2.0	Kick-Flo®	0.288	1.7
Flush-Flo™	0.126	2.0	Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0	0.800	2.7	2.000	4.2	4.000	5.8	7.000	7.6
0.200	1.9	1.000	3.0	2.200	4.4	4.500	6.1	7.500	7.9
0.300	1.8	1.200	3.3	2.400	4.5	5.000	6.4	8.000	8.2
0.400	2.0	1.400	3.5	2.600	4.7	5.500	6.8	8.500	8.4
0.500	2.2	1.600	3.8	3.000	5.1	6.000	7.1	9.000	8.7
0.600	2.4	1.800	4.0	3.500	5.4	6.500	7.4	9.500	8.9

Storage Structures for Storm

Cellular Storage Pipe: S1.000

Manning's N	0.050	Infiltration Coefficient Side (m/hr)	0.00000
Invert Level (m)	70.500	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	320.0	320.0	0.400	320.0	353.6	0.401	0.0	353.6

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

Simulation Criteria

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

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

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 360, 1440
Return Period(s) (years)	2, 100
Climate Change (%)	0, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S11	360 Winter	2	+0%					70.590
S2.000	S1	15 Winter	2	+0%	100/15 Summer				71.081
S2.001	S4	15 Winter	2	+0%	100/15 Summer				70.791
S3.000	S5	15 Winter	2	+0%	100/15 Summer				71.046
S3.001	S6	15 Winter	2	+0%	100/15 Summer				70.981
S3.002	S7	15 Winter	2	+0%	100/15 Summer				70.954
S3.003	S8	15 Winter	2	+0%	100/15 Summer				70.854
S3.004	S9	15 Winter	2	+0%	100/15 Summer				70.762
S2.002	S10	15 Winter	2	+0%	100/15 Summer				70.742
S1.001	SHB	360 Winter	2	+0%	100/60 Winter				70.590
S1.002	SSPEL ESR 25/C1	360 Winter	2	+0%					70.501
S1.003	S12	360 Winter	2	+0%					70.478
S1.004	S13	360 Winter	2	+0%					70.128
S1.005	S14	360 Winter	2	+0%					69.779

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S11	-0.311	0.000	0.00		0.9	OK	
S2.000	S1	-0.154	0.000	0.21		8.5	OK	
S2.001	S4	-0.128	0.000	0.39		14.6	OK	
S3.000	S5	-0.198	0.000	0.04		1.3	OK	
S3.001	S6	-0.185	0.000	0.07		2.3	OK	
S3.002	S7	-0.151	0.000	0.23		8.9	OK	
S3.003	S8	-0.134	0.000	0.34		12.9	OK	
S3.004	S9	-0.117	0.000	0.36		12.8	OK	
S2.002	S10	-0.068	0.000	0.82		30.1	OK	
S1.001	SHB	-0.134	0.000	0.05		1.6	OK	
S1.002	SSPEL ESR 25/C1	-0.191	0.000	0.06		1.6	OK	
S1.003	S12	-0.197	0.000	0.04		1.6	OK	
S1.004	S13	-0.197	0.000	0.04		1.6	OK	
S1.005	S14	-0.195	0.000	0.04		1.6	OK	

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

Simulation Criteria

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

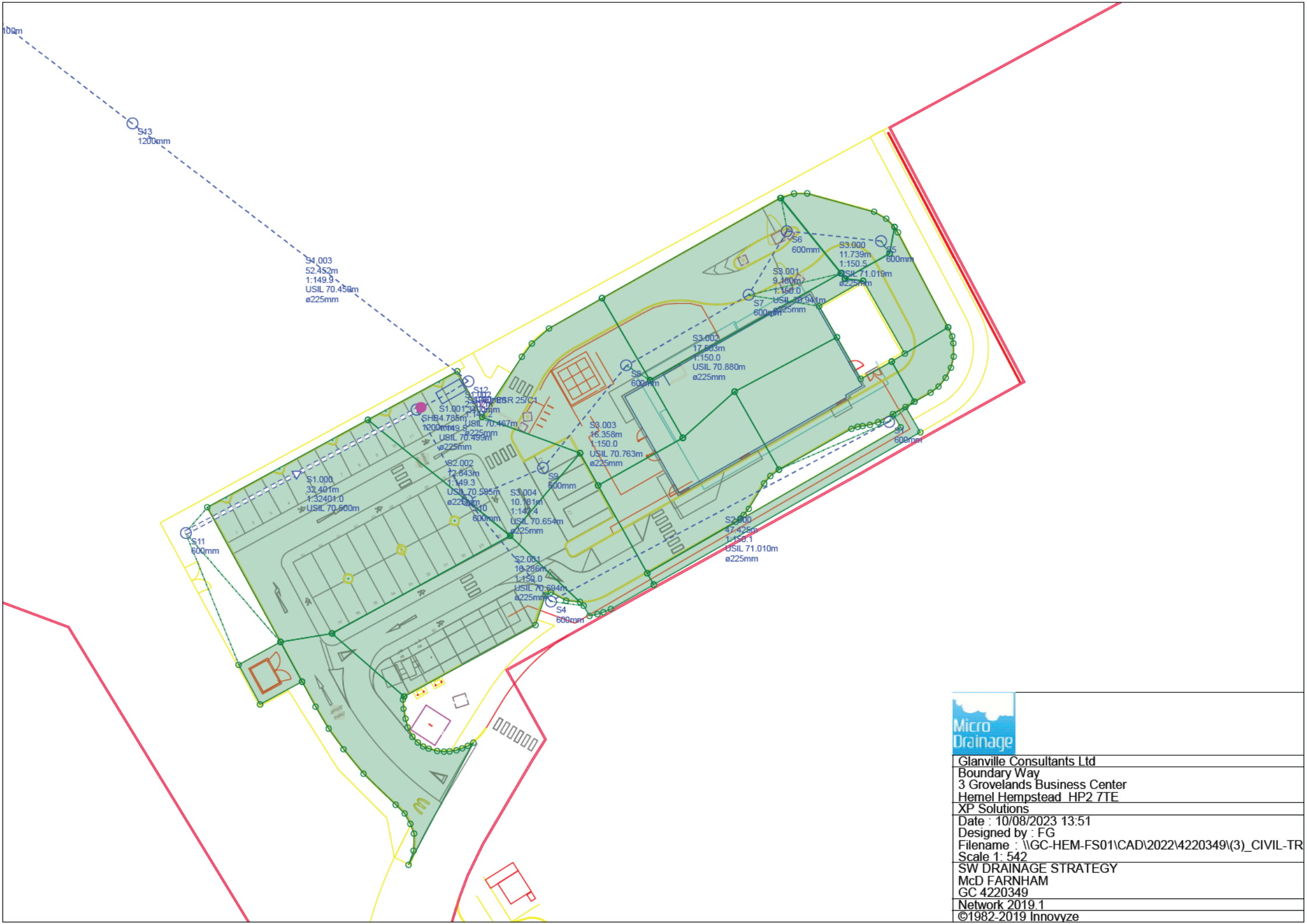
Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 360, 1440
Return Period(s) (years)	2, 100
Climate Change (%)	0, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S11	360 Winter	100	+25%					70.782
S2.000	S1	15 Winter	100	+25%	100/15 Summer				71.891
S2.001	S4	15 Winter	100	+25%	100/15 Summer				71.722
S3.000	S5	15 Winter	100	+25%	100/15 Summer				71.927
S3.001	S6	15 Winter	100	+25%	100/15 Summer				71.921
S3.002	S7	15 Winter	100	+25%	100/15 Summer				71.911
S3.003	S8	15 Winter	100	+25%	100/15 Summer				71.822
S3.004	S9	15 Winter	100	+25%	100/15 Summer				71.640
S2.002	S10	15 Winter	100	+25%	100/15 Summer				71.514
S1.001	SHB	360 Winter	100	+25%	100/60 Winter				70.782
S1.002	SSPEL ESR 25/C1	1440 Summer	100	+25%					70.506
S1.003	S12	1440 Summer	100	+25%					70.482
S1.004	S13	1440 Summer	100	+25%					70.132
S1.005	S14	1440 Summer	100	+25%					69.783

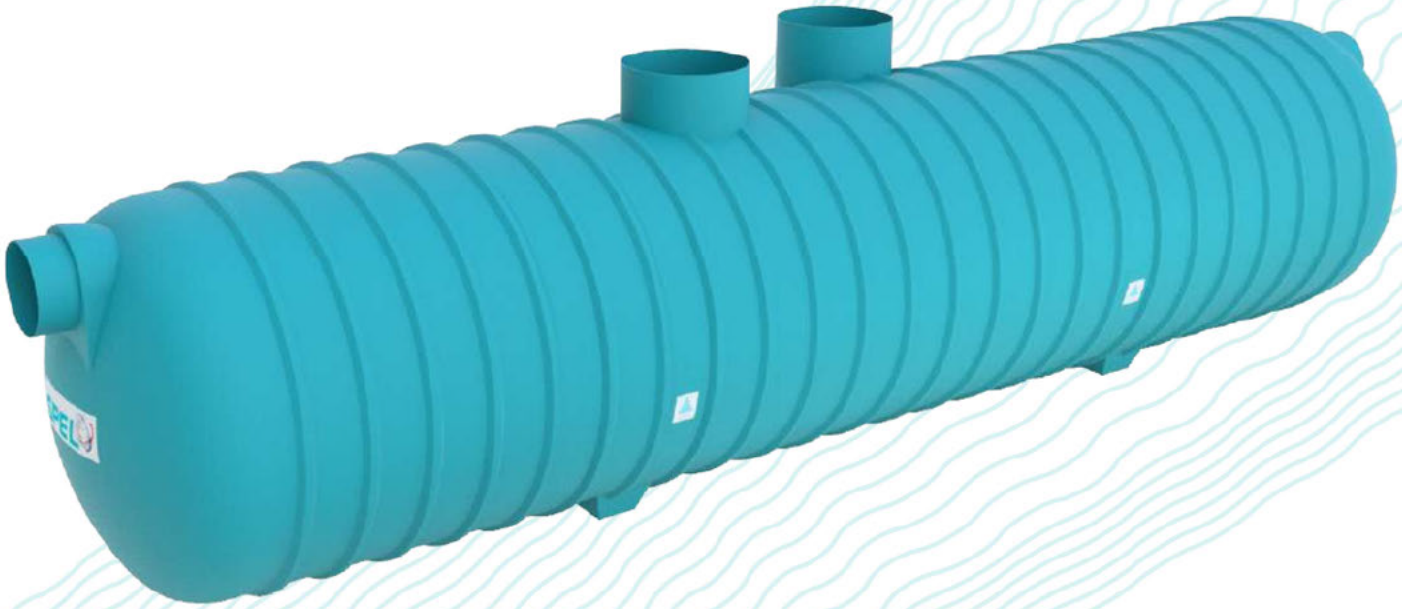
PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S11	-0.119	0.000	0.00		1.3	OK	
S2.000	S1	0.656	0.000	0.72		29.0	SURCHARGED	
S2.001	S4	0.803	0.000	1.35		50.9	SURCHARGED	
S3.000	S5	0.683	0.000	0.14		4.9	SURCHARGED	
S3.001	S6	0.755	0.000	0.26		9.2	SURCHARGED	
S3.002	S7	0.806	0.000	0.86		32.6	SURCHARGED	
S3.003	S8	0.833	0.000	1.27		47.8	SURCHARGED	
S3.004	S9	0.761	0.000	1.33		47.6	SURCHARGED	
S2.002	S10	0.704	0.000	2.99		109.6	SURCHARGED	
S1.001	SHB	0.058	0.000	0.07		2.0	SURCHARGED	
S1.002	SSPEL ESR 25/C1	-0.186	0.000	0.07		2.0	OK	
S1.003	S12	-0.193	0.000	0.05		2.0	OK	
S1.004	S13	-0.193	0.000	0.05		2.0	OK	
S1.005	S14	-0.191	0.000	0.05		2.0	OK	



Micro Drainage

Glanville Consultants Ltd
Boundary Way
3 Grovelands Business Center
Hemel Hempstead HP2 7TE
XP Solutions
Date : 10/08/2023 13:51
Designed by : FG
Filename : \\GC-HEM-FS01\CAD\2022\4220349\(3)_CIVIL-TR
Scale 1: 542
SW DRAINAGE STRATEGY
McD FARNHAM
GC 4220349
Network 2019.1

Appendix C:
Product Details



SPEL Stormceptor

ESR (Enhanced Silt Retention)

SuDS Compliant ESR Range

spelproducts.co.uk

SPEL Stormceptor ESR Range
By-Pass System

The **total** treatment solution for SuDS

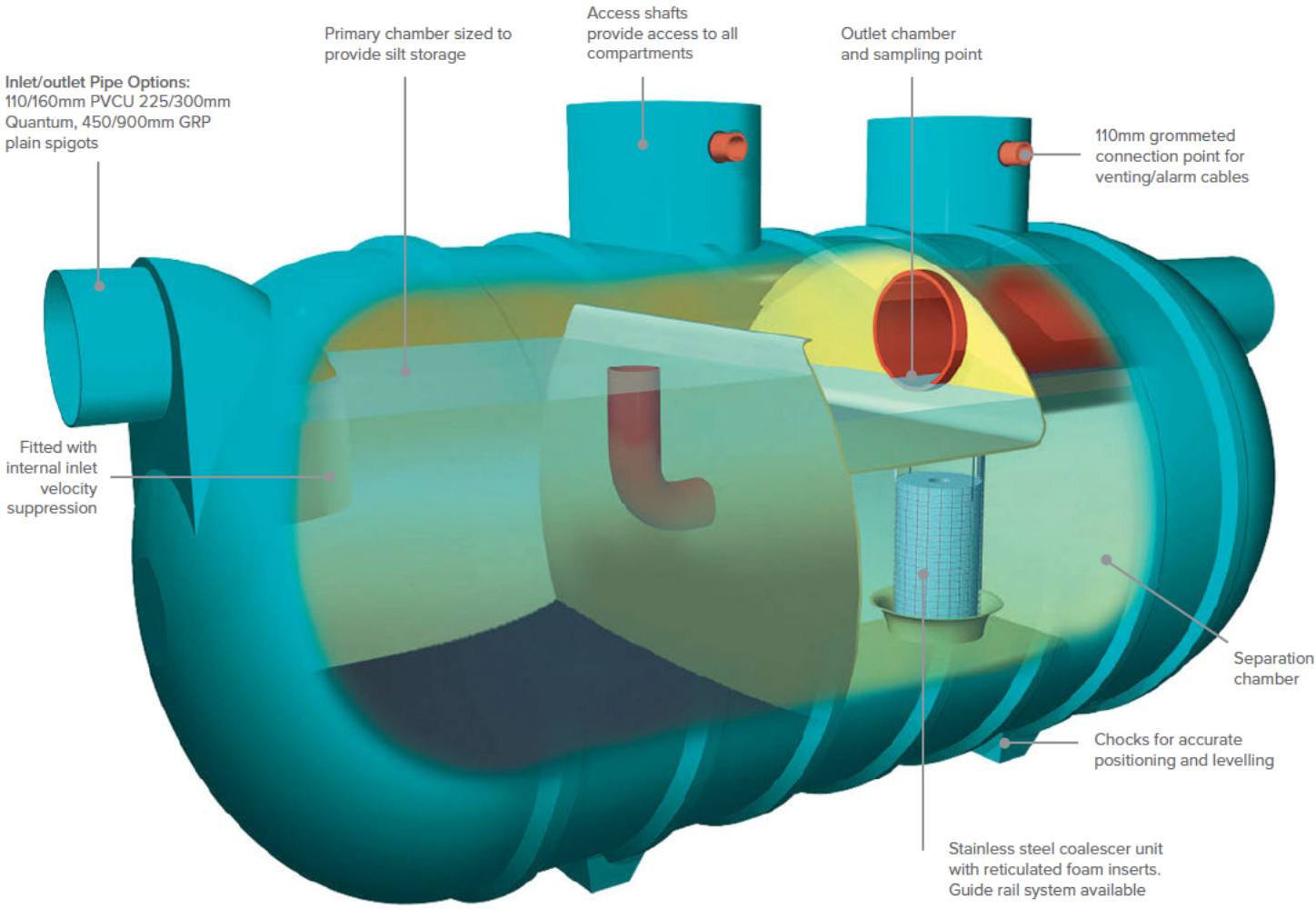
The new SPEL ESR System is fully certified to meet the CIRIA SuDS Mitigation Index. It has been tested by WRc (for TSS and Metals) to the British Water Code of Practice for Manufactured Treatment Devices. This unit is also compliant to the British and European Standard BS EN 858.

SPEL's ESR range is a total treatment system removing Hydrocarbons, Total Suspended Solids (TSS) and Metals (particulate). It's a highly efficient, single unit, water quality SuDS component.

SPEL ESR Stormceptor Certified Mitigation Index

TSS	0.8
Metals	0.6
Hydrocarbons	0.9*

**H R Wallingford test results to BS EN 858*



SPEL Stormceptor ESR Range
By-Pass System

wrc

Surface Water Treatment Device Performance Declaration

Testing carried out according to British Water Code of Practice

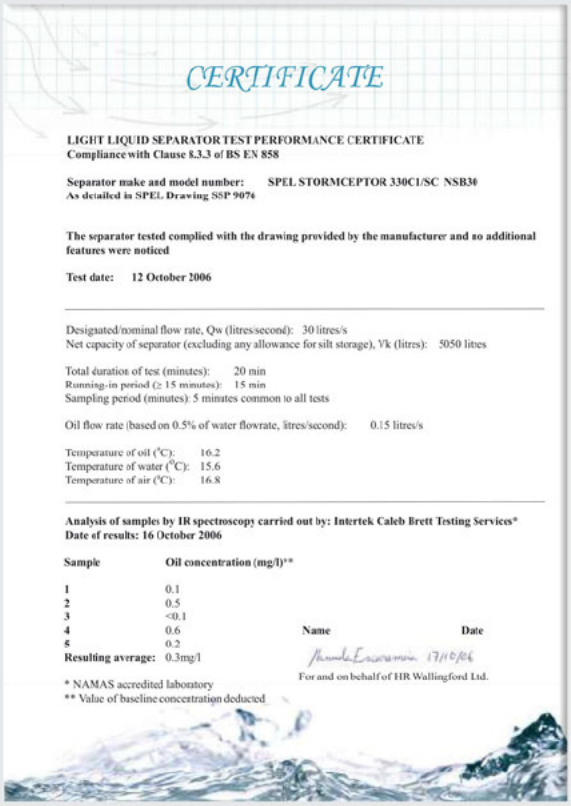
Product Details	Description
Manufacturer	SPEL Products
Treatment Device Name/Model	Stormceptor Type 210 C1/SC
General description	Class 1 By-pass Separator with Silt Capacity
Envisaged application	Treatment of Surface Water Run-off
Pollutant(s) captured	Suspended Solids

Test	Value	Unit
Treatment device capacity	3200	litres
Sediment Storage capacity	1000	litres
Treatment Flow rate	10	l/s
Connected Area	1,333	m²
Pollution retention flow rate	10	l/s

Parameter	Value	Unit
Maximum capacity flow rate	100	l/s
Device head loss (at treatment flowrate)	0.15	m
Device head loss (at maximum capacity treatment flowrate)	-	m
TSS capture and retention efficiency (Milisil W4 test sediment)	82	%
Zinc capture efficiency (if tested)	Not tested for dissolved metals	%
Zinc retention efficiency (if tested)	Not tested for dissolved metals	%
Copper capture efficiency (if tested)	Not tested for dissolved metals	%
Copper retention efficiency (if tested)	Not tested for dissolved metals	%
Dissolved Metals reduction	0 0	%
Particulate metals reduction*	61.5*	%
Total Metals reduction*	61.5*	%
Total Metals Mitigation Index	0 615*	-

* Extrapolated value in accordance with British Water How to Guide: Applying the CIRIA The SuDS Manual (C753) Simple Index Approach to Proprietary / Manufactured Stormwater Treatment Devices. Version 7, Section 4.3, (2021- under pre-publication review).

Certificates of compliance from WRc and HR Wallingford for the SPEL Stormceptor ESR Range



CERTIFICATE

LIGHT LIQUID SEPARATOR TEST PERFORMANCE CERTIFICATE
Compliance with Clause 8.3.3 of BS EN 858

Separator make and model number: SPEL STORMCEPTOR 330C1/SC NSB30
As detailed in SPEL Drawing SSP 9076

The separator tested complied with the drawing provided by the manufacturer and no additional features were noticed

Test date: 12 October 2006

Designated/nominal flow rate, Qw (litres/second): 30 litres/s
Net capacity of separator (excluding any allowance for silt storage), Vk (litres): 5050 litres

Total duration of test (minutes): 20 min
Running-in period (≥ 15 minutes): 15 min
Sampling period (minutes): 5 minutes common to all tests

Oil flow rate (based on 0.5% of water flowrate, litres/second): 0.15 litres/s

Temperature of oil (°C): 16.2
Temperature of water (°C): 15.6
Temperature of air (°C): 16.8

Analysis of samples by IR spectroscopy carried out by: Intertek Caleb Brett Testing Services*
Date of results: 16 October 2006

Sample	Oil concentration (mg/l)**
1	0.1
2	0.5
3	<0.1
4	0.6
5	0.2
Resulting average:	0.3mg/l

Name **Date**

For and on behalf of HR Wallingford Ltd.

* NAMAS accredited laboratory
** Value of baseline concentration deducted

SPEL's Head of Technical Development alongside the WRc testing officer.

Research and Development

Research and development is at the heart of what we do at SPEL, our passion as Zero Pollution Ambassadors is to be at the cutting edge of clean surface water technology.

Months of rigorous testing has resulted in the new SPEL Stormceptor ESR Range.


Quality Assured Company
BS EN ISO 9001
Design & Manufacture

Protecting our environment for over 45 years

The SuDS Manual is leading good practise in drainage design, SPEL are endorsing this with the release of the new SPEL Stormceptor ESR range.

Total Suspended Solids (TSS)	Metals	Hydrocarbons
0.8	0.6	0.9*

**H R Wallingford test results to BS EN 858*

Added to these class-leading Mitigation Indices, the ESR range benefits from:

- British/European Standard BS EN 858-1 2002 certification.
- The SPEL 25 year shell Warranty.
- 50 year+ life expectancy.
- ISO9001 quality assurance.
- ISO14001 committed to environmental improvement

26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation Indices		
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Tables from The SuDS Manual (C753), p568-569
For reference notes, please see the full manual: https://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

SPEL Stormceptor ESR Range By-Pass System

ESR Specification Chart

Model	Series	Treated Flow Rate - l/s	Maximum Flow	Catchment area (m^2)*	Oil storage (litres)	Silt capacity (litres)	Overall length* (mm) L	Overall diameter (mm)	Inlet Invert (mm) A	Base to Inlet (mm) B	Base to outlet (mm) C	Max in/ out pipe diameter** (mm)	Number of access shafts (dia. mm) 600	750	900	1200
ESR10/C1	200	10	100	1,333	150	1,000	2,920	1,225	560	1,350	1,300	300	-	1	-	-
ESR15/C1	200	15	150	2,000	225	1,500	4,237	1,225	560	1,350	1,300	300	-	1	-	-
ESR20/C1	300	20	200	2,665	300	2,000	3,200	1,875	700	1,450	1,350	450	2	-	-	-
ESR25/C1	300	25	250	3,333	375	2,500	3,540	1,875	700	1,450	1,350	450	2	-	-	-
ESR30/C1	300	30	300	4,000	450	3,000	4,420	1,875	700	1,450	1,350	450	-	1	1	-
ESR40/C1	300	40	400	5,333	600	4,000	5,760	1,875	740	1,410	1,310	450	1	1	-	-
ESR45/C1	300	45	450	6,000	675	4,500	6,570	1,875	740	1,410	1,310	450	1	1	-	-
ESR50/C1	300	50	500	6,665	750	5,000	7,060	1,875	740	1,410	1,310	450	1	1	-	-
ESR60/C1	400	60	600	8,000	900	6,000	4,400	2,700	950	2,100	2,000	600	1	-	1	-
ESR70/C1	400	70	700	9,333	1,050	7,000	5,250	2,700	950	2,100	2,000	600	1	-	1	-
ESR80/C1	400	80	800	10,665	1,200	8,000	6,170	2,700	950	2,100	2,000	600	1	-	1	-
ESR100/C1	400	100	1000	13,333	1,500	10,000	7,400	2,700	1,100	1,950	1,850	750	1	-	1	-
ESR125/C1	400	125	1250	16,665	1,875	12,500	9,050	2,700	1,100	1,950	1,850	750	1	-	1	-
ESR150/C1	400	150	1500	20,000	2,250	15,000	9,950	2,700	1,100	1,950	1,850	750	-	-	2	-
ESR160/C1	400	160	1600	21,333	2,400	16,000	11,830	2,700	1,250	1,800	1,700	750	1	1	1	-
ESR180/C1	500	180	1800	24,000	2,700	18,000	7,470	3,650	1,185	2,690	2,550	900	-	-	-	-
ESR200/C1	500	200	2000	26,665	3,000	20,000	8,530	3,650	1,185	2,690	2,355	1,200	-	-	-	-
ESR250/C1	500	250	2500	33,333	3,750	25,000	10,040	3,650	1,185	2,690	2,355	1,200	-	-	-	-
ESR300/C1	600	300	3000	40,000	4,500	30,000	10,310	4,150	1,325	2,850	2,675	1,200	-	-	-	-
ESR350/C1	600	350	3500	46,665	5,250	35,000	11,470	4,150	1,325	2,850	2,675	1,200	-	-	-	-
ESR400/C1	600	400	4000	53,333	6,000	40,000	12,690	4,150	1,325	2,850	2,675	1,200	-	-	-	-
ESR500/C1	600	500	5000	66,665	7,500	50,000	15,870	4,150	1,325	2,850	2,675	1,200	-	-	-	-
ESR600/C1	600	600	6000	80,000	9,000	60,000	18,260	4,150	1,325	2,850	2,675	1,200	-	-	-	-
ESR700/C1	600	700	7000	93,333	10,500	70,000	22,250	4,150	2,850	2,850	2,675	1,200	-	-	-	-

**These catchment areas are based on the SuDS Manual requirement for By-Pass devices to treat the 1 in 1 year storm event (27mm).*
***This dimension is for A-C inlet/outlet options, larger pipe sizes are available for D-I inlet/outlet options.*

200 Series ESR – Inside diameter 1200mm, outside diameter 1225mm.

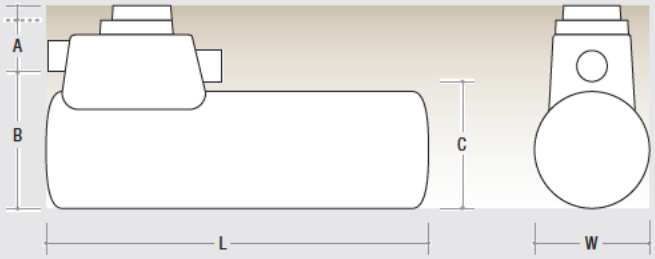
300 series ESR – Inside diameter 1800mm, outside diameter 1875mm.

400 series ESR – Inside diameter 2600mm, outside diameter 2700mm.

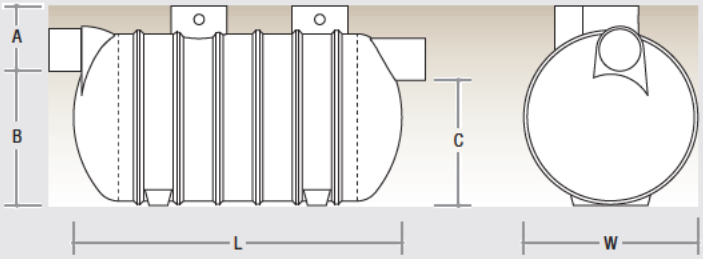
500 series ESR – Inside diameter 3500mm, outside diameter 3650mm.

600 series ESR – Inside diameter 4000mm, outside diameter 4150mm.

200 series



300/400/500 & 600 series



Optional extras

SPEL coalescer unit guide rail systems

To facilitate easy insertion of coalescer units, the SPEL guide rail system manufactured in stainless steel can be incorporated into SPEL Puraceptors and class 1 Stormceptors.

Brackets fixed to the top and bottom of the coalescer unit simply engage the stainless steel guide rail fixed to the top of the stub access shaft. The coalescer unit is then lowered in the normal way, being guided at the correct angle into the conical base.

Lifting chains are available for the larger coalescer units and where extension shafts are fitted.

Extension guide rails can be incorporated into SPEL extension shafts to suit.

SPEL coalescer unit lifting, locating and locking system

The SPEL lifting, locating and locking system is manufactured in stainless steel and replaces the standard coalescer unit handle.

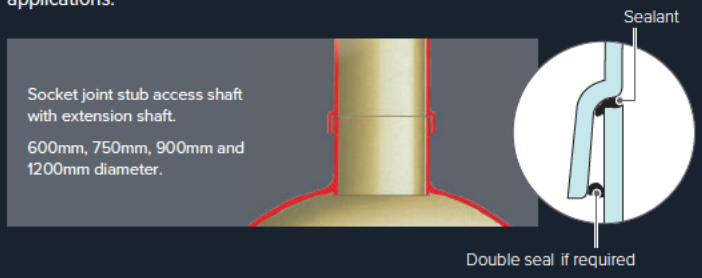
The locating/locking handle ensures the coalescer unit is seated and locked in its correct position after maintenance.

Above left:
Lifting, locating and locking system with guide rail system.

Above right:
The SPEL coalescer unit with lifting chain.

SPEL extension access shafts

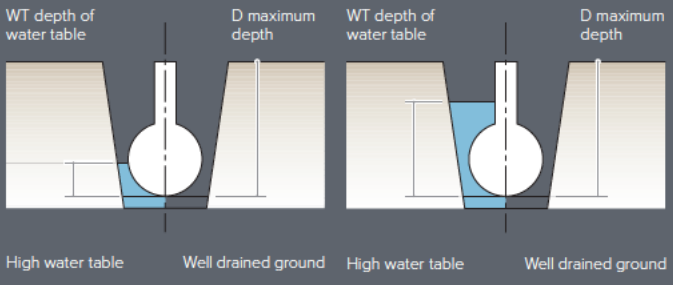
Extension access shafts are available for deep invert applications.



Tank shell specifications

The 'standard' specification is normally adequate for most installations but heavier specifications are available depending upon the burial depth and water table level, in winter. The concern is when the system is emptied completely and remains empty for a period of time.

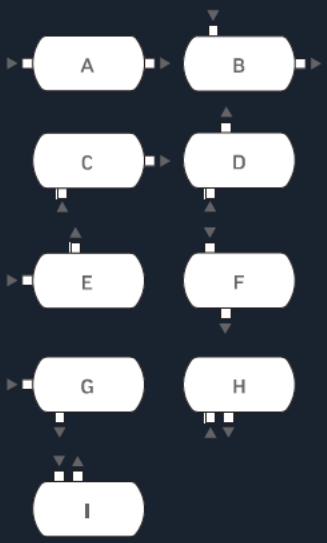
Standard tanks			Heavy tanks		
Series	WT (m)	D (m)	Series	WT (m)	D (m)
100/200	1.0	4.0	100/200	2.0	6.0
300	0.9	4.0	300	2.8	5.6
400	1.3	5.0	400	3.5	6.0
500	1.9	5.7	500	4.5	7.25
600	2.4	6.2	600	4.7	7.3



Based on installation in concrete with concrete surround
For pea gravel surround, see SPEL Data Manual p13.5

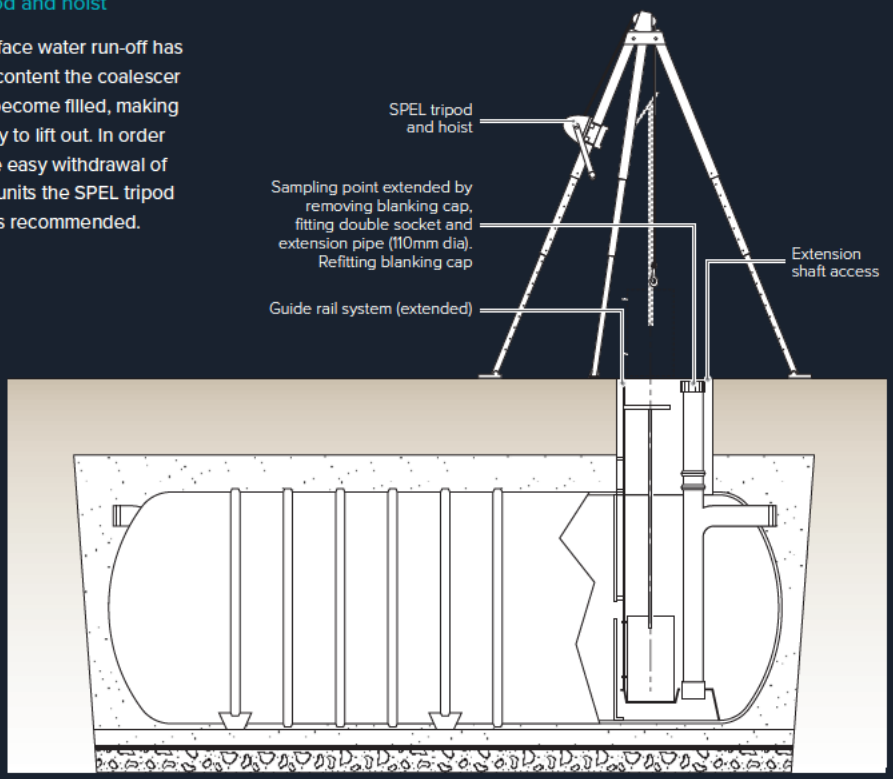
SPEL ESR Range – Inlet/outlet orientation

Dependent upon model and diameter of connections, these nine different orientations are available. However on the larger models it is important to check with our technical department.



SPEL tripod and hoist

Where surface water run-off has a high silt content the coalescer units can become filled, making them heavy to lift out. In order to facilitate easy withdrawal of coalescer units the SPEL tripod and hoist is recommended.



SPEL

Quality that protects the environment the **safest way**

The SPEL underground tanks have been designed with reference to BS EN 13121

SPEL Tank shells carry a 25 year Warranty and have a life expectancy of over 50 years

Rigorous quality control procedures at all stages of manufacture for each serial numbered tank, ISO 9001.

SPEL is an environmentally accredited company to ISO 14001.

Certificate No: FM 35174 UVDB/Achilles accredited – Supplier No. 88611.

Scan code with a QR reader to launch our website: spelproducts.co.uk

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Appendix D:
EA Letter

creating a better place

Environment Agency

Guildford Borough Council
Development Control
Millmead House Millmead
Guildford
Surrey
GU2 4BB

Our ref: WA/2017/124353/05-L01
Your ref: 17/P/01879

Date: 25 June 2018

Dear Ms Yates

Proposed erection of a roadside services facility with associated vehicular access, car parking, and landscape/habitat enhancements. Land at Runfold Farm, Grange Road, Tongham, Farnham, GU10 1QJ

We have reviewed the submitted Flood Risk Assessment (FRA) Addendum, which includes details on the pre development flood levels on site, locations of proposed earth works and floodplain compensation for the areas of the site that are proposed to be raised. The loss of floodplain storage has been assessed using the correct climate change allowance of 35% (71.86). We are satisfied that the proposal is acceptable based on the conclusions of the FRA addendum.

Environment Agency position
We are now in a permission to **withdraw** our objection to the proposed development providing the following conditions are applied to any planning permission granted.

Condition 1
The development permitted by this planning permission shall be carried out in accordance with the Flood Risk Assessment (FRA) Addendum Ref 066717-CUR-00-XX-RP-D-002 V01 issue date 23 May 2018 by Curtins and the following mitigation measures detailed within the FRA addendum:

1. Compensatory flood plain storage as shown detailed in the Flood Risk Assessment (FRA) Addendum Ref 066717-CUR-00-XX-RP-D-002 V01 and drawing titled Proposed Flood Analysis Flood Levels Post Development 82002 P04 dated 02/02/2018.

The mitigation measure(s) shall be fully implemented prior to occupation and subsequently in accordance with the timing / phasing arrangements embodied within the scheme, or within any other period as may subsequently be agreed, in writing, by the local planning authority.

Cont/d..

Reason
To prevent flooding elsewhere by ensuring that compensatory storage of flood water is provided.

Advice
We are reliant on the accuracy and completeness of the reports in undertaking our review, and can take no responsibility for incorrect data or interpretation made by the authors.

Condition 2
No development approved by this planning permission shall commence until a remediation strategy to deal with the risks associated with contamination of the site has been submitted to, and approved in writing by, the Local Planning Authority. This strategy will include the following components:

1. A preliminary risk assessment which has identified:
   - all previous uses;
   - potential contaminants associated with those uses;
   - a conceptual model of the site indicating sources, pathways and receptors; and
   - potentially unacceptable risks arising from contamination at the site.

2. A site investigation scheme, based on (1) to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off site.

3. The results of the site investigation and the detailed risk assessment referred to in (2) and, based on these, an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken.

4. A verification plan providing details of the data that will be collected in order to demonstrate that the works set out in the remediation strategy in (3) are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action.
Any changes to these components require the written consent of the local planning authority. The scheme shall be implemented as approved.

Reason
To ensure that the development does not contribute to, or is not put at unacceptable risk from, or adversely affected by, unacceptable levels of water pollution in line with paragraph 109 of the National Planning Policy Framework.

The Supporting Planning Statement by WYG dated August 2017 indicates that parts of the site may be former excavations and infill and that activities such as motorcycle racing have occurred onsite. These activities present a *medium* risk of contamination that could be mobilised during construction to pollute controlled waters. Controlled waters are particularly sensitive in this location because the proposed development site lies on a Secondary aquifer A.

We ask to be consulted on any details submitted in compliance with this condition.

Advice to applicant
With regard to the proposed petrol filling station, good practice should be followed in the location, design, construction and maintenance of Petrol Stations and other fuel dispensing facilities. Due regard should be given to
'The Environment Agency's approach to groundwater protection'

in particular the position statements and guidance in the section on the storage of pollutants (Section D). This document is available to download from: https://www.gov.uk/government/publications/groundwater-protection-position-statements
In particular note the potential issues with regard to sub water table (D3)
You should also refer to the following pollution prevention and mitigation guidance including:

Guidance on Environmental Management at Petrol Filling Stations – Energy Institute;
Design, construction, maintenance and decommissioning of filling stations (also known as the Blue Book (APEA/EI) – Energy Institute – 2011;
Groundwater Protection Code – Petrol stations and other fuel dispensing facilities Involving underground storage tanks – Defra Code of Practice; and
CIRIA C736:Design of Containment Systems for the Prevention of Water Pollution;

The Blue Book provides detailed information on the decommissioning (and investigation) of redundant tanks, risk assessment, the design and construction criteria and maintenance procedures which we expect to be implemented.

Informative
This development may require an Environmental Permit from the Environment Agency under the terms of the Environmental Permitting (England and Wales) (Amendment) (No. 2) Regulations 2016 for any proposed works or structures, in, under, over or within 8 metres of the top of the bank of designated 'main rivers'. This was formerly called a Flood Defence Consent. Some activities are also now excluded or exempt. An environmental permit is in addition to and a separate process from obtaining planning permission. Further details and guidance are available on the GOV.UK website: https://www.gov.uk/guidance/flood-risk-activities-environmental-permits.

Final comments
Once again, thank you for contacting us. Our comments are based on our available records and the information as submitted to us. Please provide us with a URL of the decision notice, or an electronic copy of the decision notice or outcome.

If I can be of any further assistance, please contact me directly.

Yours sincerely

Mrs Cathy Harrison
Planning Advisor

[redacted]

cc WYG Environment Transport Planning Limited

Glanville

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