



Phase I & II Geo-Environmental Assessment

Markfield Services

Little Shaw Lane
Markfield
Leicestershire
LE67 9PP

Prepared for:

EG on The Move Ltd

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MARKFIELD SERVICES, LEICESTERSHIRE

NON-TECHNICAL CLIENT SUMMARY

This report presents the findings of a combined Phase I Desk Study and Phase II Intrusive Investigation undertaken to determine ground conditions, establish if there are any contamination risks associated with the site and its development and provide a geotechnical appraisal. Pertinent findings and conclusions may be summarised as follows:

- Geological mapping indicates that the site lies predominantly over a deposit of gravel, sand, clay, and silt, with an area of Alluvium on the northern boundary which corresponds to the small, culverted stream. Mudstone bedrock of two formations underlies the superficial material.
- Intrusive investigations included fifteen window sample boreholes to a depth of 5.0m below ground level (bgl), with a maximum depth of made ground recorded as 2.3m, predominantly in the vicinity of the former petrol filling station (PFS). Groundwater was found sporadically, suggesting it was perched.
- The Oadby Member is typically a firm clay, and is considered suitable for the use of spread foundations, with bearing capacities starting from 65kN/m² and increasing modestly with depth. Given the depth of made ground (particularly in the east of the site), conventional spread foundations may not be suitable and alternative solutions, such as a raft, may need to be considered.
- Results of soil and groundwater testing suggest that residual contamination from the previous use of the site as a PFS is present and evidence of a historical fuel leak has been identified. Risks to human health through direct contact with soils have been identified to be low and acceptable given the low-sensitivity commercial nature of the proposed development. However, potentially unacceptable risks to controlled waters, and future users through organic vapours, warrant further action.

RECOMMENDED FURTHER WORKS

- It is recommended that a Remedial Strategy & Implementation Plan (RS & IP) is developed for site, which will initially include the removal of existing fuel storage and distribution infrastructure (old tanks and lines), as well as any grossly impacted soils.
- Upon removal of the fuel infrastructure, further soil, vapour and groundwater sampling/monitoring is to take place as part of the verification works, the results of this work will establish if any further in-situ treatment of groundwater is necessary (unlikely) and also determine on whether vapour resistant membranes are required for new buildings.

The above points represent a simplified summary of the findings of this assessment and **must not** form the basis for key decisions for the proposed development. A thorough review of the details is contained within the following report, or alternatively get in touch and we'll talk you through it.



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Where ground investigations have been conducted, these have been limited to the level of detail required for the site in order to achieve the objectives of the investigation.

The report has been written, reviewed and authorised by the persons listed above. It has also undergone EPS' quality management inspection. Should you require any further assistance regarding the information provided within the report, please do not hesitate to contact us.

The National Planning Policy Framework requires a competent person to prepare site investigation information, which is defined as a person with a recognised relevant qualification, sufficient experience in dealing with the type(s) of pollution or land instability, and membership of a relevant professional organisation. EPS considers that it fulfils these criteria and would welcome any request for staff CVs or case studies to demonstrate it.

As stated within DEFRA's Contaminated Land Statutory Guidance, with any complex risk assessment it is possible that different suitably qualified people may reach slightly different conclusions when interpreting the same information. EPS recognises this and considers the conclusions presented within this report to be robust and appropriate but input from the Local Authority and their judgement in line with this guidance would still be welcomed.

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1 INTRODUCTION

In January 2026, Environmental Protection Strategies Ltd (EPS) was commissioned by EG on The Move Ltd to complete a Phase I and II Geo-Environmental Assessment Report at Markfield Services, Little Shaw Lane, Markfield, Leicestershire, LE67 9PP ('the site'); see Figure 1.

The work was commissioned in order to fulfil pre-planning requirements and to investigate the geo-environmental and geotechnical characteristics of the site to facilitate demolition of the existing services and construction of a new petrol filling station, restaurant, coffee kiosk, and all related roads, parking, and utilities.

This report presents the findings, conclusions, and recommendations of the Phase I Desk Study and subsequent Phase II Intrusive Investigation undertaken as instructed.

1.1 Objectives

The objectives of this investigation were as follows:

- a) Compile a Phase I Desk Study and Conceptual Site Model through a Preliminary Risk Assessment to evaluate the potential risks the site may pose to human and environmental receptors, both currently and in future.
- b) Investigate potential contaminant linkages identified in the CSM by means of investigating shallow soils, groundwater and soil gases.
- c) Determine the potential risks posed by the site and make recommendations for further work that may be required, to ensure safe development in accordance the Environment Agency's *Land Contamination: Risk Management* guidance (LC:RM) and the *National Planning Policy Framework*.
- d) To collect information on ground conditions and strength in order to make appropriate recommendations for geotechnical design.
- e) Collect information regarding waste classification of soils for offsite disposal.

1.2 Scope of Work

To perform an exploratory assessment of the site in accordance with the principles and requirements of DEFRA's '*Contaminated Land Statutory Guidance*' (2012), BS10175:2026 – '*Investigation of Potentially Contaminated Sites*', BS 5930:2015+A1:2020 '*Code of practice for ground investigations*' and BS EN 1997 – 1,2 & 3: 2024 '*Geotechnical Design*', the following tasks were undertaken:

Desk Study:

- Collection of site records.
- Study of existing geological, hydrogeological and historic maps of the area.
- Consultation of environmental databases, including records held by the local authority (where available).
- Review of proposed development plans.

- Development of a Conceptual Site Model (CSM) through a Preliminary Risk Assessment.

Intrusive Investigation:

- Site walkover, inspection of any visual evidence of contamination at the site, obtaining photographic records.
- Health and safety briefing / site supervision.
- Concrete coring through hardstanding to facilitate borehole formation.
- Drilling of fifteen windowless sample boreholes to a maximum depth of 5.0m below ground level (bgl), using a track-mounted, percussive rig.
- Continual logging of ground conditions including inspection of samples for visual and olfactory contamination, and laboratory analysis of selected representative samples.
- Completion of in-situ strength testing throughout the boreholes, and headspace testing with a photo-ionisation detector (PID) where required.
- Installation of groundwater monitoring standpipes at selected locations, with a return groundwater sampling programme conducted.

Reporting:

- Data collection
- Interpretation of data including completion of Generic Quantitative Risk Assessment

The findings and conclusions of these investigations are presented in the following sections.

1.3 Limitations and Constraints

The purpose of this report is to present the findings of a soil sampling investigation conducted at the location(s) specified. When examining the data collected from the investigations made during the assessment, Environmental Protection Strategies Ltd (EPS) makes the following statements:

No investigation method is capable of completely identifying all ground conditions that might be present in the soil or groundwater under a site. Where outlined in our report, we have examined the ground beneath a site by constructing a number of boreholes to recover soil and groundwater samples. The locations of these excavations and sampling points are considered to be representative of the condition of the whole site subsurface however, ground conditions are naturally variable, and it may be possible that the conditions encountered may differ to those found during the investigation.

No visible evidence of Japanese Knotweed was identified during the site walkover. However, this plant can be difficult to identify in the early stages of growth and therefore it is not always possible to identify its' presence at certain times of the year. For this reason, EPS cannot confirm that Japanese Knotweed rhizomes do not exist, and it is recommended that if it is suspected that this species, or other similarly invasive plants are present at the site, a specialist contractor should be commissioned to make a detailed assessment.

This report does not include specific investigation for the presence of Potential Asbestos Containing Material (PACM). Specialist contractors should be commissioned to make detailed assessments and recommendations if these materials are suspected.

The investigation was carried out to assess the significance of contamination resulting from the use of the site as identified in this report. Unless EPS has otherwise indicated, no assessment of potential impact of any other previous uses has been made.

2 SITE CHARACTERISATION

The following section provides a summary of the information collected in relation to the site location and history.

2.1 Site & Location Description

Detail	Description
Location	The site lies at junction 22 on the M1, directly west of the roundabout connecting the M1 running north-south with Little Shaw Lane to the northwest. Furthermore, the site is located approximately 1.7km northwest of Markfield, and 13km northwest of Leicester city centre.
Grid Reference	Easting: 447679, Northing: 311137
Topographic Elevation	A site-specific topographical survey has been completed for the site and made available to EPS, this has been included within Appendix C. This survey shows that the levels are approximately 189m Above Ordnance Datum (AOD) in the northeast, gently sloping upward to 193m AOD in the southwest.
Description of Site	The site is roughly rectangular and covers an area of approximately 2.42 hectares. At the time of the walkover survey (28th January 2026), the site was found to comprise an inactive service station, Markfield Services, that consists of an abandoned main services building to the south of the site, an inactive petrol filling station (PFS) to the southeast, and an active Travelodge to the southwest. The main services building closed in 2014, whereas the PFS closed in 2020. The site has vegetated soft landscaping present throughout, with hedgerow present surrounding all sides. A service road snakes through the middle and eastern half of site, from the northern boundary down to the southern end of the eastern boundary. The west half of site predominantly comprises a car park for the active two-story Travelodge, which is situated along the western end of the southern boundary. Located centrally along the southern boundary, the now inactive single-story services building is surrounded by trees and vegetation. The eastern half of site is mostly bituminous hardstanding with a PFS located toward the southern end of the eastern boundary. Concrete bollards and barricades, as well as fencing, limited access to the hardstanding areas surrounding the service road. The canopy, pump islands, and tank lids remain although the PFS is no longer active.

Detail	Description
Description of Site (cont.)	There were twelve lids visible in the vicinity of the tanks, though only ten are assumed to be tank lids. The vent stacks are still present south of the old sales kiosk, southeast of the majority of the tank lids. An old car wash was also present to the southwest of the inactive PFS. The majority of the site was covered by bituminous hardstanding, with localised areas of sandstone flagging around the hotel and services building. On the whole, the hardstanding was in a general poor condition with multiple cracks and large potholes, especially in the hotel access road to the north. General drainage and ACO drains were observed across the site, and an interceptor is present on the PFS forecourt. A manhole to the northwest of the sales kiosk, beneath the canopy, was overflowing and leaving white streaks across the forecourt, accompanied by a pungent, rancid odour.
Surrounding Land Use	The site lies west of the roundabout at junction 22 of the M1. Little Shaw Lane borders the northern boundary of the site with some residential housing beyond and Cliffe Lane to the east and south-east. Further south-east is an outdoor paintball arena. Agricultural land borders the site to the west and south. Approximately 200m to the south is Old Cliffe Hill quarry (~60 Hectares), historically extracting both granite for road aggregate, and diorite of the South Charnwood Diorites formation.

A plan showing the site location is provided as Figure 1, the current site layout is detailed on Figure 2 and an aerial photograph is included as Figure 3. Selected site photographs and Site Walkover Notes are included as Appendix A, a proposed development plan is included as Appendix B and relevant extracts of a Landmark Envirocheck report are included as Appendix D-G.

2.2 Geo-Environmental Setting

Detail	Description
Geology	Geological mapping shows the site is underlain by diamicton of the Oadby Member, and locally alluvium of clay, silt, sand, and gravel toward the northern boundary surrounding the stream. The superficial material is further underlain by bedrock mudstone of the Edwalton Member, outcropping toward the south. An area of made ground associated with the M1 slip road is recorded 85m southeast. Information on the site's geological context is included as Appendix E.

Detail	Description	
British Geological Survey (BGS)	Historic borehole logs were acquired from the British Geological Survey. One borehole (ID: SK41SE10) is located 160m to the east north-east, and on a similar elevation to the study area, and reports a thin layer of topsoil overlying pebbly clay down to approximately 9.2mbgl and the termination of the borehole. Another historic borehole (ID: SK41SE198), located 159m to the east of site, was drilled during the widening of the M1, and recorded made ground fill down to 8.90mbgl, which was underlain by firm to stiff red brown sandy gravelly clay down to the termination of the borehole at 14.50mbgl. Another of the nearby historic boreholes (ID: SK41SE9), located 156m to the east, recorded a thin layer of topsoil underlain by various strata of sandy pebbly clay down to 9.3mbgl, where the borehole terminated.	
	Groundwater was encountered in the historic borehole log (ID: SK41SE9) at a depth of 2.28mbgl. Copies of the historic borehole logs are included within Appendix E.	
Geological Hazards	Hazard	On Site Risk
	Mining (non-coal)	No Hazard
	Collapsible Ground	Very Low
	Compressible Ground	No Hazard (moderate associated with alluvium)
	Ground Dissolution	No Hazard
	Running Sand	Low
	Landslide	Very Low
	Shrinking / Swelling Clay	Low
	The Envirocheck records three BGS recorded mineral sites within 500m of the site, the nearest being Old Cliffe Hill Quarry 375m south extracting igneous and metamorphic rocks. There are no man-made or natural cavities recorded within 500m of the site.	
Radon	The Envirocheck indicates the site to lie in a location where the percentage of homes above the radon action level is less than 1%. It further reports that the site will not require radon protection measures in the construction of new buildings.	
Hydrogeology	Groundwater vulnerability maps for the area show that the underlying superficial geology is classified as a Secondary Aquifer with the small section of alluvium classified as a Secondary A Aquifer. The bedrock geology is classified as predominantly a Secondary Aquifer B, however the small outcropping of sandstone of the Cotgrave Sandstone Member is classified as a Secondary A Aquifer. The site does not lie within a Source Protection Zone (SPZ) for local groundwater abstraction.	

Detail	Description
	The Envirocheck report doesn't list any groundwater abstractions within 500m. Groundwater vulnerability maps are included as Appendix F.
Hydrology & Flood Risk	The nearest surface water feature is a small stream along the northern boundary, trending approximately northwest to southeast. The stream is present within the hedgerow to the northwest and is culverted beneath the road and along the hedgerow to the northeast. The Envirocheck report lists four discharge consents within 3m of the site boundary. The first two discharge consents, from May 1988, were 1m north and 3m northeast of site by Granada Hospitality Limited for 'Trade Effluent Discharge-Site Drainage'. Similarly, in May 2003, BP Oil UK Ltd were given two discharge consents, also 1m north and 3m northeast for 'Trade Effluent Discharge-Site Drainage' into a freshwater stream/river. Review of the EA Flood Zone Map for the area indicates that the site lies within Flood Zone 1, which is defined as the area with a low potential risk of flooding from fluvial or tidal sources. It should be noted that the EA maps do not take into account flooding from poor drainage or groundwater. A copy of the flood map for the site and surrounding area is also included within Appendix F.
Known Site Drainage & Utilities	A combined utility and topographical survey has been provided to EPS for the site by the Client; this is included within Appendix C. In general, there are gullies trending approximately east-west, one to the north of the PFS sales kiosk and one to the south. There are six below ground tanks present from the former use of the site as a PFS, as well as pump islands and associated below ground utilities.
Landfill & Waste	The BGS, Local Authority, and historical records do not have any records of historic or active landfills within 500m of the site, and no waste transfer or waste treatment sites are within 500m of the site. One area of infilled land (non-water) is recorded within 500m, at 498m southwest of site, which aligns with a section of the current Old Cliffe Hill Quarry.
Permitted Industrial Activity	One site is permitted by the local authority for industrial activity within 500m, which was the former PFS on-site.
Industrial Land Use & Points of Interest	The Envirocheck report lists five industrial land uses/points of interest within 500m, the most pertinent of which are summarised below.

Detail	Description		
	Land Use	Distance (Direction)	Status
	A511/M1 Markfield Service Area (PFS, Vehicle Cleaning Services)	On-site	Inactive
	Deuce Recovery Service (Breakdown and Recovery)	128m (NE)	Inactive
	Euro Garages (Petrol Filling Stations)	146m (N)	Inactive
	There is one fuel station entry record, which is the now obsolete BP station present on site. The Euro Garages site reported 146m north is not listed under the Fuel Station entries section and there is no evidence of this former PFS on historic mapping. An additional PFS with the same address and postcode as the Euro Garages one is also listed 532m northwest and on-site so it might be an inaccurate record or relate to the on-site PFS.		
Pollution Incidents	Two Category 3 – Minor Incident pollution incidents affecting controlled waters are recorded within 100m of the site. The first, a road traffic accident in 1998 leading to oils – diesel to drains, was situated 37m northeast, whereas the second was located 53m north and involved crude sewage entering the Rothley Brook. No other incidents are recorded within 500m.		
Unexploded Ordnance (UXO)	In order to initially assess risks associated with unexploded ordnance (UXO), reference has been made to UXO Bomb Risk maps available publicly available via Zetica UXO. These maps show that the site and the entirety of Markfield is in an area with a 'low' bomb risk and no records of any UXO finds or strategic targets are recorded either on site or in the surrounding area.		
Planning History	Following a review of the Leicester City Council (LCC) planning portal, no planning applications have been identified that are pertinent to the site.		
Previous Investigation or Remediation	EPS are not aware of any previous site investigations or remedial works undertaken at the site, however, during the site walkover existing borehole monitoring wells were observed around the PFS area, listed on the utility survey scans and included in Figure 4.		
Sensitive Land Use	The site lies within a Nitrate Vulnerable Zone where surface water is identified as being at risk. Cliffe Hill Quarry is designated as a Site of Special Scientific Interest located 235m southwest.		

2.3 Site History

A summary of historical map data from 1883 to 2026 is provided below. Key points are highlighted and copies of relevant historic maps and any others examined during the investigation are included in this report as Appendix G.



- In the late 1800s, the site and surrounding area was predominantly undeveloped, except for a few nearby farms.
- Old Cliffe Hill Quarry, located southwest of the site, is a now inactive quarry that existed on the first available historic map in 1883. The quarry has undergone a number of expansions over the years, reaching its current extent in approximately the late 1970s to mid-1980s, and whilst was subsequently abandoned in the 1980s to early 1990s it was reopened in the early 2000s to replace the exhausted reserves at the New Cliffe Hill Quarry.
- There are a number of small ponds present in the surrounding area, including one adjacent to the northern boundary, which was subsequently infilled by 1967.
- In the late 1960s, the M1 and related adjoining roads were constructed to the north, east, and southeast of the site. The stream situated along the northern boundary was culverted and redirected around the southwest of the motorway roundabout. The stream flows south, parallel to the M1 motorway, and eventually outflows more than 3km south into the Thornton Reservoir.
- By the 1970s a depot was located to the north of Little Shaw Lane which was still present in 2026 as was operating as a haulage yard.
- The Markfield Services were constructed on the site in 1989, present on the 1991 historic map and 2000 aerial image, showing the site in its current form. This suggests no change to the layout of the site since its construction. The service station closed around the mid-2010s and the PFS was known to close to 2020.

2.4 Petroleum Officer Information

Given the site's historic use for the storage and retail distribution of petroleum fuels, a request for petroleum records was made to the local authority. The information held regarding the tanks present on site is as follows:

Tank No.	Construction	Install Date	Capacity (Litres)	Product
1	Single Skin Steel*	1989	56,946	Diesel
2	Single Skin Steel*	1989	56,577	Petrol
3	Single Skin Steel*	1989	56,313	Petrol
4	Single Skin Steel*	1989	28,420	Petrol
5	Single Skin Steel*	1989	27,949	Diesel
6	Single Skin Steel*	1995	60,000	Diesel

*The records don't state the exact construction of the tanks but they were believed to be single skinned tanks.

No records are held regarding pressure tests and no details of any tank spills or leaks are provided. However, it was mentioned that in 1997 that during a fuel delivery a small quantity of petrol was delivered into a diesel tank but the issue was resolved and no fuel was spilt during the incident.

It was confirmed that all six tanks were decommissioned in July 2020, by filling with Britfoam^R (a hardfoam product often used for decommissioning PFS tanks).

A full copy of the petroleum officer records are present in Appendix H.

3 PRELIMINARY RISK ASSESSMENT & CONCEPTUAL SITE MODEL

In accordance with the Environment Agency's Land Contamination: Risk Management, there are three stages to managing contaminated land (Risk Assessment, Remedial Options Appraisal / Remediation and Verification). This section outlines the first tier of Stage 1, the Preliminary Risk Assessment.

The following section provides a review of the contaminant linkages that may be active at the site, whereby EPS have examined the potential sources that may be present as a result of historic and / or current site activities and where potential interaction between these sources and the identified human / environmental receptors may occur.

3.1 Background

A Desk Study comprises the first stage of any geo-environmental assessment, the purpose of which is to determine what potentially contaminative activities may have occurred at the property or the surrounding area which may pose an environmental or geological risk to site users, the surrounding environment or proposed development, either at present or in the future.

The method used in this investigation to assess the environmental risk posed is based on the concept of 'contaminant linkage', which considers the following three factors:

Source	The location from which an environmentally hazardous / contaminative substance is, (or was,) derived.
Pathway	A route or mechanism via which a source could come into contact with a receptor to cause significant harm.
Receptor	An environmentally sensitive object or condition e.g. person, property, controlled water, or ecological system, which may be present now or in future.

If all three factors are identified, there is the potential for a 'contaminant linkage' to be active, which could result in significant harm being caused to the environment or human health.

3.2 Source Characterisation

The following potential contaminant sources have been identified at the site and in the surrounding area:

Potential Source	Source Description	Principal Contaminants of Concern
Current and Historic Site Use	Historic use of the site as a Petrol Filling Station and Service Station with at least 6 tanks still present, and associated infrastructure.	TPH (incl. BTEX & MTBE)
	Infill material of unknown origin (Made Ground) used to level areas beneath the former and existing buildings/ hardstanding.	PAH, Metals & ACM
Current and Historic Surrounding Land Use	Areas of infilled land recorded in the surrounding area including a pond on the northern boundary.	Ground Gas (CO ₂ and CH ₄)
	Infill material of unknown origin (Made Ground) used during the construction of the M1 and adjoining roads.	PAH, Metals & ACM
	Current and historical industrial land use of the surrounding area including depots and potentially another PFS within 200m.	PAH, Metals, TPH (incl. BTEX & MTBE)
	Cliffe Slade Farm located around 100m southwest.	TPH, Pesticides & Herbicides

Notes:

PAH	Polycyclic Aromatic Hydrocarbons	ACM	Asbestos Containing Material
TPH	Total Petroleum Hydrocarbons	MTBE	Methyl Tert Butyl Ether
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes	CH ₄	Methane
CO ₂	Carbon Dioxide		

3.3 Potential Receptors

A framework for the assessment of risks arising from the presence of contamination in soils has been produced by the Environment Agency and the Department for the Environment, Food and Rural Affairs (DEFRA) and is presented with the report: *'Using Science to Create A Better Place: Updated Technical Background to the CLEA Model – Science Report SC050021/SR3'*. This guidance document defines a series of standard land-uses which have been further developed into six generic land uses in the Category 4 Screening Levels project for Land Affected by Contamination (DEFRA/Contaminated Land: Applications in Real Environments (CL:AIRE) Project Report SP1010, 2014) which form a basis for the development of the Conceptual Site Model.

Risks posed to controlled waters have been considered in line with the Environment Agency's *approach to groundwater protection* (v1.2, 2018) and associated position statements.

The proposed development plan includes demolition and removal of the existing PFS, tanks, and services building, and construction of a new PFS with tanks, a restaurant, coffee kiosk, development of a new road layout, and all relevant utilities. Therefore, the land use has been considered as:

- Commercial

The above land use has been adopted as it is considered the most representative at this stage, in terms of exposure pathways and activity patterns.

In view of the environmental setting, current and potential future land use of the site and surrounding sites, the potential receptors for any contaminant impact are discussed in the table below:

Receptor	Site Specific Description
Human	Future site users, site workers involved in the site redevelopment, and those working and living in the surrounding area have the potential to be at risk from exposure to potential contaminants of concern (CoCs).
Groundwater	The mapped underlying geology is variable but the superficial and bedrock strata are all classified as Secondary Aquifers with superficial Oadby Member a Secondary Undifferentiated Aquifer. The bedrock Edwalton Member and Gunthorpe Member are both classified as Secondary Aquifer B, whereas the Cotgrave Sandstone Member is classified as a Secondary Aquifer A. One of the nearby historic borehole logs suggests that groundwater could be within 3m of surface, i.e. quite shallow. The site does not lie within a SPZ for nearby groundwater abstraction, however, the groundwater could have some resource potential and therefore, groundwater should be considered as a potential receptor to site derived contaminants.
Surface Water	The nearest surface watercourse is a small predominantly culverted stream present within the site boundary, trending approximately northwest to southeast along the northern boundary. It is possible that site derived contaminants of concern may enter this watercourse by overland flow or migration through unsaturated soils therefore surface waters must also be considered as a sensitive receptor within the conceptual site model.
Flora and Fauna	The proposed development includes the provision of soft landscaping, albeit this will be a net loss from the current layout as the proposed building and road construction will occupy current soft landscaped areas. Some of the identified contaminants of concern are known to be phytotoxic and as such, the potential for this impact should be considered.
Buildings & Infrastructure	Subsurface structures are likely to be present at the site which may be adversely affected by the potential presence of the identified contaminants of concern. These include concrete used in building foundations, buried potable water supply pipes and other service lines and pipes.
Adjacent Land	Adjacent properties, including private residential dwellings, could also be at risk from potential contaminants found at the site.

3.4 Potential Pathways

Where contaminants may be present in soil, there are a number of potential pathways that enable human receptors to come into contact with or be exposed to them. The most direct pathways, considered under current UK legislation, can be summarised as follows:

- Direct ingestion of contaminated soil
- Ingestion of household dust
- Ingestion of contaminated vegetables
- Ingestion of soil attached to vegetables
- Dermal contact with contaminated soil
- Dermal contact with household dust
- Inhalation of fugitive soil dust
- Inhalation of fugitive household dust
- Inhalation of vapours outside
- Inhalation of vapours inside

Clearly, not all of these potential pathways apply for every standard land-use. For example, ingestion of contaminated vegetables will not apply to land uses other than residential with plant uptake and allotments.

However, in addition to direct exposure pathways, a number of physical transport mechanisms / pathways may also exist at a site that allow remote or less accessible contaminants in soil or groundwater to reach human or environmental receptors both at a site and beyond the site boundary. These include the transport mechanisms listed below.

- Downward and lateral movement of contaminants in soil either by gravity or through being 'leached' by percolating rainwater
- Lateral migration of contaminants dissolved in groundwater.
- Direct seepage or leaching of contaminants from soil into subsurface drains or supply pipework.
- Volatilisation of contaminants from groundwater or unsaturated soils into buildings or outdoor air.

Through examination of the standard land use and environmental setting at each site, the presence of pathways and transport mechanisms described above must be considered when assessing whether a contaminant linkage may plausibly be active and therefore be included in the conceptual site model.

3.5 Summary of Contaminant Linkages

Considering the site use and environmental setting, and proposed land use, the following plausible contaminant linkages have been identified through this Preliminary Risk Assessment and will require further investigation.

Source	Pathway	Receptor
Fuel and controlled substance storage	Leakage from primary and / or secondary containment and & subsequent migration	Soil and Groundwater
Contaminated soil (Made Ground/residual contamination from historic use as a PFS)	Direct contact and inadvertent ingestion by eating or smoking with dirty hands	Construction workers during redevelopment & site users
	Inhalation of fugitive dusts	
Contaminated soil and / or groundwater	Ingress / diffusion through permeable potable water supply pipes	Site users
	Volatilisation of organic compounds to indoor air	
	Direct uptake via root systems	Plants
	Direct contact	Buried infrastructure
	Leaching of contaminants vertically through unsaturated soils	Groundwater
	Lateral migration of contaminants through unsaturated soils	Surface Waters
	Off-site migration of contaminants in groundwater and subsequent volatilisation of organic compounds to indoor air	Adjacent site users

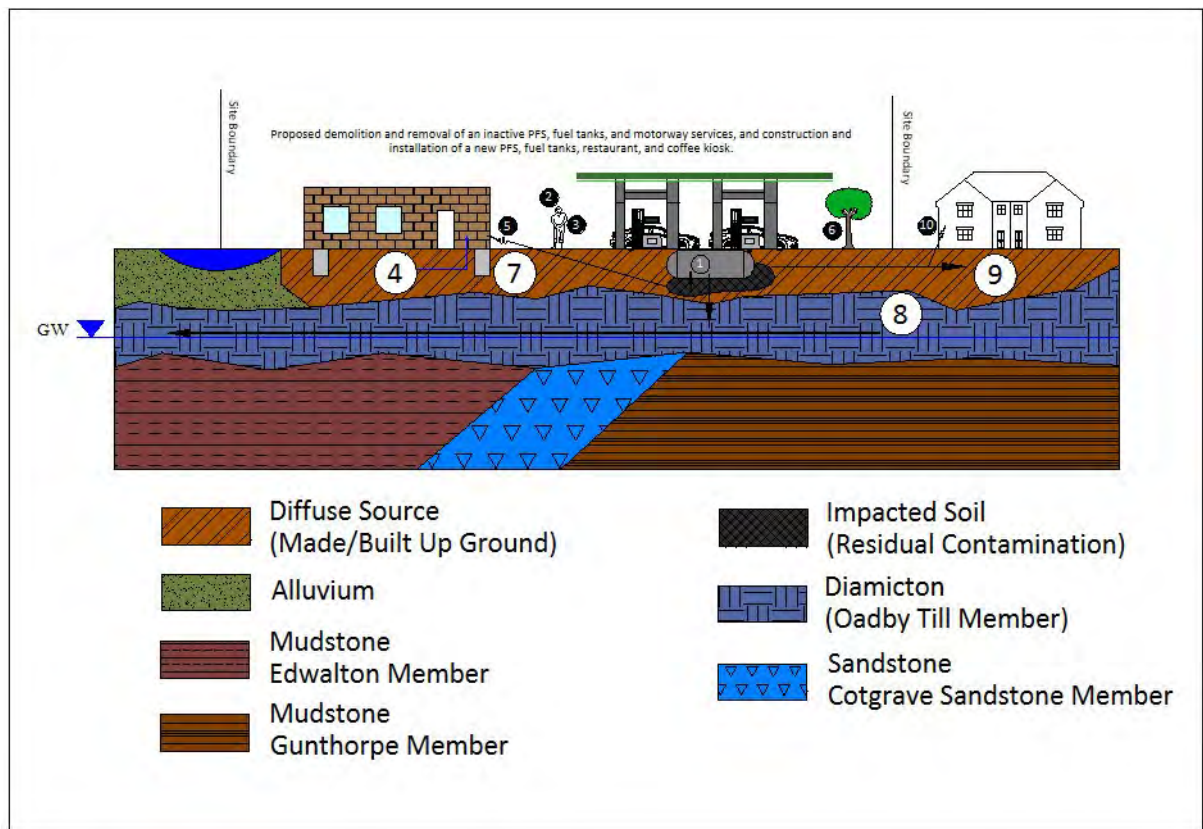
The following comments are made with respect to contaminant linkages which have been considered through development of the conceptual model, but have not been concluded as 'plausible' – i.e. through which a significant possibility of significant harm could occur to an identified receptor:

- PAHs and metals have been identified as contaminants of concern associated with the historic on-site infill and nearby made ground associated with construction of the M1 motorway and adjoining roads; however, these contaminants are considered to be relatively immobile in the environment by virtue of their very low solubility and volatility. On this basis, plausible pathways by which these potential contaminants could pose a significant risk to the underlying groundwater (or nearby surface watercourses) are not considered to be active. However, risks to groundwater or nearby surface water still remain from more mobile contaminants of concern potentially present on site, such as TPH.

- The proposed development is for a new petrol filling station with associated below ground tanks; these new tanks will be installed following best practice as per the Blue Book. These new modern tanks as a minimum are understood to be double skinned with interstitial monitoring, therefore these are not thought to pose a new risk through the proposed development following their installation.
- A number of areas of infilled land have been recorded within the surrounding area, including one just to the north of the site. However, the small scale of these features, and given the age (and therefore the likely nature of the fill material), it is not thought that these would be a significant source of ground gas migrating onto the site to pose a risk to the future redevelopment.
- A limited number of commercial sites are located in the surrounding area including a depot and historic PFS; however, due to their distance from site (>90m) and the cohesive nature of the mapped superficial deposits likely limiting any migration. Therefore, risks are not considered to be present associated with the on-site migration of organic compounds in groundwater from any of these specific sources.
- Whilst Cliffe Slade Farm is mapped in the surrounding area. It is not anticipated that significant quantities of fuel or agri-chemicals were ever stored at the site and therefore, no significant source of potential contamination is recognised from this land use. Additionally, pesticides and herbicides have been associated with the presence of farmland in the surrounding area but given the low residency time of these contaminants in soil, and the time since the area was used as farmland no plausible contamination linkage is recognised from the on-site migration of agri-chemicals (including pesticides) onto the site.

The following diagram provides an illustration of the plausible contaminant linkages that may be active at the site, and which may need further investigation or control to ensure safe development:

Illustrative Conceptual Site Model – Markfield Services, Leicestershire



Potential Contaminant Linkages:

1. Leakage from primary and / or secondary containment and on-site migration of contaminants
2. Direct contact and inadvertent ingestion by eating and smoking with dirty hands
3. Inhalation of fugitive dusts
4. Ingress / diffusion through permeable potable water supply pipes
5. Volatilisation of organic compounds to indoor air
6. Direct uptake via root systems
7. Direct contact with buried structures (i.e. foundations)
8. Leaching of contaminants vertically through unsaturated soils
9. Lateral migration of contaminants through unsaturated soils
10. Off-site migration of contaminants in groundwater and subsequent volatilisation of organic compounds to indoor air

3.6 Key Potential Areas of Concern and Uncertainties

The main area of focus within the property boundary is the former use of the site as a PFS, including the presence of historic tanks on-site and whilst they have been recorded as decommissioned in 2020 there is an uncertainty as to the severity of the contamination underlying the site. Given the tanks are likely single skinned as they were installed pre 2000 the presence of some contamination is likely inevitable, although any minor unrecorded fuel leaks may have been relatively contained in these low permeability ground conditions. Risks of the potential for the interaction between ground workers and potentially contaminated shallow soils during the redevelopment works should also be considered.

A culverted stream is present along the northern boundary. It is possible that by being culverted this would offer some protection from potential contaminants entering it. However, as the construction of the culverted stream is unknown, and a plausible pathway of the migration of contaminants laterally through soils and groundwater is present, this risk should be further investigated and evaluated once ground conditions are confirmed from the intrusive investigation.

4 SUMMARY OF INTRUSIVE INVESTIGATIONS

Intrusive ground investigations were undertaken on 28th and 29th January 2026, as well as 12th February 2026, in accordance with EPS standard operating procedures, copies of which will be made available on request. A summary of all site activities is presented in the following sections:

4.1 Exploratory Hole Locations

Exploratory hole locations were selected through consideration of the potential contaminant linkages identified through the Phase I Desk Study, the proposed development layout, the location of below ground utilities as well as operational and health & safety considerations. Additionally, in the east of the site near the tanks and fuel lines, locations were hand pitted to 1.20mbgl as part of EPS' service clearance procedure.

Fifteen window sample boreholes (WS01 – WS15) were attempted at the site to a depth of 5.0m using a track-mounted percussive drilling rig. Due to service density, hand dug inspection pits were formed at WS03, WS08, WS11 and WS13 but due to shallow refusals and obstructions the boreholes couldn't be progressed beyond 1.2m.

The overall objective in terms of exploratory hole locations was to provide an appropriate lateral and vertical coverage of the soils underlying the site in order to offer information relating to their quality and nature as well as provide information for geotechnical design. Further rationale for each sampling location is provided within the table below:

Location	Rationale
WS03, WS08 WS11, WS12, WS13, WS14 WS15	Assess the nature, quality and strength of shallow soils across the site to provide detailed coverage of the ground profile and to assist with geotechnical design.
WS01, WS02, WS04, WS05, WS06, WS07, WS09 and WS10	Assess the nature, quality and strength of shallow soils across the site to provide detailed coverage of the ground profile and to assist with geotechnical design. Additionally, these boreholes facilitated the installation of combined groundwater and gas monitoring standpipes to monitor levels during a return monitoring programme.

Standpipes were installed within positions WS01, WS02, WS04, WS05, WS06, WS07, WS09, and WS10 to facilitate subsequent groundwater sampling and monitoring. Standpipes were installed using 50mm diameter uPVC well casing and fitted with a gas tap. Slotted pipe (1mm slot) was installed at each location from the base of the borehole to approximately 1.0m below the surface. The installations were completed to ground surface using plain pipe. A filter pack of 2-20mm washed gravel extended from the base of the boreholes to approximately 0.1m above the slotted section with a bentonite seal to surface. All installations were finished with flush-mounted, bolt-down headworks.

A borehole and trial pit location plan is presented as Figure 4.

4.2 In-Situ Testing & Soil Sampling

Each borehole was logged for ground conditions encountered and inspected for any physical evidence of contamination, such as soil staining, odour and the presence of separate phase liquids on a precautionary basis.

Cone penetration tests (CPT) were carried out in all materials using an automatic trip hammer. The number of blows required to advance a solid 60° nose cone over the final 300mm of a 450mm total drive was recorded and is shown on the borehole records as the penetration resistance (“N” value).

The undrained shear strength of the cohesive soils encountered were measured where possible by carrying out hand vane tests in the materials recovered from the 1m sample liners. The ‘peak’ undrained shear strengths are recorded in kPa on the borehole logs, shown as ‘HVP’.

Where potentially volatile organic compounds are suspected, EPS carries a Photoionisation Detector (PID), which can be used to measure the relative concentrations of vapour associated with soil samples collected from different depths and locations at the site. In these circumstances, soil samples will be placed into plastic bags, sealed, shaken and then allowed to rest for a few minutes to allow time for volatile vapour to accumulate in the air trapped within the bag.

The PID probe will then be used to pierce the bag and sample the air above the soil to measure the concentration of volatile compounds that have accumulated. PID readings are only used to provide EPS with a basic means to quantify areas of volatile organic compound in the field to help guide the investigation. As potentially volatile organic compounds, specifically including petroleum hydrocarbons, were identified in the conceptual site model, PID readings were collected during this intrusive investigation. These readings are included within borehole logs presented as Appendix I and the results are discussed further in later sections.

4.3 Laboratory Testing

Soil and groundwater samples obtained for analysis of identified contaminants of concern were submitted to Element Materials Technology, who hold appropriate UKAS / MCERT accreditation for the required testing. Samples were transported in laboratory supplied containers and delivered to the laboratory by approved courier.

Geotechnical testing was undertaken by Soil Property Testing, Huntingdon, a UKAS accredited laboratory.

Copies of chain of custody documentation are held by EPS and will be made available on request. An Environmental and Geotechnical laboratory testing schedules are included as Table 1, 2 and 3.

4.4 Groundwater Monitoring

Follow-up groundwater monitoring was carried out within all the installed borehole locations in the vicinity of the former PFS (WS01, WS02, WS04, WS05 & WS06) on the 11th February 2026, with samples obtained for additional laboratory analysis using the 'low flow' sampling technique, where possible, in accordance with EPS' standard operating procedures. Groundwater was monitored for dissolved oxygen, redox potential, electrical conductivity, pH, and temperature before sampling, with well purging taking place until the parameters stabilised, or for up to a maximum of 30 minutes if the parameters did not stabilise. Low flow sampling was attempted at WS02; however, groundwater parameters did not stabilise and due to water levels dropping during the low flow technique, a grab sample was obtained.

During the ground investigation on the 28th January a grab sample of the impacted groundwater entering into WS03 was also taken.

4.5 Organic Vapour Monitoring

Return soil vapour monitoring was also completed on the 11th February 2026 in order to assess the presence and concentration of volatile organic compounds that might be present given the historic use as a PFS. These parameters were measured PID. Additionally, WS01 was inaccessible due to the damaged car being parked on top of the location and unable to be moved without specific machinery.

5 FINDINGS OF THE INVESTIGATION

This section of the report provides a summary of the findings of the various aspects of the ground investigation.

5.1 Ground Conditions

A total of fifteen window sample boreholes were formed at the site and the ground conditions encountered, from surface level, were found to comprise:

- Hardstanding / Topsoil
- Made Ground
- Oadby Till Member

Site specific borehole logs are included as Appendix I and give descriptions and depths of strata encountered. A summary of the general strata encountered across the site is provided in the table below, with more detailed description given in the following sub sections.

Geological Strata	Maximum Depth to Base of Strata (m bgl)	Strata Thickness (m)
Hardstanding / Topsoil	0.45	0.22-0.45
Made Ground (Sub-base)	1.45	0.10-1.22
Made Ground	2.30	0.54-1.50
Oadby Till Member	>5.45 (not proven)	>0.75->5.05 (not proven)

5.1.1 Hardstanding / Topsoil

Bituminous hardstanding was recorded from the surface of all locations, except for WS09, WS10, WS11, WS13, and WS14 which recovered topsoil with rare anthropogenic inclusions.

5.1.2 Made Ground (Sub-base)

Subbase of sand and gravel was recorded beneath all instances of bituminous hardstanding, except for WS08 and WS12 which encountered sandy gravelly clay; both of which are located east of the old services building and west of the main service road.

5.1.3 *Made Ground*

Made ground of predominantly dark greyish brown slightly gravelly sandy silty clay with localised anthropogenic inclusions was recorded within all window sample boreholes, except for WS03, WS10, and WS11, down to a maximum depth of 2.30m bgl in WS02 and 2.1mbgl in WS04. The thickness of made ground was generally observed to be greatest in the eastern area of the site which coincided with the former PFS.

A few locations did not penetrate the made ground either because the clearance pit couldn't be completed in WS03 due to groundwater ingress, with an unknown utility noted at the base of WS08.

It should be noted that a greater thickness of infilled soil can be expected beneath existing infrastructure such as disused buildings and the decommissioned tank farm.

5.1.4 *Oadby Till Member*

Variable strata of firm and occasionally soft and stiff, brown to reddish brown, slightly sandy, slightly gravelly, clay, interpreted to be representative of the Oadby Member was identified beneath the made ground at all locations, except for WS03 and WS08 (for reasons outlined in the previous section).

This material was recorded to beyond the maximum formation depth of each of the boreholes.

5.2 **Groundwater**

Groundwater ingress was recorded in selected locations during the initial site works as a seepage within WS10 at 1.5mbgl and ~1.0mbgl in WS03 within the inspection pit. Within WS12, WS14 and WS15, slow inflow was encountered between 1.1m and 1.45m respectively, rising to 1.3mbgl and 1.0mbgl after roughly 20 minutes.

It should be noted that inflows in the remaining locations may have been masked by the speed and nature of the drilling process.

During the return monitoring visit on the 11th of February 2026, the standpipes were dipped to determine resting water levels, and this data is presented in the table below.

Location	Depth to Groundwater (mbgl)
	11.02.25
WS01	1.18
WS02	1.55
WS04	1.56
WS05	1.30
WS06	1.10
WS07	1.75
WS09	2.20
WS10	0.62

Given the range of depths encountered, these are anticipated to be representative of perched groundwater within the profile of the made ground which in some locations is likely sitting between the made ground and clay based superficial deposits.

5.3 Physical Evidence of Contamination

Whilst Made Ground was identified at all the intrusive locations and there was generally no palpable evidence of contamination encountered in any of the sampling locations during the investigation, such as any visual or olfactory evidence of petroleum hydrocarbon staining. However, the presence of hydrocarbons was noted in WS03 through olfactory and PID techniques (see below), as well as a visible sheen present on the groundwater flowing through the made ground subbase at 1.00mbgl.

During the return groundwater monitoring visit, no odours or sheens were reported by the field engineer and the initial product checks using a bailer didn't show any evidence of LNAPL.

During the ground investigation headspace testing was completed on the soils and generally readings below <0.1ppmv were recorded, although a reading of 180.1ppmv was noted at 1.0m at WS03 where the impacted groundwater was observed.

5.4 Laboratory Analysis – Soil

A laboratory analysis testing schedule is presented as Table 1 and all environmental sample results obtained from the laboratory are included as Appendix J. The key results of laboratory testing on environmental soil samples are summarised below.

Contaminant	No. of Samples	No of Detections	Range of Detections (mg/kg)		Highest Location & Depth (m bgl)
			Min	Max	
Arsenic	8	8	7	12.1	WS10 ES1 (0.00-0.30)
Cadmium	8	0	-	-	-
Chromium III	8	8	37	69.3	WS01 ES1 (0.40-0.50)
Chromium VI	8	0	-	-	-
Copper	8	8	14	28	WS02 ES2 (0.40-0.60)
Lead	8	8	5	46	WS10 ES1 (0.00-0.30)
Mercury	8	0	-	-	-
Nickel	8	8	5.7	18.7	WS07 ES2 (2.10-2.30)
Selenium	8	3	1	3	WS10 ES1 (0.00-0.30)
Zinc	8	8	43	103	WS10 ES1 (0.00-0.30)
Naphthalene	8	1	0.07	-	WS02 ES2 (0.40-0.60)
Benzo(a)pyrene	8	1	0.05	-	WS09 ES1 (0.10-0.30)
Dibenzo(ah)anthracene	6	1	-	-	-
PAH 16 Total	8	1	0.8	-	WS01 ES1 (0.40-0.50)
PCBs (7 Total)	3	0	-	-	-
Total Cyanide	5	0	-	-	-
MTBE	11	0	-	-	-
Benzene	11	0	-	-	-
Toluene	11	0	-	-	-
Ethylbenzene	11	2	0.023	0.37	WS03 ES1 (0.90-1.10)
m/p-Xylene	11	2	0.172	1.46	WS03 ES1 (0.90-1.10)
TPH CWG - Aliphatics					
C5-C6	11	0	-	-	-
C6-C8	11	2	0.1	3.1	WS03 ES1 (0.90-1.10)
C8-C10	11	2	5.7	29.3	WS03 ES1 (0.90-1.10)
C10-C12	11	4	1.9	156.9	WS03 ES1 (0.90-1.10)
C12-C16	11	5	27	576	WS03 ES1 (0.90-1.10)
C16-C21	11	4	22	597	WS03 ES1 (0.90-1.10)
C21-C35	11	3	48	194	WS03 ES1 (0.90-1.10)
C35-C40	11	0	-	-	-
TPH CWG - Aromatics					
C5-EC7	11	0	-	-	-
EC7-EC8	11	0	-	-	-
EC8-EC10	11	2	0.2	1.8	WS03 ES1 (0.90-1.10)
EC10-EC12	11	2	15.8	38.2	WS03 ES1 (0.90-1.10)
EC12-EC16	11	4	25	278	WS03 ES1 (0.90-1.10)
EC16-EC21	11	4	11	282	WS03 ES1 (0.90-1.10)
EC21-EC35	11	6	19	84	WS03 ES1 (0.90-1.10)
EC35-EC40	11	0	-	-	-
Asbestos (%)	8	0	-	-	-

Notes:
- Contaminant not found above laboratory detection limits
PAH Polycyclic Aromatic Hydrocarbons

MTBE Methyl Tert Butyl Ether
TPH CWG Total Petroleum Hydrocarbons (Criteria Working Group)
PCB Polychlorinated Biphenyls

5.5 Laboratory Analysis - Groundwater

A laboratory analysis testing schedule is presented as Table 2 and all environmental sample results obtained from the laboratory are included as Appendix J. The key results of laboratory testing on environmental soil samples are summarised below.

Contaminant	No. of Samples	No of Detections	Range of Detections (µg/l)		Highest Location
			Min	Max	
MTBE	6	2	6	10	WS04
Benzene	6	0	-	-	-
Toluene	6	0	-	-	-
Ethylbenzene	6	1	55	-	WS03
m/p-Xylene	6	1	219	-	WS03
o-Xylene	6	0	-	-	-
TPH CWG - Aliphatics					
>C5-C6	6	0	-	-	-
>C6-C8	6	1	292	-	WS03
>C8-C10	6	2	27	3,513	WS03
>C10-C12	6	2	609	64,104	WS03
>C12-C16	6	2	2,660	227,860	WS03
>C16-C21	6	2	2,920	23,0530	WS03
>C21-C35	6	2	1,540	68,720	WS03
TPH CWG - Aromatics					
>C5-EC7	6	0	-	-	-
>EC7-EC8	6	0	-	-	-
>EC8-EC10	6	1	274	-	WS03
>EC10-EC12	6	2	374	35,013	WS03
>EC12-EC16	6	2	1,890	236,900	WS03
>EC16-EC21	6	2	2,000	228,620	WS03
>EC21-EC35	6	2	630	68,800	WS03

Notes: - Contaminant not found above laboratory detection limits
MTBE Methyl Tert Butyl Ether
TPH CWG Total Petroleum Hydrocarbons (Criteria Working Group)

5.6 Preliminary Waste Classification

Waste classification (i.e. hazardous or non-hazardous) was undertaken on samples of both made ground and natural soils, which included total concentrations of metals and hydrocarbons, using computer software provided by HazWaste Online™. The outputs from the software are included in a Waste Classification Report in Appendix K.

Waste Acceptance Criteria was subsequently undertaken on two samples of made ground and one sample of natural clay. The results of the WAC analysis are included within Appendix J. These results, together with those of the waste classification above are summarised in the following table:

Strata	Typical Depth (m bgl) and Description	Is it Hazardous or Non-Hazardous? (number of hazardous samples)	Waste Acceptance Criteria
Made Ground (Topsoil)	0.00-0.40 Grass over made ground topsoil.	Non-Hazardous** (0 of 2)	NA
Made Ground (granular Subbase)	0.23-1.45 brown sandy silty gravel or very gravelly silty sand.	Non-Hazardous** but Hazardous where impacted soils were encountered in WS03	-
Made Ground (dark greyish brown slightly gravelly sandy silty clay)	0.30-2.30 firm brown slightly sandy slightly gravelly clay.	Non-Hazardous** (0 of 6)	Passes Inert Criteria
Oadby Till Member	0.40-5.45 Firm orangish brown to reddish brown slightly sandy slightly gravelly clay.	Non-Hazardous* (0 of 3)	Passes Inert Criteria

*Based on the above assessment, where the soils are not contaminated with fuel, both the made ground (cohesive) and natural soil at the site is considered to be **Non-Hazardous** waste. The natural, non-hazardous soils should be classified under the European Waste Code (EWC) **17 05 04**. It should be noted that in addition to the above, the waste acceptance criteria testing indicates that the uncontaminated natural soil could be chemically suitable for disposal to an inert landfill, subject to confirmation by the chosen waste receiver.

It should be noted that visible evidence of fuel contamination has been observed on-site in the soils at WS03, with the soil sample from this location recording elevated concentrations of TPH (WS03 ES1 0.90-1.00m). Therefore, the impacted made ground subbase material in the area of WS03 should be classified as **Hazardous**. Based on the information available, the wider subbase material from across the site has been classified as **Non-Hazardous**, however, it would be prudent to complete further waste testing to confirm the Waste Acceptance Criteria.

** For made ground present on a brownfield site such as this, although the soil sampling process did not identify potentially hazardous concentrations of Asbestos Containing Material (ACM) within the soil, it must be acknowledged that the material may exist within areas which were not sampled or accessible during the investigation. Any visually identifiable fragments of ACM can invalidate any non-hazardous waste classification, as such, the above waste classifications are made on the proviso that no visually identifiable fragments of ACM are present.

The above results are based on a limited dataset (hence 'preliminary') and consideration may need to be given to more detailed testing once confirmation is made of the exact materials to be disposed of. Furthermore, this preliminary waste assessment does not account for the surfacing material (bituminous asphalt) and no coal tar testing has been undertaken, additional testing would be required to ascertain the best disposal route and whether it would be possible to re-use.

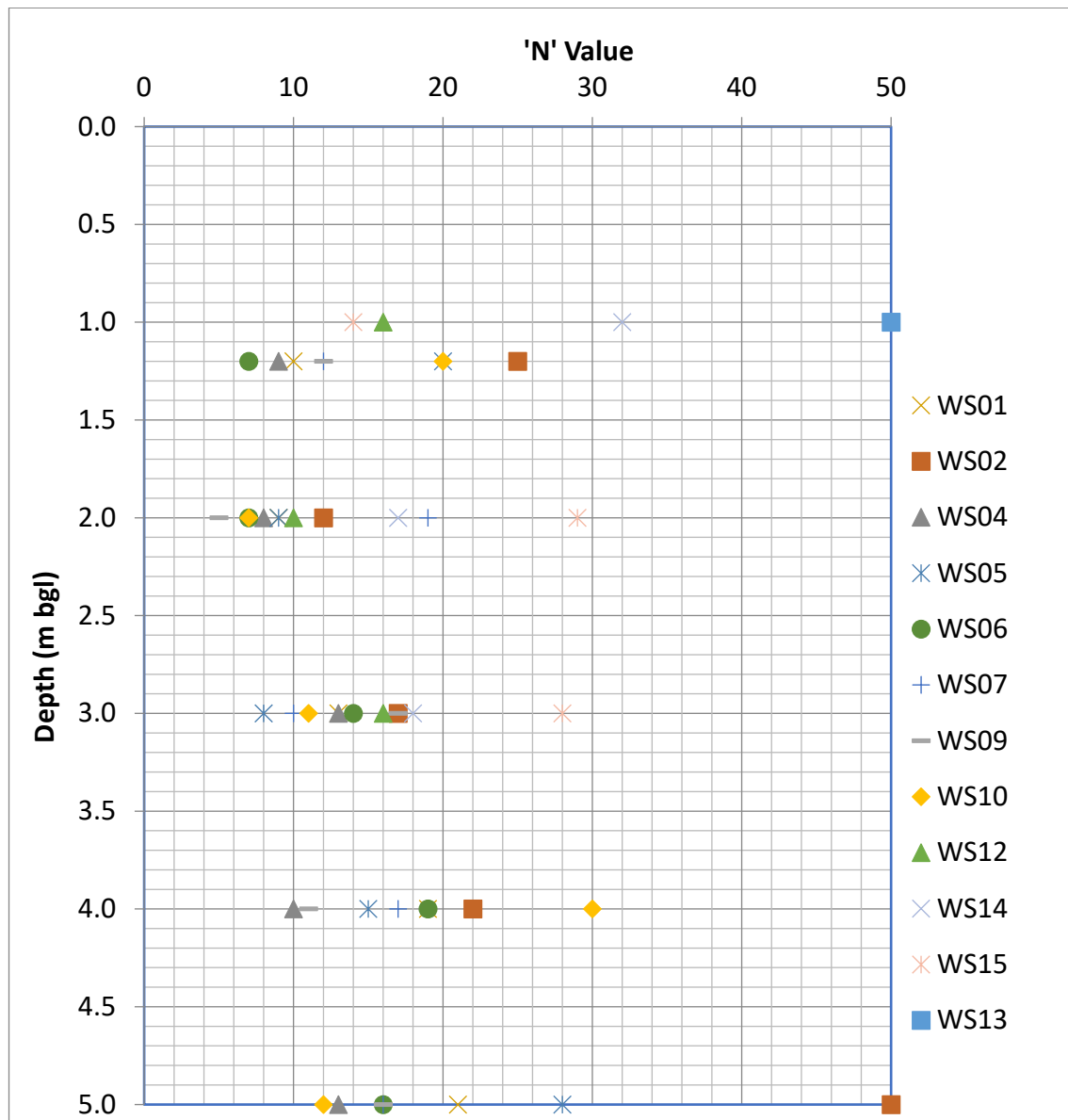
Input from the waste haulier should always be obtained to confirm the appropriate facility for disposal.

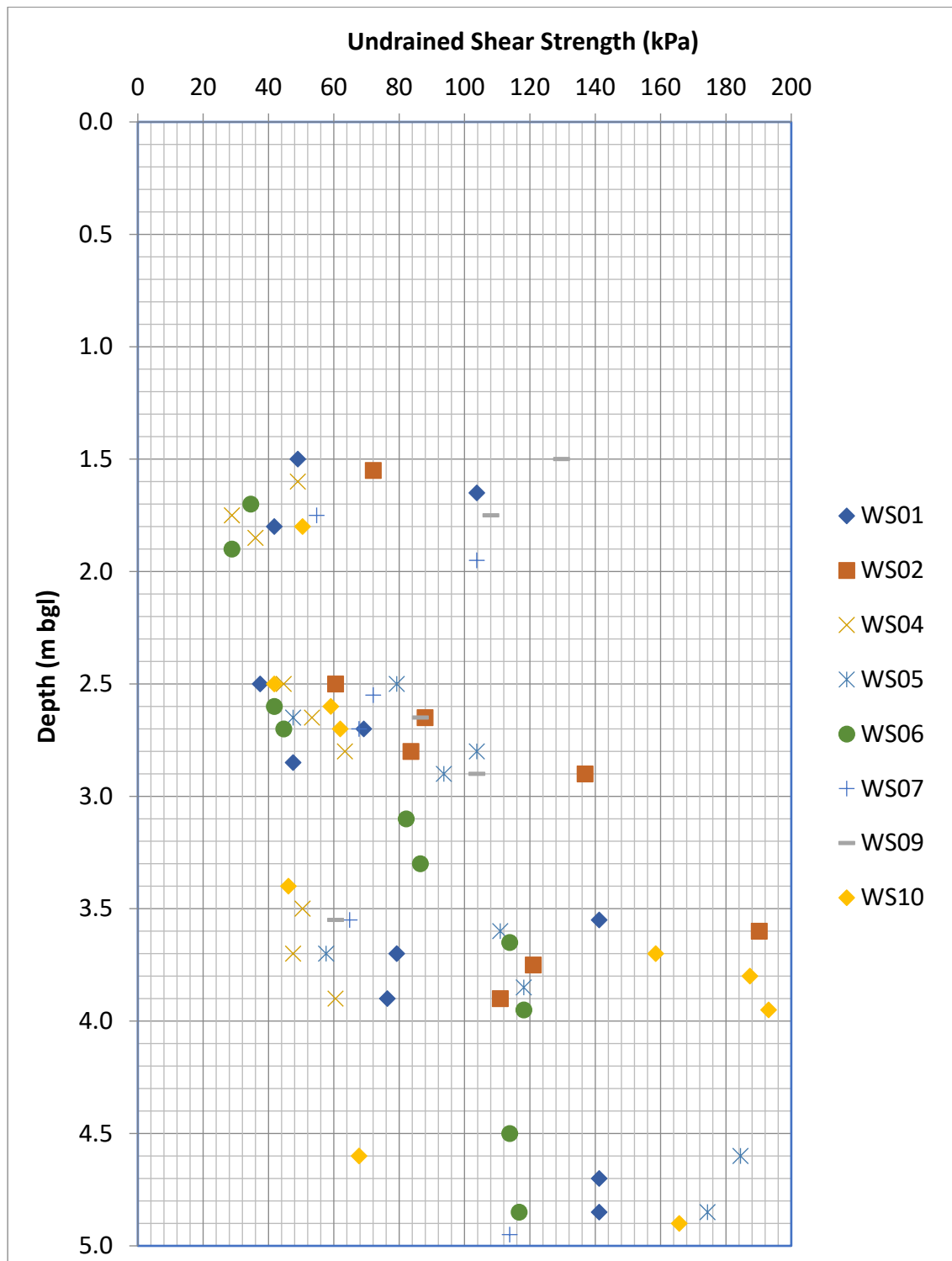
5.7 Geotechnical Testing

5.7.1 *In-Situ Geotechnical Testing*

The results of in-situ geotechnical testing are summarised in the graphs below.

The in-situ testing indicates soil strength is typically firm, but occasionally soft and stiff for the predominantly cohesive soils of the Oadby Member. Rare, thin layers of granular material were also identified, and the strength of these sections were recorded as medium dense.





5.7.2 Laboratory Geotechnical Testing

The results of geotechnical laboratory testing are summarised in the tables below and all geotechnical sample results obtained from the laboratory are included as Appendix L.

Strata	Soil Fraction (%)					
	Gravel		Sand		Silt / Clay	
	Min	Max	Min	Max	Min	Max
Oadby Member	38	75	22	46	3	16

Strata	Range of Parameters					
	Moisture Content (%)		Plasticity (%)		California Bearing Ratio (%)	
	Min	Max	Min	Max	Min	Max
Oadby Member	5.1	25.5	13 (2)	27	1.0	1.9

(-) Denotes Modified Plasticity Index

The water content, liquid and plastic limits and plasticity and liquidity indexes were established for 12 samples of predominantly cohesive soils, tested in line with BS EN ISO: 17892-1: 2014 & BS 1377: Part 2:1990:3.2, 4.4, 5.3 and 5.4.

Particle Size Distribution (PSD) tests were carried out on 2 sample of granular soils in accordance with the test BS1377: Part2: 1990: 9.2.

A laboratory California Bearing Ratio (CBR) test was scheduled for 2 samples of shallow soil, tested in accordance with BS1377: Part 4: 1990: 7.

Sulphate contents and pH values determinations were carried out by the environmental and geotechnical laboratories for natural soils, the results of which are summarised in Section 6.6.

A geotechnical laboratory analysis testing schedule is presented as Table 3 and all geotechnical sample results obtained from the laboratory are included as Appendix L.

6 GEOTECHNICAL APPRAISAL

The ground conditions have been found to comprise a notable thickness of made ground, in the order of 1.0m to 2.0m thick in the east, but limited to approximately 1.0m in the centre and west.

This was underlain by typically firm, but occasionally soft and stiff clays of the Oadby Member, proven to at least 5.0m below existing levels.

Some perched groundwater strikes were noted during the works and the most recent monitoring visit has shown resting levels between roughly 0.6m and 2.2m bgl.

6.1 Geotechnical Complexity Class (GCC)

Geotechnical Complexity	Features
GCC1	<i>GCC1 - Lower</i> - Negligible uncertainty regarding the ground conditions - Uniform ground conditions low sensitivity to groundwater and surface water conditions, - Low complexity of the ground/structure interaction
GCC2	<i>GCC2 – Normal</i> GCC2 applies if GCC 1 and GCC3 are not applicable
GCC3	<i>GCC3 - Higher</i> - Considerable uncertainty regarding ground conditions - Highly variable or difficult ground conditions - Significant sensitivity to groundwater and surface water conditions - Significant complexity of the ground/structure interaction

The proposed development comprises the construction of a new restaurant, coffee kiosk, and a petrol filling station with a sales kiosk, areas of carparking and associated below ground tanks. Therefore, the below assessment has been undertaken in accordance with Geotechnical Complexity Class 2 (GCC2), as defined by BS EN 1997 – 1, 2 & 3: 2024.

6.2 Structural Foundations

6.2.1 Spread Foundations

As detailed above, the development is understood to comprise the construction of a services with the foundations for any new buildings being vertically loaded. The foundation assessment has been undertaken in accordance with BS EN 1997 – 1, 2 & 3: 2024 to take in to account;

- Bearing Pressure (Ultimate Limit State)
- Settlement (Serviceability Limit State)

Allowable bearing capacities have been calculated for depths of up to 2.0m for the underlying natural soils, however it should be noted that made ground was identified to a maximum depth of 2.3m (WS02) and could be deeper in some parts of the site, especially under the existing buildings:

Foundation Depth (m)	Allowable Bearing Capacity* ¹ (kN/m ²)	
	Strip	Pad
1.0* ²	65	80
1.5* ²	80	95
2.0* ²	95	110

*¹ BS EN 1997 (EC7) Geo Load Combination 2

*² Where natural soils are encountered at this depth

The ground conditions are considered suitable for the use of conventional spread foundations, either strip footings or pad foundations bearing on the predominantly cohesive soils of the Oadby Member.

The allowable bearing capacity is the permissible increase in vertical stress at the level of the underside of the foundation, above existing overburden pressure, which may be calculated on the basis of a soil density of 19kN/m³.

At the above bearing capacities, total settlements in soils are unlikely to exceed approximately 20mm to 25mm. Settlements in cohesive soils will comprise a relatively small proportion of immediate settlement and a larger portion of consolidation settlement, which will take place over a long period of time.

A minimum foundation depth of 0.9m below existing or proposed ground level is considered suitable for the site, subject to the following provisos:

- a) All foundations must fully penetrate any made ground or disturbed ground and should extend a minimum of 150mm into undisturbed natural strata, with a shear strength of at least 40kPa. It is acknowledged that a significant thickness of made ground has been encountered during the ground investigation works (particularly in the east around the old petrol filling station and adjacent car parking), which may result in foundation depths beyond the minimum of 0.9m that has been presented.
- b) The Oadby Member will be subject to volume change (subsidence and / or heave) due to the presence of trees/ vegetation. Foundations will therefore need to take into account the presence of trees, including those adjacent to the site boundaries. Laboratory analysis has established that the natural clay soil has a 'medium volume change potential'.

It is recommended that all trees present locally, including those to be planted or recently removed, are given full consideration in the design process so that the impact of these may be taken into account in foundation design.

Where foundations exceed 1.5m in depth due to the influence of trees/ vegetation, full anti-heave precautions will need to be adopted.

6.2.2 *Raft Foundations*

Given the limitations associated with spread foundations outlined above, consideration could also be given to the use of raft foundations to support new structures, particularly as they are likely to be lightly loaded.

Raft foundations must be designed to transmit loads from the structure to the ground without excessive settlement and must be of adequate stiffness to ensure differential movement does not affect the structure. An appropriately compacted granular infill material should be placed beneath the raft, which should extend beyond the edge of the foundation. The depth to the underside of the foundation must be at least 450mm below finished ground level.

For the shallow soils, an allowable bearing capacity of no more than 20kN/m² is considered suitable, although this will depend upon the proposed foundation size and depth, nature of compacted infill and associated structural load.

6.2.3 *Tank Farm*

The proposed development also incorporates subsurface fuel tanks, which are anticipated to be situated roughly between 3.0m and 4.0m bgl within the firm, but occasionally soft and stiff clay of the Oadby Member.

Within this material at a depth of 3.0m, a maximum allowable bearing capacity of 125kN/m², is suggested.

For tank excavations, it must be appreciated that perched groundwater ingress has been recorded at varying depths during the intrusive works, resting between approximately 0.6m to 2.2m during the most recent return visit. Whilst inflows are anticipated to be modest and temporary, groundwater will still need to be considered with respect to both excavation support and groundwater control for the excavations.

6.3 Ground Floor Construction

Given the depth of made ground and presence of shrinkable cohesive soils beneath the site, the use of ground bearing floor slabs is not considered suitable for the proposed development without some form of improvement of the ground. This would require the removal of a proportion of the existing made ground and/ or cohesive soil and its replacement with a granular fill material compacted to an appropriate specification.

Alternatively, suspended ground floor construction could be adopted, which will reduce the risk of future floor slab movements.

6.4 Groundworks

Whilst excavations in the cohesive soils may remain stable for short periods during construction, the stability of any infilled or granular soils should not be relied upon, particularly when influenced by the presence of perched groundwater, where loosening of soils can be created.

Heavy plant and stockpiles of materials should not be permitted close to the edges of unsupported excavations. Further reference may be made to CIRIA Report No. 97 '*Trenching Practice*' 1992.

The presence of underground services and infrastructure is also likely and should be given full consideration in design proposals, and may require diversion to accommodate the proposed development.

Excavations must not be carried out in close proximity of any existing on-site or neighbouring structures/ retaining features without permanent support measures in place. Care should also be taken to ensure excavations do not destabilise any slopes.

Perched groundwater ingress has been recorded at varying depths during the intrusive works, resting between approximately 0.6m to 2.2m during the most recent return visit. Whilst inflows are anticipated to be modest and temporary, groundwater will still need to be considered with respect to both excavation support and groundwater control during future groundworks.

Backfilling in areas where former tanks are to be removed will need to be undertaken using a granular backfill material, that is compacted to an appropriate specification.

6.5 External Works

6.5.1 Pavement Design

Two laboratory CBR tests were undertaken on bulk samples of cohesive soils recovered from the shallow profile of the Oadby Member. Results of this testing produced CBR values ranging between 1.0% and 1.9%, as included within the full laboratory report in Appendix L. EPS's experience of the natural materials encountered (clay with a maximum plasticity of ~30%) suggests that a design CBR value of 3% could be expected for the natural soils. It is anticipated that the lower CBR values returned are the result of higher fines content of the sample (which does vary throughout the profile of the Oadby Member).

Where made ground is present at subgrade level, a CBR value of only 2% is recommended and therefore it is suggested that a design CBR value of 2% is adopted for the site, subject to further in-situ testing of the subgrade to identify any soft spots. However, it should be borne in mind that if CBR values are shown to lie below 2%, some form of permanent improvement of the subgrade soils may be necessary.

Once the formation level for the new pavement has been achieved, proof rolling should be carried out using a heavy roller, and any significant/ extensive soft areas revealed should be excavated and a greater depth of sub-base provided.

Exposed subgrades will likely deteriorate rapidly on exposure to wet weather and should be shaped to shed water. Sub-base should be placed as soon as possible to minimise the exposure of the subgrade to adverse weather conditions.

6.6 Concrete Grade

Sulphate contents and pH value determinations were carried out by the geotechnical and environmental laboratories, and the results of this testing are summarised in the below table as well as being presented within Appendix J and M.

Strata	Water Soluble Sulphate 2:1 SO ₄ (mg/l)		pH	
	Min	Max	Min	Max
Oadby Member	20	1,069	6.67	10.55

In accordance with Part 1 of the BRE Special Digest 1 'Concrete in Aggressive Ground' 2005, a design sulphate class of DS2 is considered suitable for concrete in direct contact with the Oadby Member, with an aggressive chemical environment for concrete (ACEC) of AC-1s.

7 ENVIRONMENTAL APPRAISAL

The following section outlines the approach applied to assessing the risks posed to human health and controlled waters, then identifies any sample results found by this investigation which warrant further consideration. In accordance with the Environment Agency's Land Contamination: Risk Management, this section represents the second tier of Stage 1, the Generic Quantitative Risk Assessment.

7.1 Human Health

7.1.1 Land Use Setting

It is understood that development proposals for the site includes the construction of a new petrol filling station, coffee kiosk, and restaurant, retaining the existing hotel, with new areas of car parking meaning the existing areas of soft landscaping will be maintained or reduced as a result. In order to screen laboratory data for concentrations of contaminants in soil with potential to cause harm to human health, relevant generic screening values most applicable to this land use have been utilised. A land use setting of 'Commercial' has been adopted as it is considered the most representative.

The technical framework used to derive DEFRA's Category 4 Screening Levels (Policy Companion Document '*SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*') outlines the relevant factors for determining land use selection in the application of the screening levels and the following key considerations have been taken into account.

7.1.2 Generic Screening – Soils

The technical framework used to derive the assessment criteria and the documents in which they are published are summarised as follows:

- *EA Science Reports* (SC050021/SR2, SC050021/SR3, and SC050021/SR7)
- *EA Soil Guideline Value Science Reports*
- *Suitable For Use Levels (S4ULs) for Human Health Risk Assessment* – LQM & CIEH (2015)
- *Soil Generic Assessment Criteria for Human Health Risk Assessment* - EIC/AGS/CL:AIRE (2010)

Category 4 Screening Levels (C4SLs) provide generic suitable for use screening values for common contaminants in a variety of land uses and are also utilised as appropriate generic screening criteria.

Where assessment of the risk to human health from asbestos in soil is concerned there is no nationally recognised suitable for use / generic screening value commonly referred

to through the planning system. Due to this, it is necessary to take a more qualitative approach to the risks posed to future site users from asbestos on a site-specific basis.

A summary of the screening criteria and the methodology used to derive them is included in Appendix M.

7.1.3 Generic Screening – Groundwater

The technical framework used to derive the assessment criteria and the documents in which they are published are summarised as follows, in addition to those listed above:

- *The VOCs Handbook. Investigating, assessing and managing risks from inhalation of VOCs at land affected by contamination (C682)*, CIRIA, London 2009
- *Society of Brownfield Risk Assessment (SoBRA) 'Development of Generic Assessment Criteria for Assessing Vapour Risks to Human Health from Volatile Contaminants in Groundwater' - Version 1.0, February 2017*

SoBRA groundwater vapour GAC were derived for two types of land uses, namely generic residential and generic commercial land use. They are intended as a conservative screening tool in the assessment for long-term (chronic) risks to human health from inhalation of vapours arising from groundwater. For other land uses (public open space, and allotment), these typically do not include building and as such a pathway of vapour intrusion is generally not recognised.

A summary of the screening criteria and the methodology used to derive them is included in Appendix M.

7.1.4 Assessment of Soil Results – Human Health

The results of the screening process for on-site human receptors showed that generic screening criteria representative of risks to future site users were not exceeded for any contaminant at any location.

7.1.5 Assessment of Groundwater Results – Human Health

The results of the screening process for on-site human receptors showed that generic screening criteria representative of risks to future site users were not exceeded for any contaminant at any location.

It should be noted that for both groundwater and soil results with regards to risks posed to human health from petroleum hydrocarbons, some of the results from this investigation are in excess of saturation limits. This suggests that some free-phase contaminant may be present, and therefore conventional exposure modelling derived through CLEA has to be applied with caution. This is not an unusual issue when assessing contaminated sites under a commercial landuse setting, and does require a degree of

pragmatism when interpreting data. In this instance, limited evidence of free-phase liquids (LNAPL) was identified through the field works, and the sporadically high results largely do not include shorter chain BTEX compounds which would pose the greatest risk. In this commercial setting, the risks to site users are likely to be low as suggested by the screening process.

7.2 Controlled Waters

7.2.1 Generic Screening

In addition to screening the recorded concentrations of contaminants to pose risks to human health, EPS has also screened the results of soil analysis for potential to cause harm to water resources.

The criteria used for this process were derived by EPS using the following technical guidance,

- *Environment Agency Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination.*

Primary Receptor Associated with Site	Basis of Tier 1 Criteria
Groundwater	UK Drinking Water Standards (UKDWS)
Surface Water	UK Environmental Quality Standards (EQS)

The site is predominantly underlain by Secondary B Aquifer, however a small band of Secondary A Aquifer trends approximately northwest-southeast beneath the northern end of site. A small predominantly culverted stream borders the northern site boundary, which doesn't appear to have a nearby catchment. As such, the site is assessment against water screening criteria for both surface water and groundwater as resource receptors.

7.2.2 Assessment of Soil Results – Controlled Waters

The screening process has shown that screening criteria representative of suitability of soil concentrations as applicable to controlled waters (surface water and groundwater) have been exceeded by the following contaminants:

Contaminant	Screening Criteria (mg/kg)		Detection (mg/kg)	Location and Depth (mbgl)
	Surface Water	Groundwater		
Ethylbenzene	0.23	3.4	0.37	WS03 ES1 (0.90-1.00m)
m/p-Xylene	0.351	5.86	1.46	WS03 ES1 (0.90-1.00m)
Aromatic EC10-EC12	5.67		15.8	WS02 ES3 (1.70-1.90m)
			38.2	WS03 ES1 (0.90-1.00m)
Aromatic EC12-EC16	11.3		25	WS02 ES2 (0.40-0.60m)
			44	WS04 ES2 (1.60-1.80m)
			115	WS02 ES3 (1.70-1.90m)
			278	WS03 ES1 (0.90-1.00m)
Aromatic EC16-EC21	35.6		128	WS02 ES3 (1.70-1.90m)
			282	WS03 ES1 (0.90-1.00m)

The detections of predominantly hydrocarbons are indicative of petroleum products and possibly suggest a leak from below ground fuel lines in close proximity to the affected locations, given the shallower depths rather than from a tank, which would be expected to be at a lower depth. The lack of contamination present within the natural slightly gravelly slightly sandy / sandy clay situated beneath the contaminated made ground suggests that the contamination is not widespread across the site and limited to the former PFS area in the east.

It's likely that soils present around certain tanks and fuel lines, which cannot safely be drilled into for the purpose of installing monitoring wells, may be found to be contaminated and contributing to the contamination.

7.2.3 Assessment of Groundwater Results – Controlled Waters

Assessment of groundwater samples through laboratory results against general screening criteria for controlled waters (surface water) as a primary receptor identified the following exceedances:

Contaminant	Screening Criteria (ug/l)		Detection (ug/l)	Location
	Surface Water	Groundwater		
Ethylbenzene	20	300	55	WS03
m/p-Xylene	30	500	219	WS03
Aliphatic C8-C10	300		3,513	WS03
Aliphatic C10-C12	300		609	WS02
			64,101	WS03
Aliphatic C12-C16	300		2660	WS02

		227,860	WS03
Aromatic EC10- EC12	90	374	WS02
		35,013	WS03
Aromatic EC12- EC16	90	1,890	WS02
		236,900	WS03
Aromatic EC16- EC21	90	2,000	WS02
		228,620	WS03
Aromatic EC21- EC35	90	630	WS02
		68,800	WS03

The results above show exceedances of screening criteria recorded within WS02 and WS03; the former was sampled from a monitoring well, whilst the latter was a sample of perched water within a hand dug pit with visible and olfactory evidence of hydrocarbons present within the water, including a sheen, strong odour, and a PID readings above 120 ppmv.

The above results indicate a potential risk to controlled waters from site-derived contamination, particularly the stream along the northern boundary. The samples recovered from WS02 and WS03 exceeded screening criteria for various hydrocarbon fractions and suggest the source to be diesel, though they are present within known perched water within the made ground material beneath the hardstanding. Exceedances were identified in the locations farthest to the southeast (WS02 and WS03). Given the shallow nature of the contaminated perched water, and the lack of contamination detected within WS06 which was located between WS03 and the fuel tanks, this would suggest that a potential leak could have occurred from below ground fuel lines situated away from the fuel tanks. The utility survey does indicate a fuel line runs to the east of the kiosk close to where WS03 was formed.

On this basis, an unacceptable risk to controlled waters from site-derived contamination cannot be ruled out at this stage and it would be prudent to undertake additional assessment of soil and groundwater quality during and post tank removal. By completing these additional works during that phase, it would allow access to areas of the site that are inaccessible due to logistical or safety reasons and overall would allow for further clarification of the potential risk present at the site.

7.3 Initial Organic Vapour Monitoring

In terms of organic vapours, the field observations, laboratory results of soil and groundwater analysis and monitoring data do not suggest that there may be discernible risks associated with the volatilisation of organic compounds and ingress into indoor air. As stated above, no groundwater results fail the SoBRA human health screening criteria relating to vapour risks from groundwater, however there are still some high results petroleum impacts in groundwater and there may also be an odour risk, which drives a requirement for vapour membranes at the site.

Based on the data collected there is not thought to be a risk of offsite migration of vapours to neighbouring properties, as the groundwater encountered is thought to be perched water within the cohesive deposits, which would further limit migration offsite and subsequent volatilisation. Additionally, laboratory interpretation of the extractable petroleum hydrocarbon contamination indicates that this is likely diesel, therefore, of relatively low volatility. As part of the remedial measures that are recommended in Section 7.5, there will be source removal and inherent betterment of the site and therefore risks to adjacent properties are not deemed to be significant.

Risks to future users from vapour ingress cannot be fully assessed at this stage. The requirement for mitigation and the possible need for gas/vapour protection measures would need to be confirmed following the further works outlined in Section 7.5. This would be based around the post tank/source removal monitoring.

7.4 Summary of Findings

The Phase I Desk Study identified a number of plausible contaminant linkages (risks) which have the potential to be active or become active through the redevelopment of the site. The majority of these linkages (risks) are as a result of the historic use of the site as a PFS with older style tanks which were more prone to leaking than modern tanks, as well as the presence of made ground on site.

The ground investigation identified a significant thickness of made ground, to a maximum depth of 2.30mbgl, predominantly around the PFS, followed by predominantly sandy slightly gravelly clay which is indicative of the natural diamicton till mapped beneath the majority of the site to the full extent of the boreholes (5.0m).

Laboratory analysis of soil samples obtained has not identified risks to human health in the context of the proposed commercial land use. However, laboratory analysis of soil and groundwater sampled from around the existing PFS has identified that the adopted screening criteria protective of controlled waters have been exceeded by contaminants of concern, notably fuel derived contaminants which would be expected from the site's use as a petrol filling station and it does appear to have leaked fuel at some point in the past as an impact has been identified away from the main tank farm (see Figure 5). On this basis, a potentially unacceptable risk to controlled waters cannot be ruled out.

In order to further assess the risks to controlled waters, further data around the existing PFS will be required. However, taking into account safe drilling distances around tanks and fuel lines, it is not possible to gather all the necessary data at this stage. Furthermore, as the site is due to be redeveloped and the existing fuel lines and tanks are due to be replaced with modern lines and double-skinned tanks regardless, this may also remove the bulk of the contaminant source. It would need to be determined whether there was still a plume in soils / groundwater which required follow-on management or treatment after the existing tanks had been removed. Therefore, recommendations have been

made in order to further quantify the level of risk present, and what the remedial process will need to take account of, as detailed in the following section.

Waste classification of the general made ground and natural soils have been classified as **Non-Hazardous** and are to be removed for the purpose of off-site disposal. The made ground around WS03 has been impacted by petroleum hydrocarbons though and should be considered as **Hazardous**, for the purpose of off-site disposal.

7.5 Recommendations

In the context of potentially unacceptable or acceptable risks as outline within the Environment Agency's *Land Contamination: Risk Management Guidance*, the contaminant linkages which pose potentially unacceptable risks and warrant further assessment to determine the most appropriate action are as follows:

- Migration and accumulation of organic vapours to indoor air (site users)
- Risks to controlled waters, from site-derived sources of fuel to contamination
- Ingress of organic contaminants into drinking water supplies and risks to buried concrete from petroleum hydrocarbons
- Risk to groundworkers from physical interaction with shallow soils

Due to the fact that the soil and groundwater results suggest that the contamination is largely isolated to the former PFS area at shallow depths, there does not appear to be a widespread issue across the whole site but an area of concern has been identified as shown on Figure 5, along with the tank farm area itself.

A Remedial Strategy & Implementation Plan should be prepared, which at the very least will cover the removal and verification process around the old tanks and associated infrastructure, covering the areas shown in Figure 5. The Strategy will also need to cover risks to future site users as well. If verification soil sampling, vapour monitoring and groundwater testing indicates that unacceptable contamination remains after the tanks have been removed and replaced, there is a possibility that additional in-situ remedial treatment will be needed alongside the construction of the new PFS/services, although that appears unlikely at this stage. This process will also determine the need for vapour-resistant membranes in some/all of the proposed buildings.

The proposed remaining works are therefore laid out as follows:

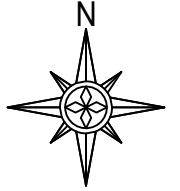
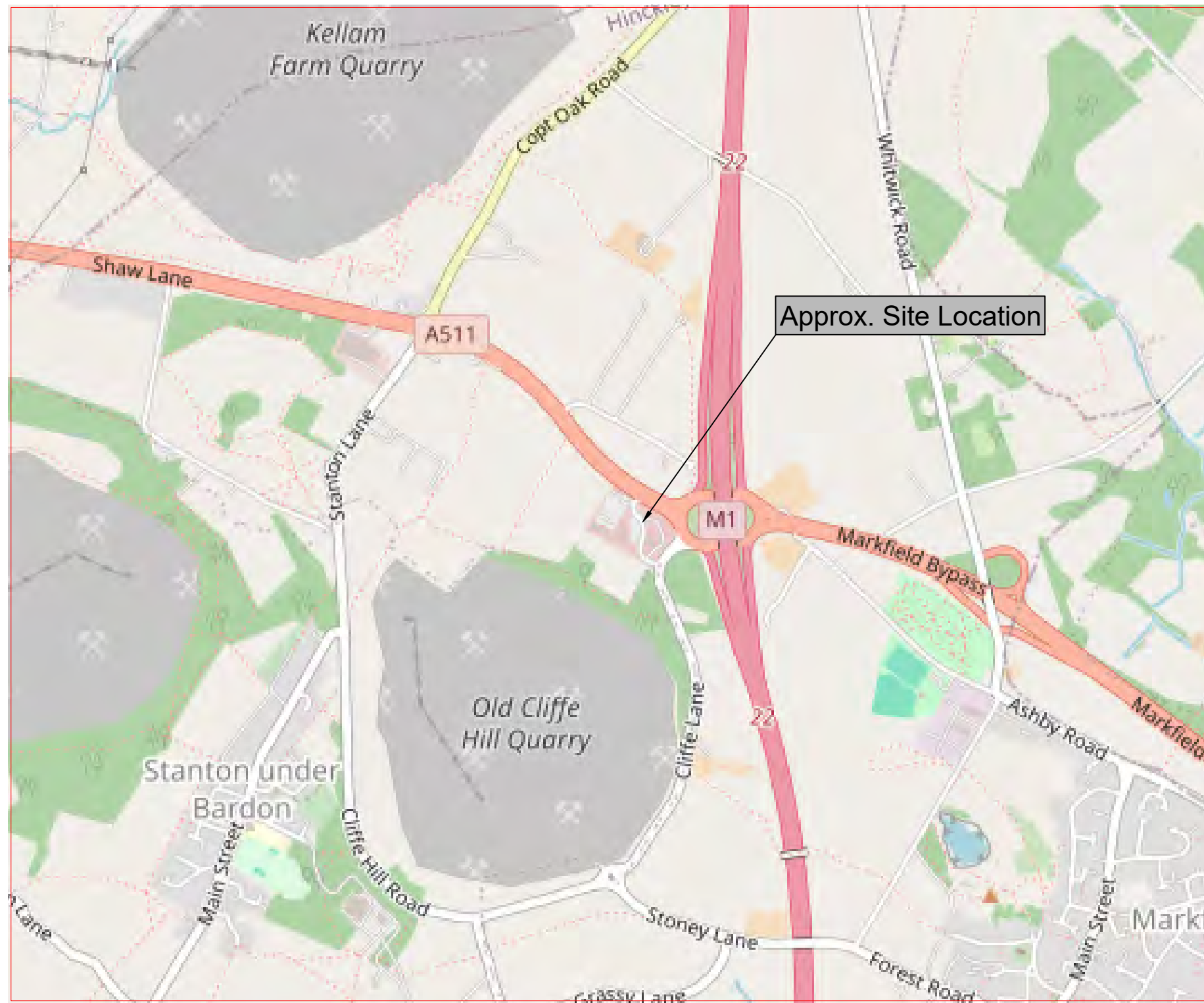
EPS' RECOMMENDED APPROACH

- Prepare Remedial Strategy & Implementation Plan (RS & IP), covering removal of all old tanks, fuel lines, redundant drainage infrastructure and grossly impacted soils.
- LPA must approve RS & IP prior to commencement.
- Implement RS & IP, with Watching Brief provided by EPS (or equivalent) with soil sampling required to evidence process.
- Additional waste testing likely to be required to inform off-site disposal of soil arisings.
- Undertake additional groundwater (GW) and organic vapour monitoring, post tank removal.
- Verify remedial works. If GW risks appear acceptable, no further works needed. If risks are identified to GW, further quantitative risk assessment, remedial options appraisal and follow-on treatment may be needed (but unlikely).
- Based on post-tank removal monitoring, determine whether vapor resistant membranes are needed.
- If deemed necessary, install vapour resistant membrane in new buildings. Barrier drinking water pipes likely also required.
- Issue Verification Report to close out planning process relating to contamination, prior to occupation.



It is recommended that a copy of this report be provided to the Environmental Health Department of Leicester City Council so that the information may be incorporated into their land quality records and used to support the current planning application..

FIGURES



Rev	Date	Drawn	Description	CHKD



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Site
Markfield Services, Little Shaw Lane
Markfield, LE67 9PP

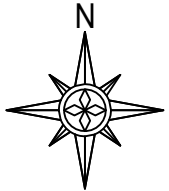
Client
EG on The Move Ltd

Title
Figure 1 - Site Location Plan

Surveyed by:	MO	Drawn by:	MO
Checked by:	TBC	Date:	19/01/2026

Scale	(A4 Sheet)	Drawing Reference
Not to Scale		UK26.7708_001

Job No	UK26.7708	Rev	01
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Rev	Date	Drawn	Description	CHKD



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Site
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Markfield, LE67 9PP**

Client
EG on The Move Ltd

Title
Figure 2 - Current Site Layout

Surveyed:	MO	Drawn by:	MO
Checked by:	TBC	Date:	19/01/2026

Scale	(A4 Sheet)	Drawing Reference
Not to Scale		UK26.7708_002

Job No	Rev
UK26.7708	01



Rev	Date	Drawn	Description	CHK'd



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Client
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Title
Figure 3 - Aerial Photograph

Surveyed:	MO	Drawn by:	MO
Checked by:	TBC	Date:	19/01/2026

Scale	(A4 Sheet)	Drawing Reference
Not to Scale		UK26.7708_003

Job No	Rev
UK26.7708	01



- KEY:
- SITE BOUNDARY
 - EPS WINDOWLESS SAMPLE BOREHOLE
 - EPS GROUNDWATER MONITORING BOREHOLE
 - HISTORICAL BOREHOLE



Rev	Date	Drawn	Description	CHK'd



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Site
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Client
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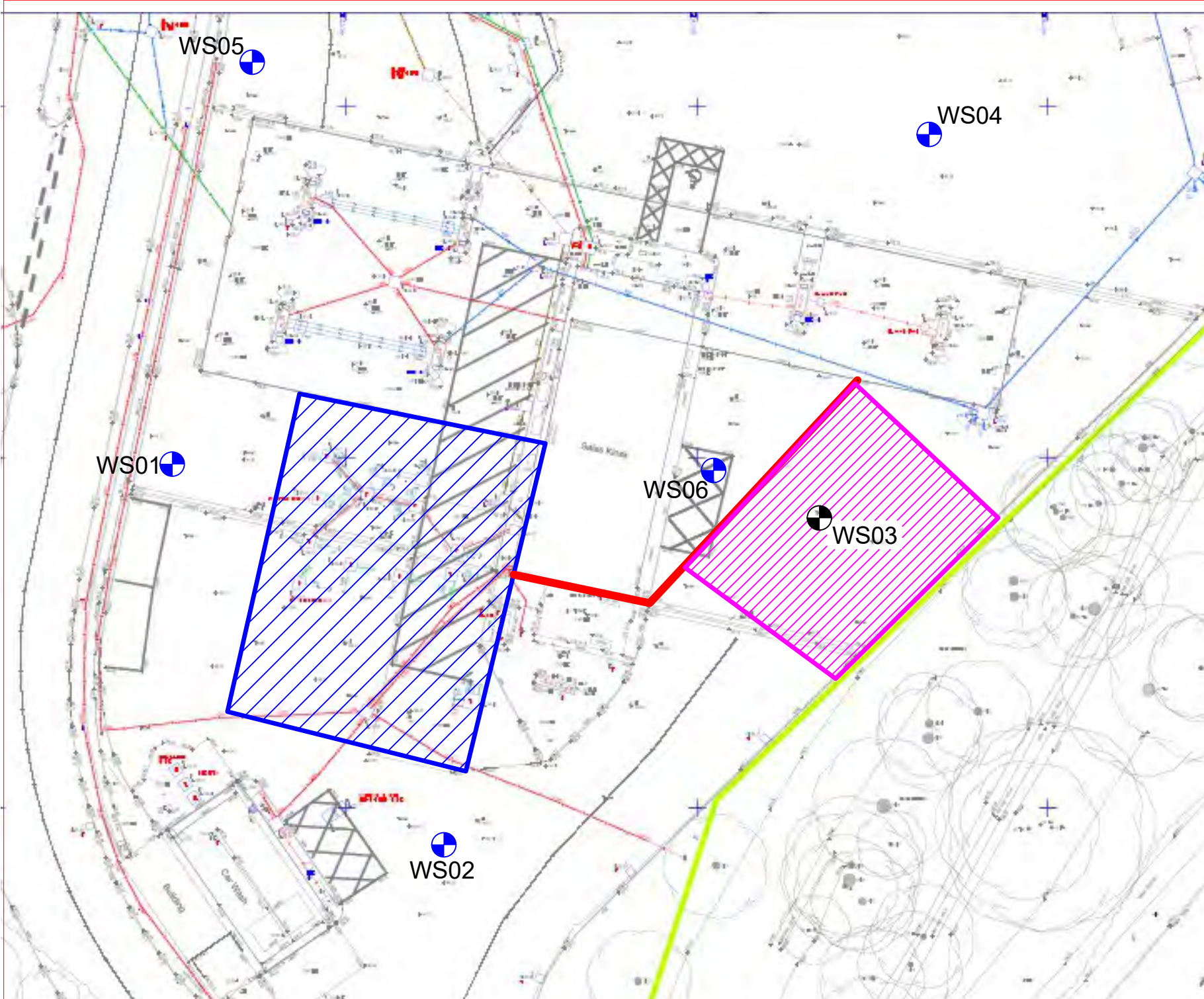
Title
Figure 4 - Borehole Location Plan

Surveyed by:	MO	Drawn by:	MO
Checked by:	TBC	Date:	19/01/2026

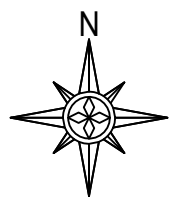
Scale
Not to Scale

(A4 Sheet) Drawing Reference
UK26.7708_004

Job No	UK26.7708	Rev	01
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- KEY:
- SITE BOUNDARY
 - EPS WINDOWLESS SAMPLE BOREHOLE
 - EPS GROUNDWATER MONITORING BOREHOLE
 - APPROXIMATE LOCATION OF KNOWN TANK FARM
 - AREA OF CONCERN - POTENTIALLY IMPACTED SOILS AROUND WS03



Rev	Date	Drawn	Description	Ch'gd



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Client
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Title
Figure 5 - Tank Farm Location and Area of Concern

Surveyed:	MO	Drawn by:	MO
Checked by:	JB	Date:	07/04/2026
Scale	(A4 Sheet)	Drawing Reference	

Not to Scale UK26.7708_005

Job No	UK26.7708	Rev	01
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TABLES

Table 1 – Laboratory Testing Schedule (Environmental)

Sample ID	Sample Depth (m bgl)	EPS Waste Suite	EPS Mini Suite	EPS TPH Suite
WS01 ES1	0.4-0.5	X	-	-
WS01 ES2	1.2-1.4	-	-	X
WS01 ES3	2.2-2.4	-	-	-
WS01 ES4	4.8-5.0	-	-	-
WS02 ES1	0.25-0.35	-	-	-
WS02 ES2	0.4-0.6	-	X	X
WS02 ES3	1.7-1.9	-	-	X
WS03 ES1	0.9-1.1	-	-	X
WS04 ES1	0.7-0.9	-	-	-
WS04 ES2	1.6-1.8	-	-	X
WS05 ES1	0.7-0.9	-	-	X
WS06 ES1	0.5-0.7	-	-	-
WS06 ES2	1.2-1.4	-	-	-
WS07 ES1	1.0-1.2	-	-	-
WS07 ES2	2.1-2.3	X	-	-
WS08 ES1	0.3-0.45	-	-	-
WS08 ES2	0.5-0.7	-	X	X
WS09 ES1	0.1-0.3	-	X	-
WS09 ES2	1.15-1.25	-	-	-
WS09 ES3	1.4-1.6	X	-	-
WS10 ES1	0.0-0.3	-	X	-
WS10 ES2	0.5-0.7	-	-	-
WS11 ES1	0.45-0.6	-	X	X

Notes:

mbgl

meters below ground level

1

Sample Taken

-

Sample Not Analysed

EPS Mini Suite

Organic Matter, Cyanide, Metals, PAH's, Phenols, Asbestos

EPS TPH Suite

Total Petroleum Hydrocarbons (Criteria Working group), BTEX & MTBE

EPS Waste Suite

Waste Characterisation Suite

Table 2 – Laboratory Testing Schedule (Groundwater)

Sample ID	EPS TPH Suite
WS01	X
WS02	X
WS03	X
WS04	X
WS05	X
WS06	X

Table 3 – Laboratory Testing Schedule (Geotechnical)

Sample ID	Sample Depth (m bgl)	Moisture Content	Liquid / Plastic Limits	CBR	PSD
WS01 B1	0.9-1.1	-	-	X	-
WS01 D2	2.0-2.2	X	X	-	-
WS04 D1	1.8-2.1	X	X	-	-
WS04 D3	3.1-3.4	X	X	-	-
WS05 D1	1.8-2.0	X	X	-	-
WS07 D1	2.9-3.1	X	X	-	-
WS09 D1	1.8-2.0	X	X	-	-
WS10 B1	0.5-1.2	-	-	X	-
WS10 D1	1.0-1.2	X	X	-	-
WS10 D3	4.7-5.0	X	X	-	-
WS11 D1	0.6-0.8	X	X	-	-
WS12 D1	1.1-1.3	-	-	-	X
WS12 D2	1.6-1.8	X	X	-	-
WS14 D2	0.8-1.0	X	X	-	-
WS14 B1	2.8-3.0	-	-	-	-

Notes:

mbgl

CBR

PSD

1

-

meters below ground level

California Bearing Ratio

Particle Size Distribution

Sample Taken

Sample Not Analyse

APPENDICES

APPENDIX A

Selected Site Photographs & Site Walkover Notes

SITE WALKOVER CHECKLIST 2024

GEOTECHNICAL	COMMENTS/EVIDENCE
 Are there any abrupt changes in slope profiles?	No
 Is there evidence of overburden on the slopes?	No
 Is there evidence of excavation at the base of a slope?	No
 Are there signs of landslip, such as tilting trees/posts?	No
 Are there signs of subsidence?	<i>Yes Potential for subsidence, or large pot holes, in the road leading into the hotel. Unable to determine due to the large puddles present.</i>
 Is there evidence of cracked ground?	No
 Is there evidence of compressible ground (i.e. Peat)?	No
 Is there evidence of an abrupt change in ground conditions?	<i>Yes Asphalt hardstanding around the PFS, car park, and asphalt area to the west of the service road. Overgrown vegetated areas between hotel and PFS car parks, and around old services building. Grass verges around hotel and car park.</i>
 Is there evidence of high groundwater, such as areas of waterlogged ground?	No
 Do signs of water loving plants such as reeds exist?	No
 Are there any ponds, streams, ditches (even if dry), springs or wells?	<i>Yes Culverted stream crosses the site to the north, trending approximately east-west.</i>
 Is there vegetation? What is the nature of it?	<i>Yes Frequent trees and grass around the edge of site, and between the services building and asphalt car parking.</i>

Job Number: UK26.7708
 Date: 28 January 2026
 Engineer: MO

To be completed by consultant for all Phase I Desk Studies and completed form must be scanned/photographed and saved in job folder under 'Scanned Site Notes'. EPS Lower Risk Assessment (EPS025a) also must be completed and scanned.



	Are trees present? What are the species & height of the trees?	<i>Yes Trees are up to approximately 15m, variable in species, including silver birch.</i>
	What is the nature and condition of vegetation on adjoining land?	<i>No Former Vegetation Seen</i>
	Is there evidence of former vegetation?	<i>Yes</i>
	Is there evidence of movement in any existing structures?	<i>No</i>
	Evidence of below ground structures & services?	<i>Yes PFS has utilities and tanks present, services building remains standing with utilities still present.</i>
	Any evidence of mine shafts or adits? (Check Coal Authority Mapping)	<i>No</i>
	Are there any access issues for a digger/drilling rig (slopes, height, gates etc.)?	<i>Yes Concrete blocks and heras fencing - excavator to move concrete blocks to access PFS, and asphalt car parking to the west of the service road.</i>

Any other comments?

CONTAMINATION		COMMENTS/EVIDENCE
	Evidence of ground contamination?	<i>Yes Overflowing sewer / foul water on the north side of the PFS, directly beneath the canopy flowing east from a manhole on the northwest corner of the PFS main building.</i>
	Evidence of groundwater /surface water contamination?	<i>Yes Overflowing foul water, as above.</i>
	Evidence of historic site use?	<i>Yes PFS and services.</i>

Job Number: UK26.7708
 Date: 28 January 2026
 Engineer: MO

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	Have all buildings been accessed internally, what was found?	No
	Evidence of /suspected asbestos? In building fabric or on ground, describe condition and form (cement/fibrous).	No
	Any man-made surfacing present? Including bituminous road planings/scalpings. Describe condition of hardstanding.	<i>Yes Hardstanding around PFS, service road, and car parking. High curbs around edge of and within PFS, and edges of the service road.</i>
	Any fuel or oil storage? If above ground, are tanks bunded/ steel/with above ground pipe or any staining?	No
	Obvious drainage features observed such as 3-chamber oil-water interceptor?	<i>Yes Surface drainage present across the PFS, as well as all PFS related drainage still present.</i>
	Any waste deposition observed, such as fly-tipped soils or chemical containers/ drums or areas of burning?	<i>Yes Fly tipping in front of heras fencing and concrete blocks, along edges of service road, around the edges of site.</i>
	Electricity substation present, maintained/operational? Are there any warning stickers on the gates/fence regarding chemicals?	No
	Evidence of previous investigation/remediation (e.g. old monitoring wells)?	<i>Yes Boreholes present around PFS, all located and monitoring completed or attempted.</i>
	Walked around surrounding areas? Identify any off-site sources such as petrol stations, heating oil tanks.	No
	Anecdotal evidence	<i>Yes Rats present near and in the bins on the western edge of the hotel car park, identified by hotel staff and on-site contractors.</i>

Job Number: UK26.7708
Date: 28 January 2026
Engineer: MO

To be completed by consultant for all Phase I Desk Studies and completed form must be scanned/photographed and saved in job folder under 'Scanned Site Notes'. EPS Lower Risk Assessment (EPS025a) also must be completed and scanned



Any other
comments?

AIR QUALITY (ONLY NECESSARY IF INSTRUCTED – CHECK WITH AQ TEAM)

Completed Air Quality Walkover Checklist?

No

Photo 1: Kiosk and car wash of the PFS, looking southeast.



Photo 2: PFS on the east of site, facing northeast.



Photo 3: Car parking in the centre of the site, facing southwest.



Photo 4: Southeast corner of the services building, facing northwest.



Photo 5: Car parking on the west of the site, facing north.



Photo 6: Enclosed bins in car park, facing north.



Photo 7: Edge of car park, facing north.



Photo 8: Service road, facing southeast.



Photo 9: WS01 1.20 – 5.00m



Photo 10: WS02 1.20 – 5.00m



Photo 11: WS07 1.20 – 5.00m



Photo 12: WS10 1.20 – 5.00m



APPENDIX B

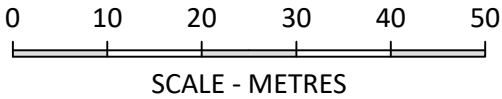
Proposed Development Plan



GENERAL NOTES

CDM 2015 - Designer

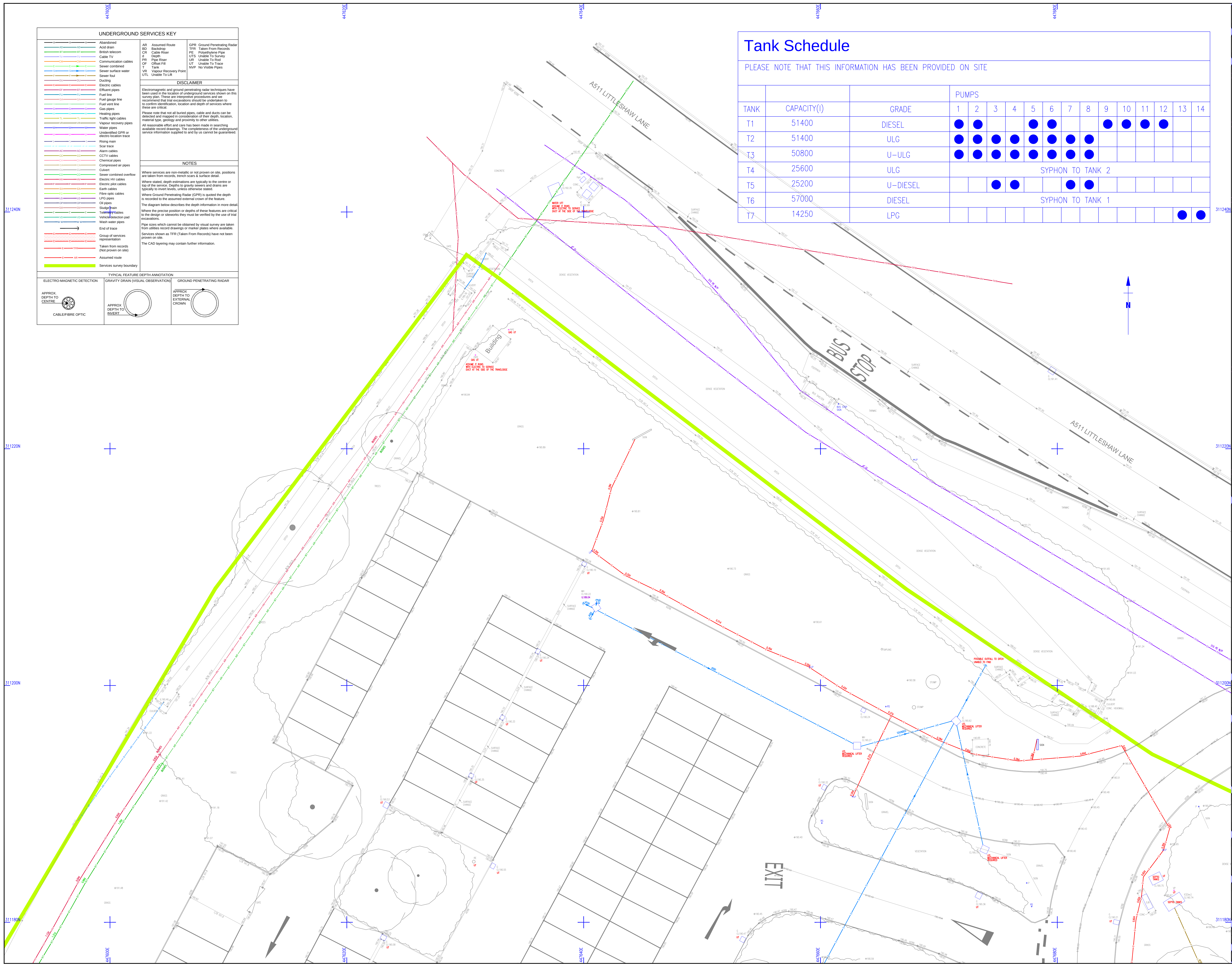
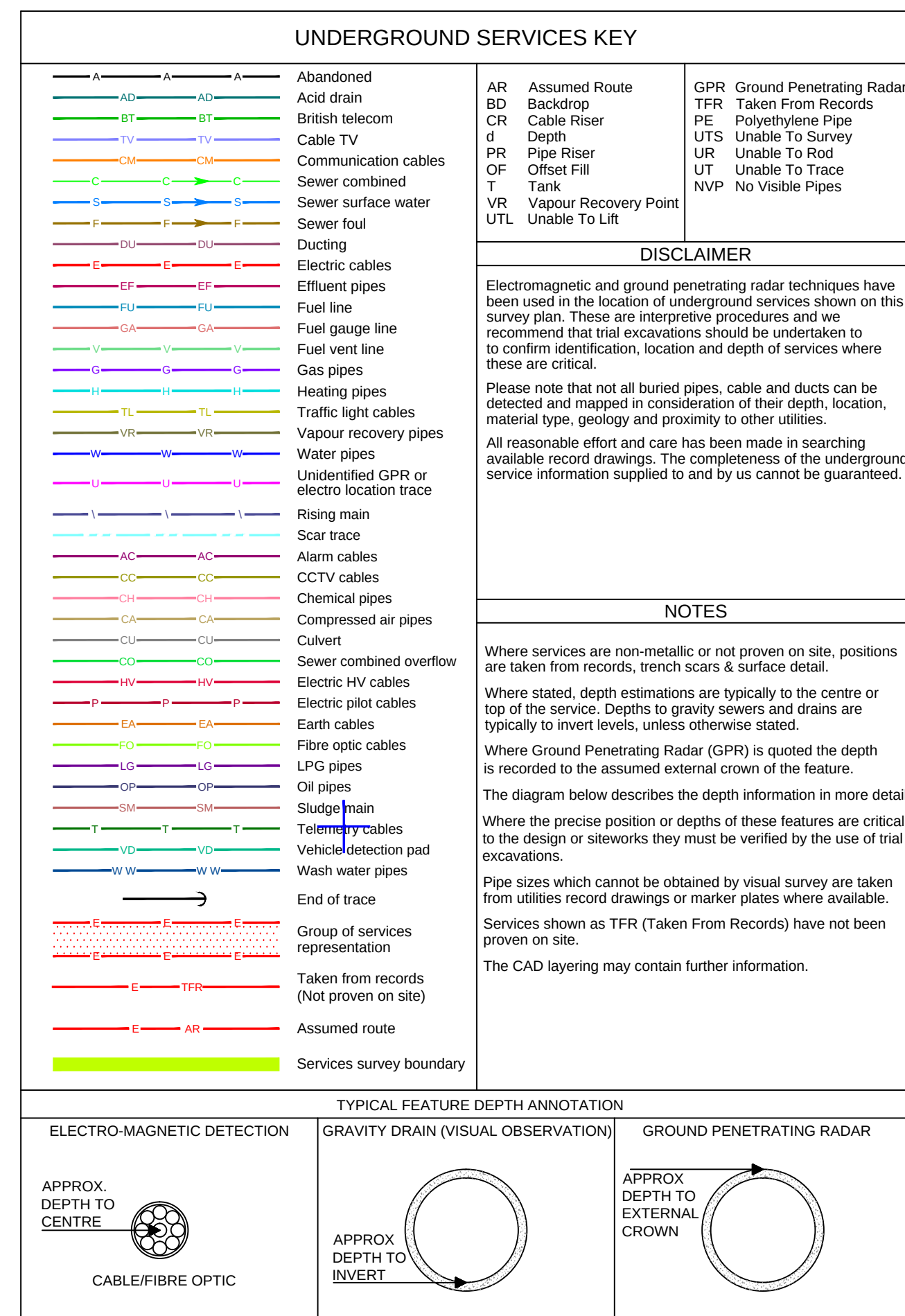
- Drawing prepared from historical topographical survey referenced :- 51184-MH-VTO-M1 Markfield-M3-G-0001(Topo 31-01-2018)
- Large number of Tree protection orders on site.
- Existing hotel to be retained.
- Existing site egress to be reviewed by Highways engineers, potential widening works to ease HGV exit maneuvers.

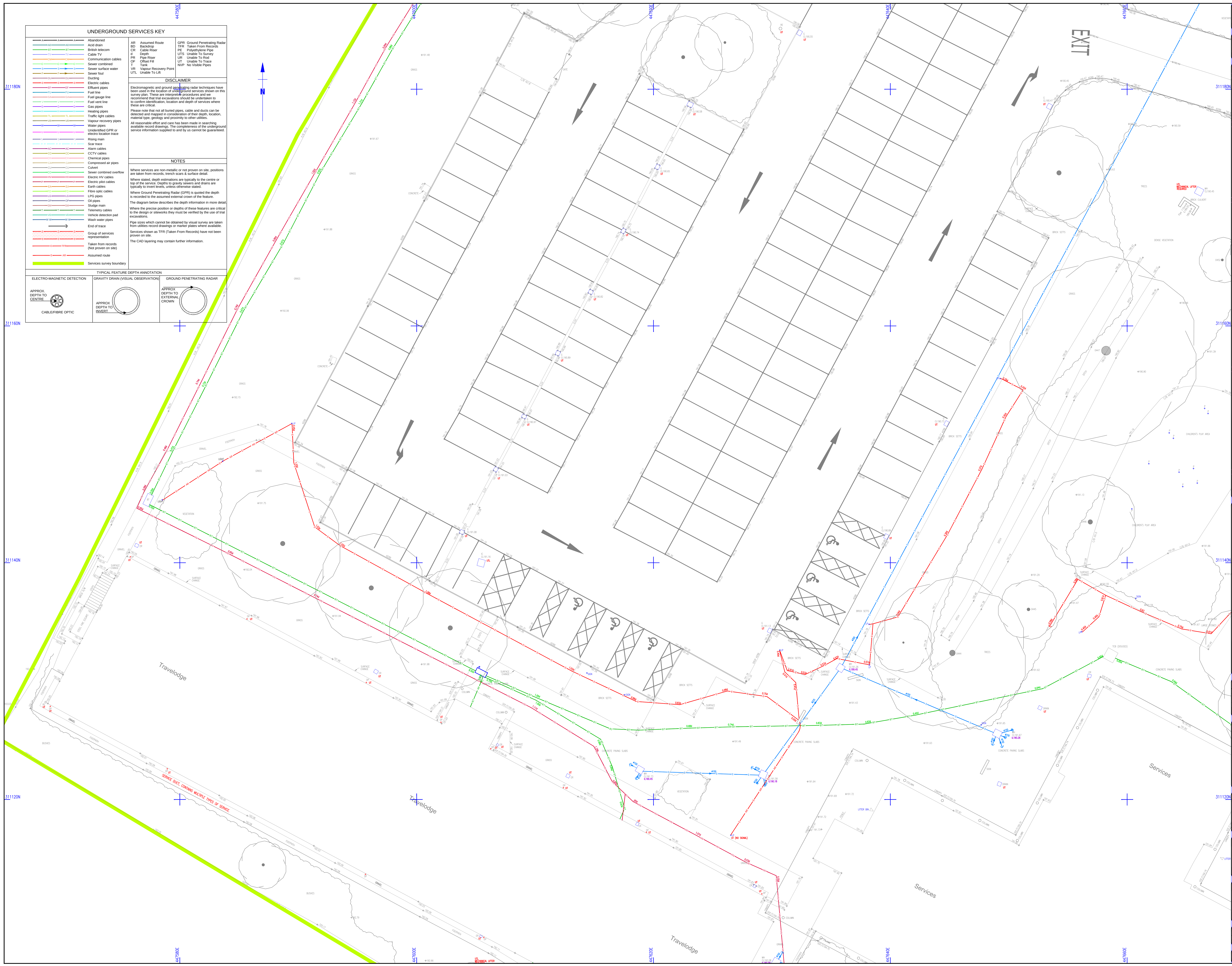


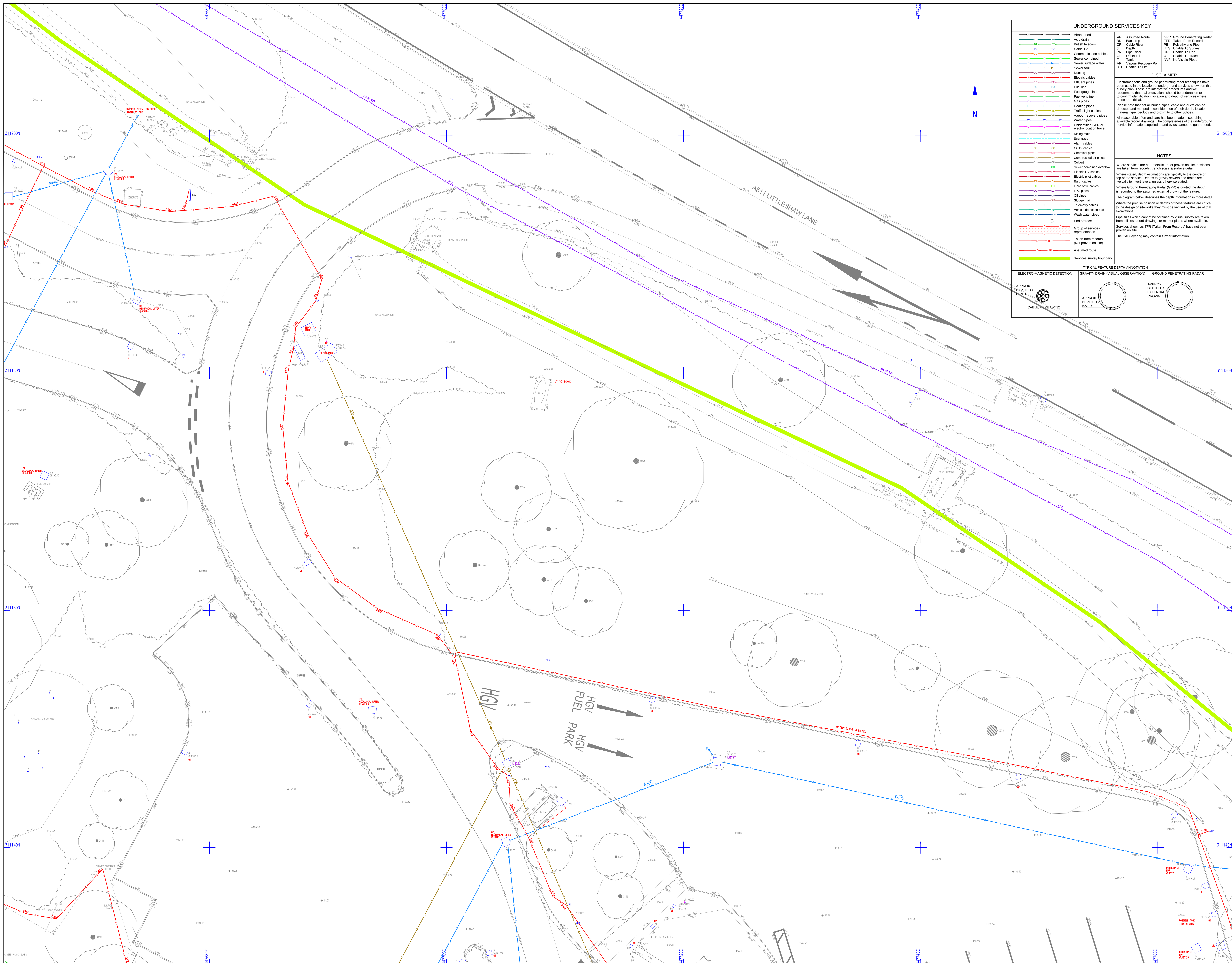
STATUS			CLIENT	  8 Feast Field, Horsforth, Leeds, West Yorkshire, LS18 4TJ www.jennings-design.com 01274 395422 office@jennings-design.com
FEASIBILITY SCHEME			EG ON THE MOVE	
DRAWN BY CJW	ISSUE DATE November 2025	SCALE NTS @ A3	ADDRESS Former Motorway service area Little Shaw Ln Markfield LE67 9PP	
PLAN NUMBER 251141 - SK 02		REVISION -		

APPENDIX C

Site Specific Utility and Topographical Survey

[illegible][illegible]

[illegible]



UNDERGROUND SERVICES KEY

Abandoned
 Acid drain
 British Telecom
 Cable TV
 Communication cables
 Sewer combined
 Sewer surface water
 Sewer foul
 Ducting
 Electric cables
 Effluent pipes
 Fuel line
 Gas pipeline
 Fuel vent line
 Gas pipes
 Heating pipes
 Traffic light cables
 Wastewater vapour pipes
 Water pipes
 Unidentified GPR or other services
 Rising main
 Scar trace
 Alarm cables
 CCTV cables
 Chemical pipes
 Connected air pipes
 Culvert
 Sewer combined overhead
 Electric HV cables
 Electric pile cables
 Earth cables
 Fire optic cables
 LPG pipes
 Oil pipes
 Sludge main
 Frequency cables
 Velocity detection pad
 Wastewater pipes
 End of trace
 Ground of services representation
 Taken from records (Not proven on site)
 Assumed route
 Services survey boundary

AR Assumed Route
 BD Backdrop
 CB Cable Rise
 d Depth
 FI Fire Rise
 CF Cist Fill
 VR Vapour Recovery Point
 UL Unlabel To Lift

GPR Ground Penetrating Radar
 TFR Taken From Records
 PE Polyethylene Pipe
 UTS Unable To Survey
 UR Unable To Rod
 UL Unable To Trace
 NVP No Visible Pipes

DISCLAIMER

Electromagnetic and ground penetrating radar techniques have been used in the location of underground services shown on this map. These services are interpreted from records and it is recommended that all excavations should be undertaken to a minimum depth of 100mm. Location and Depth of services where there are critical.

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

All reasonable effort and care has been made in searching for and recording the location of services. The completeness of the underground service information supplied to and by us cannot be guaranteed.

NOTES

Where services are non-metallic or not proven on site, positions are taken from records, trench surveys or GPR data.

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

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

The diagram below describes the depth information in more detail.

Where the precise position and frequency of these features are critical (e.g. as in sewers) they must be verified by the use of trial excavations.

Pipe sizes which cannot be obtained by visual survey are taken from other records (drawings or marker plates where available).

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

The CAD layering may contain further information.

ELECTROMAGNETIC DETECTION

GRAVITY DRAIN (VISUAL OBSERVATION)

GROUND PENETRATING RADAR

APPROX DEPTH TO SURFACE

APPROX DEPTH TO INVERT

APPROX DEPTH TO EXTERNAL CROWN

CABLE/PIPE OPTIC

[illegible]

Sheet Index

A diagram illustrating overlapping rectangles. A central rectangle is labeled "0106_01:23". It is surrounded by several other rectangles of varying sizes and positions, some of which overlap with it. The rectangles are drawn with thin black lines.

[illegible]

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Accreditations








Client

BP Oil UK Ltd

Witan Gate House, 500 - 600 Witan Gate

Milton Keynes, MK9 1ES

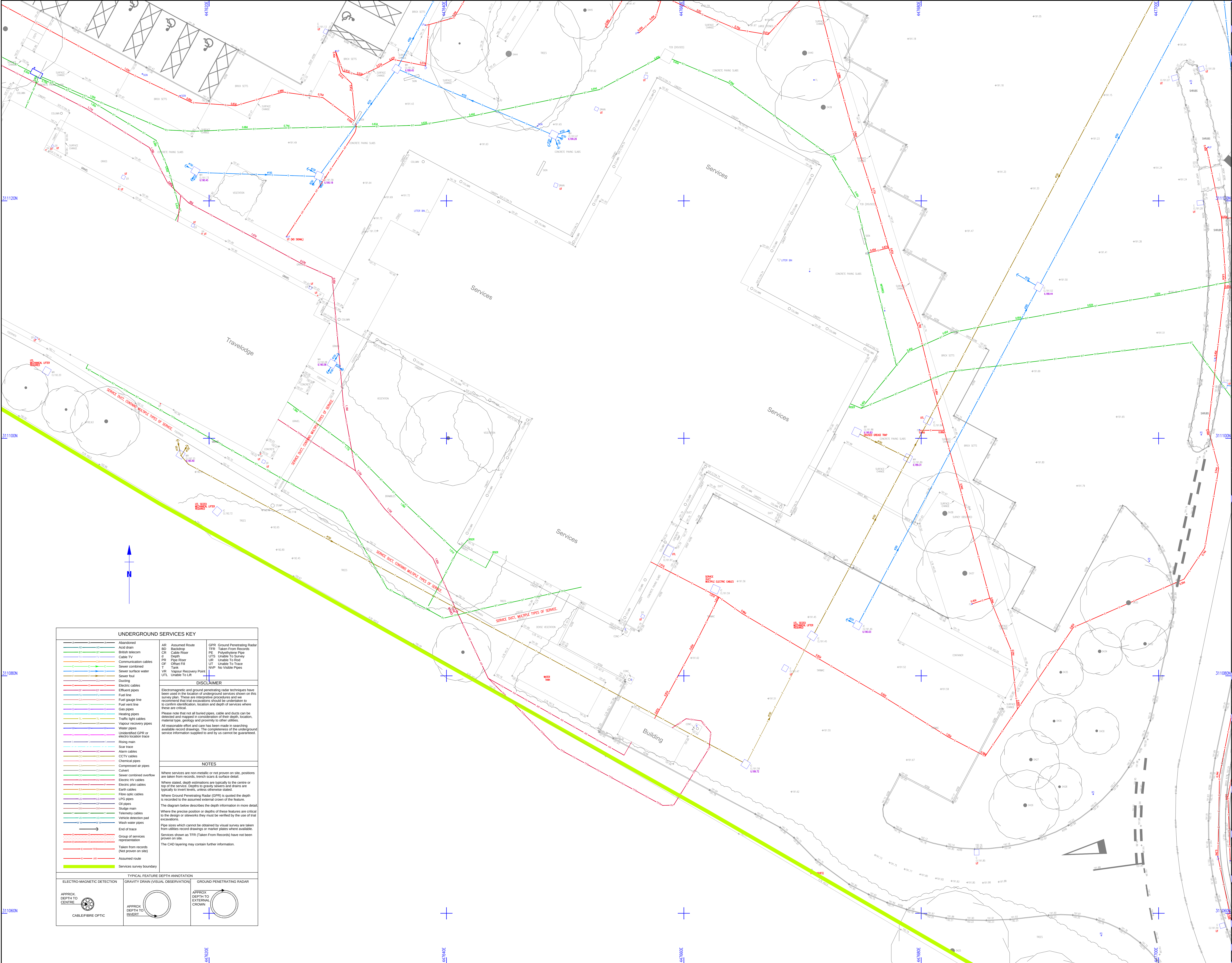
Project

Site at M1, Markfield
Leicestershire Little Shaw Ln
Markfield LE67 9PP

Drawing Title

Underground Services

Drawn By BG		09/04/2018		Survey Date Feb-18	
Checked by MP		11/04/2018		Scale 1/100@A0	
Drawing No 51184_01_03					Revision



Survey Notes
Grid: Local plane metric related to OS Grid
Levels: Arbitrary

Notes
It is shown on the drawing only the records available at the time of the survey

Topographical Survey Legend

Building

Subsidence

Run

Passage

Wall with height

Retaining Wall

Roof

Roof

Roof

Roof

Roof

Roof

Roof

Roof

Roof

Roof

Roof

Roof

Power Pump

Basement Light

Footbridge

Box Type Channel

Box Type Channel

Box Type Channel

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FEWCE STYLES AND DESCRIPTIONS

Concrete Buried

Concrete Buried

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OVERHEAD FEATURES

Electricity Pylon

Electricity Pylon

Electricity Pylon

Electricity Pylon

Electricity Pylon

Electricity Pylon

Electricity Pylon

Electricity Pylon

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ROADS

Footpath

Footpath

Footpath

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Footpath

Footpath

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STREET FURNITURE

Bus Stop

Bus Stop

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Bus Stop

Bus Stop

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Bus Stop

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Bus Stop

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LEVEL AND HEIGHT INFORMATION

Standard Spot Height

Standard Spot Height

Standard Spot Height

Standard Spot Height

Standard Spot Height

Standard Spot Height

Standard Spot Height

Standard Spot Height

Standard Spot Height

Standard Spot Height

Standard Spot Height

Standard Spot Height

Standard Spot Height

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Standard Spot Height

SURVEY INFORMATION SIGNS

Permanent Ground Marker

Permanent Ground Marker

Permanent Ground Marker

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Rev. Date Description

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Rev. Date Description

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RICS

THE SURVEY ASSOCIATION

RICS

THE SURVEY ASSOCIATION

RICS

THE SURVEY ASSOCIATION

Client

BP Oil UK Ltd

Witan Gate House, 500 - 600 Witan Gate

Milton Keynes, MK9 1ES

Project

Site at M1, Markfield

Leicestershire Little Shaw Ln

Markfield LE67 9PP

Drawing Title

Underground Services

Drawn by

BG

09/04/2018

Survey Date

Feb-18

Checked by

MP

11/04/2018

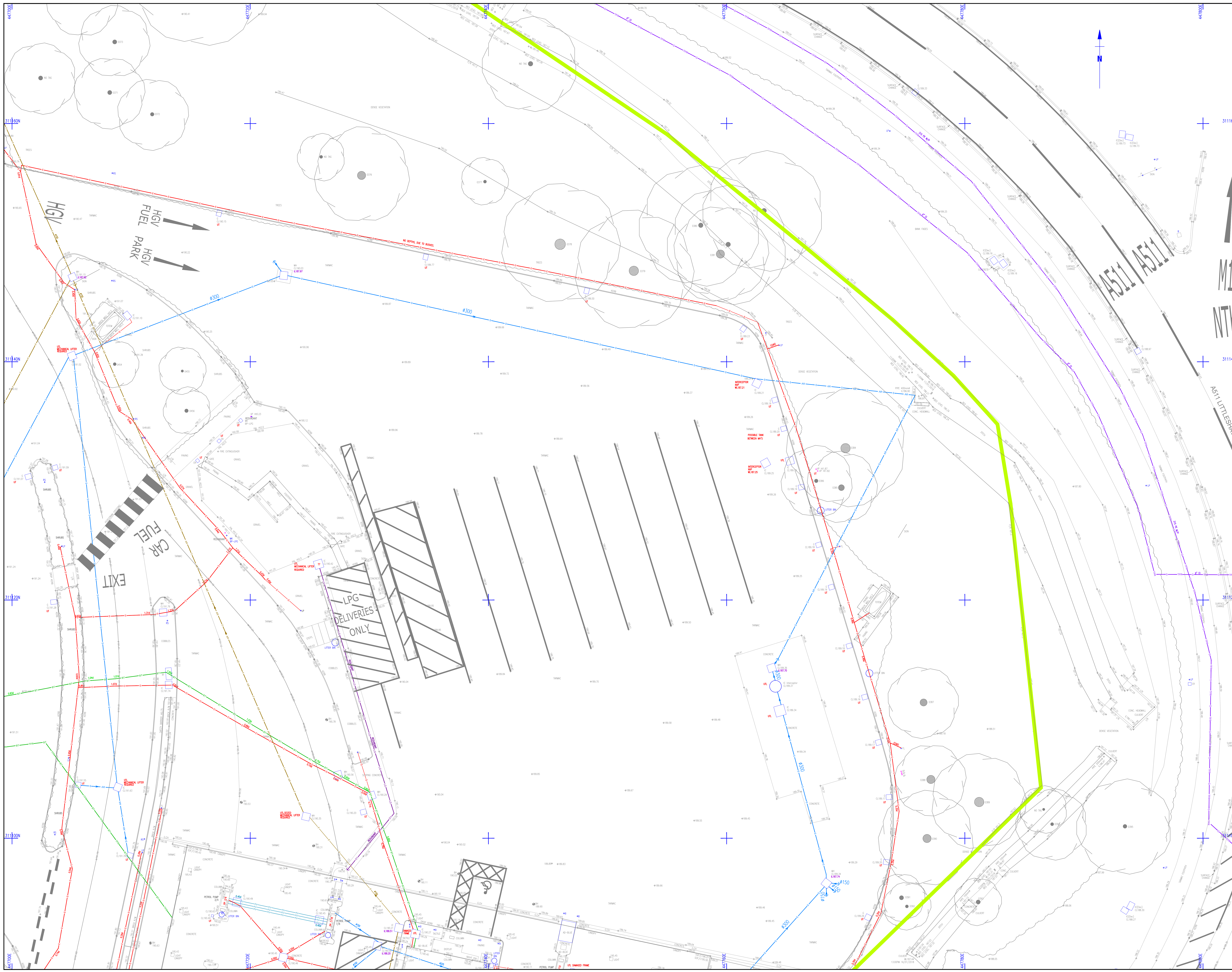
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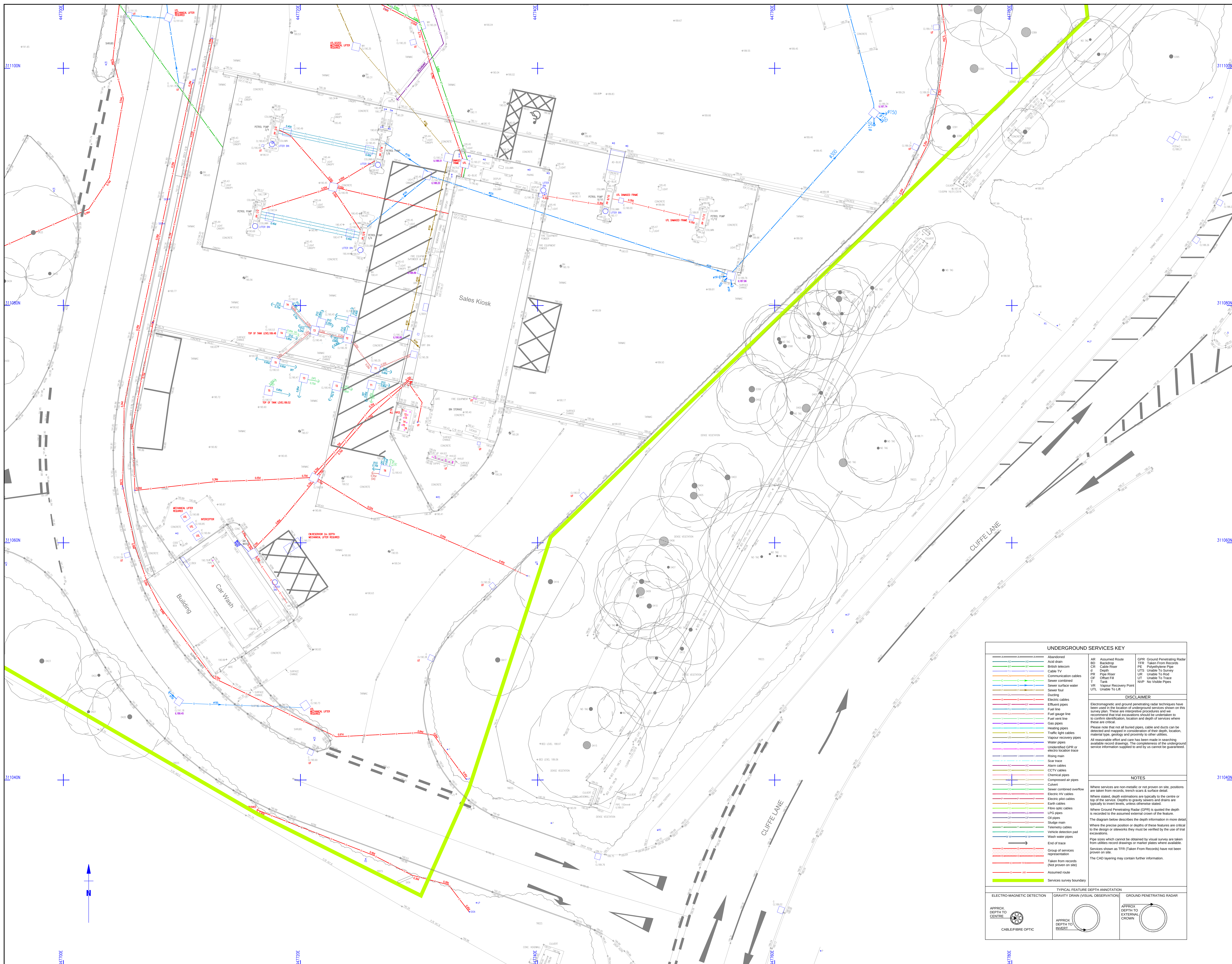
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Drawing No

51184_01_04

Revision

[illegible]



Survey Notes	
Grid:	Local, plane metric related to OS Grid
Levels:	Arbitrary

Notes

It is shown on the drawing only the records available at the time of the survey

[illegible]Sheet Index

9/10/2020

[illegible]

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Project	Site at M1, Markfield Leicestershire Little Shaw Ln Markfield LE67 9PP
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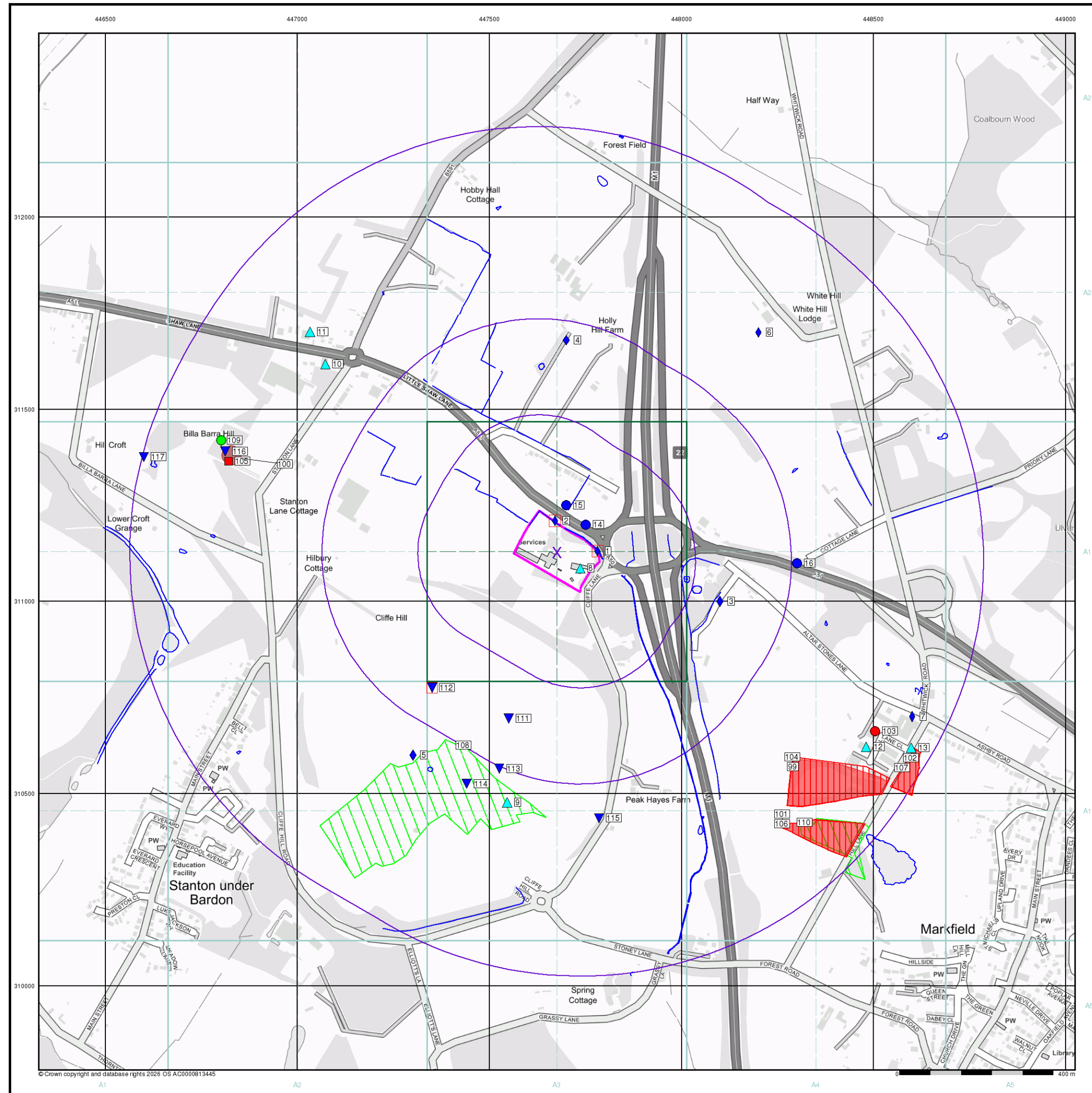
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Underground Services

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Checked by MP 11/04/2018		Scale 1/100@A0	
Drawing No 51184_01_06			Revision

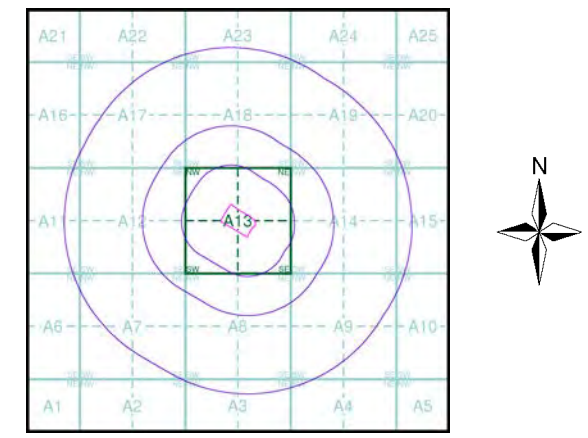
APPENDIX D

Surrounding Land Use



- General**
 - Specified Site
 - Specified Buffer(s)
 - Bearing Reference Point
 - Map ID
 - Several of Type at Location
- Agency and Hydrological**
 - Contaminated Land Register Entry or Notice (Location)
 - Contaminated Land Register Entry or Notice
 - Discharge Consent
 - Enforcement or Prohibition Notice
 - Integrated Pollution Control
 - Integrated Pollution Prevention Control
 - Local Authority Integrated Pollution Prevention and Control
 - Local Authority Pollution Prevention and Control
 - Local Authority Pollution Prevention and Control Enforcement
 - Pollution Incident to Controlled Waters
 - Historical Prosecutions
 - Prosecutions
 - Registered Radioactive Substance
 - River Network or Water Feature
 - Substantiated Pollution Incident Register
 - Water Abstraction
 - Water Industry Act Referral
- Waste**
 - BGS Recorded Landfill Site (Location)
 - BGS Recorded Landfill Site
 - EA Historic Landfill (Buffered Point)
 - EA Historic Landfill (Polygon)
 - Integrated Pollution Control Registered Waste Site
 - Licensed Waste Management Facility (Landfill Boundary)
 - Licensed Waste Management Facility (Location)
 - Local Authority Recorded Landfill Site (Location)
 - Local Authority Recorded Landfill Site
 - Potentially Infilled Land (Non-water)
 - Potentially Infilled Land (Non-water)
 - Potentially Infilled Land (Non-water)
 - Potentially Infilled Land (Water)
 - Potentially Infilled Land (Water)
 - Potentially Infilled Land (Water)
 - Potentially Infilled Land (Water)
 - Registered Landfill Site (Location)
 - Registered Landfill Site (Point Buffered to 100m)
 - Registered Landfill Site (Point Buffered to 250m)
 - Registered Waste Transfer Site (Location)
 - Registered Waste Transfer Site
 - Registered Waste Treatment or Disposal Site (Location)
 - Registered Waste Treatment or Disposal Site
- Hazardous Substances**
 - COMAH Site
 - Explosive Site
 - NIHHS Site
 - Planning Hazardous Substance Consent
 - Planning Hazardous Substance Enforcement
 - BGS Recorded Mineral Site
- Geological**
 - BGS Recorded Mineral Site

Site Sensitivity Map - Slice A

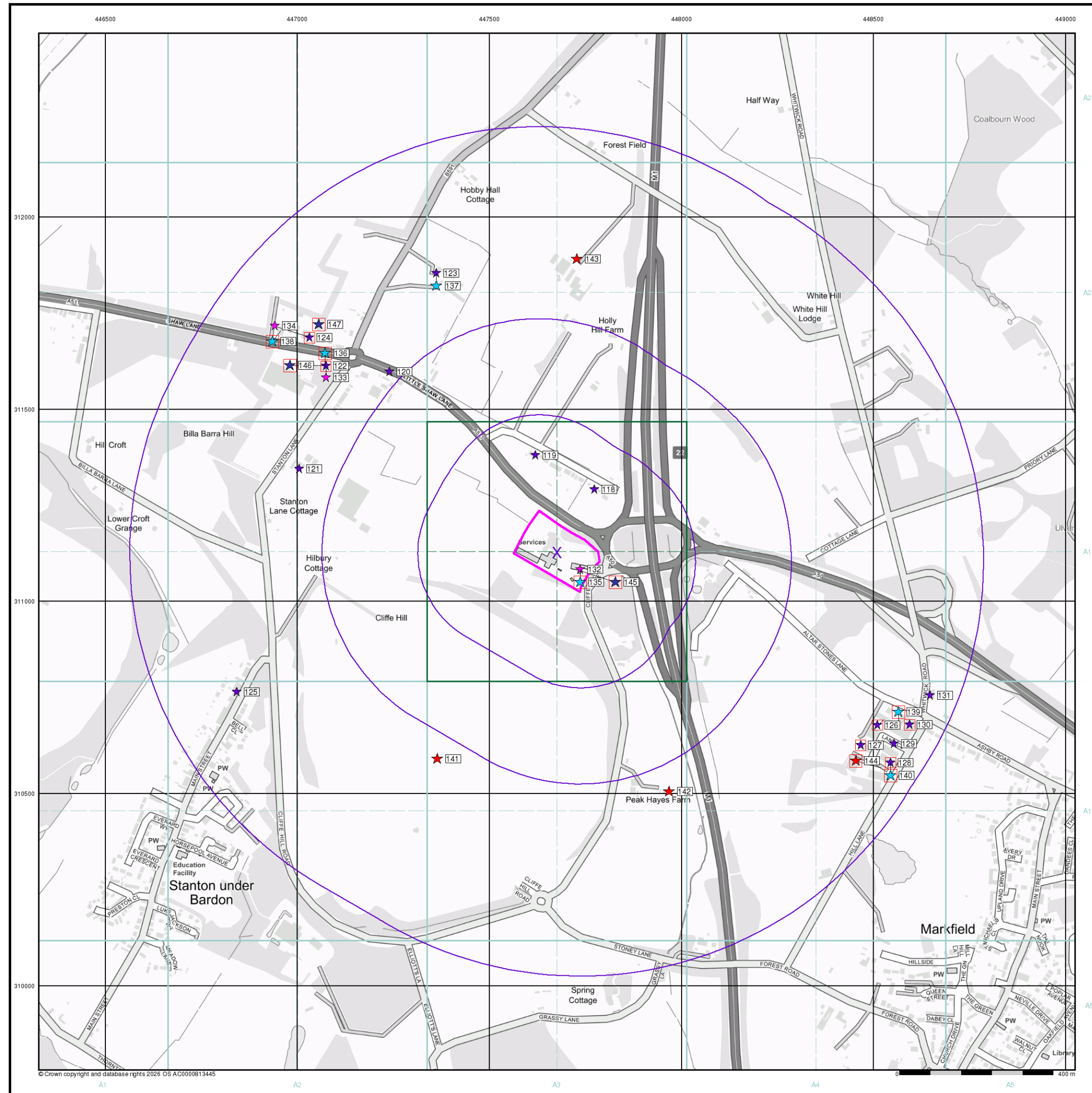


Order Details

Order Number: 392811784_1_1
Customer Ref: UK26.7708
National Grid Reference: 447680, 311130
Slice: A
Site Area (Ha): 2.42
Search Buffer (m): 1000

Site Details

Markfield Services, Little Shaw Lane, Markfield, LE67 9PP



Industrial Land Use Map

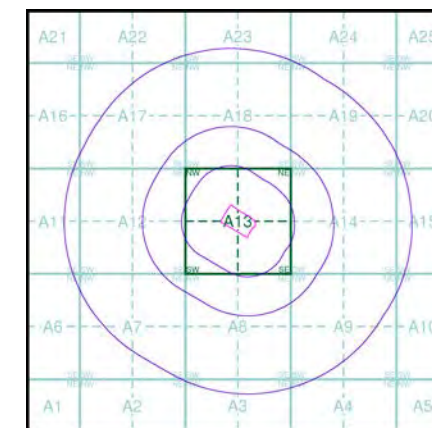
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry
- Points of Interest - Commercial Services
- Points of Interest - Education and Health
- Points of Interest - Manufacturing and Production
- Points of Interest - Public Infrastructure
- Points of Interest - Recreational and Environmental
- Underground Electrical Cables

Industrial Land Use Map - Slice A



Order Details

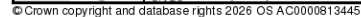
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Customer Ref: UK26.7708
National Grid Reference: 447680, 311130
Slice: A
Site Area (Ha): 2.42
Search Buffer (m): 1000

Site Details

Markfield Services, Little Shaw Lane, Markfield, LE67 9PP



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Fax: 0844 844 9951
Web: www.envirocheck.co.uk



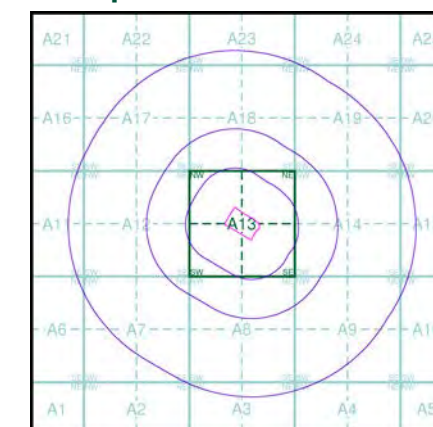
General

-  Specified Site
-  Specified Buffer(s)
-  Bearing Reference Point

Agency and Hydrological (Flood)

-  Extreme Flooding from Rivers or Sea without Defences (Zone 2)
-  Flooding from Rivers or Sea without Defences (Zone 3)
-  Area Benefiting from Flood Defence
-  Flood Water Storage Areas
-  Flood Defence

Flood Map - Slice A



Order Details

Order Number: 392811784_1_1
Customer Ref: UK26.7708
National Grid Reference: 447680, 311130
Slice: A
Site Area (Ha): 2.42
Search Buffer (m): 1000

Site Details

Markfield Services, Little Shaw Lane, Markfield, LE67 9PP



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