



Phase I Geoenvironmental Assessment

Land South of Kelvedon Road
Tiptree
Colchester
CO5 0LU

Marden Homes Ltd

1342 R01: Issue 2

November 2020



Title Phase I Geoenvironmental Assessment Report
Land South of Kelvedon Road, Tiptree, Colchester, CO5 0LU

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY	
Project Details	Green Earth Management Company Limited (GEMCO) were commissioned by Marden Homes Limited (the Client) to undertake a Phase I Geoenvironmental Assessment at Land South of Kelvedon Road, Tiptree, Colchester, CO5 0LU. The works were commissioned to support a planning application to redevelop the land to residential usage to include the construction of 130 dwellings with associated infrastructure, access and soft landscaping.
Site Location	The site address is Land South of Kelvedon Road, Tiptree, Colchester, CO5 0LU centred upon approximate National Grid Reference (NGR) 588700, 217000.
Site Walkover Description	<p>The site is located south of Kelvedon Road and comprises 3 (no.) connecting parcels of land, totalling 5.15 ha in area.</p> <p>The first parcel of land comprised two (2 no.) residential dwellings (Tower End and The Annexe) and associated gardens, a stable block, a storeroom, courtyard, an office and associated infrastructure. The rear of the property comprised paddocks. Three oil-storage tanks were noted at the properties, all in a good condition.</p> <p>The second parcel of land comprised a residential dwelling, a warehouse/barn, a stable block, a place of worship and associated infrastructure. Suspected ACMs were noted on the barn. Evidence of made ground and historical burning was present at the southern end of this parcel of land.</p> <p>The third parcel of land comprised two (2 no.) fields. Both fields were partially overgrown. A small stockpile of made ground was present in Field 2 and a ditch containing ponded water was noted running around the perimeter.</p>
Site History	The earliest map available, dated 1874-1875, indicated the site was a set of agricultural fields, which by 1973 had been developed with residential buildings.
Published Geology	<p>Superficial Deposits: None – see below nearby deposits</p> <p>Bedrock: London Clay Formation (Clay, silt and sand)</p> <p>Nearby Deposits: The Superficial Deposits comprising the Glaciofluvial Deposits (Mid Pleistocene) run parallel with the eastern boundary and possibly outcrop in the north-eastern corner of site (Field 1).</p>
Hydrogeology	<ul style="list-style-type: none"> • Superficial Deposits (off-site/NE corner): Secondary A Aquifer. • Bedrock: Unproductive Strata. • The site is located within three (3 no.) Nitrate Vulnerable Zones. • The site is not located within a Source Protection Zone (SPZ). • There are 29 (no.) OS Water Network lines within a 1 km radius.

EXECUTIVE SUMMARY	
Hydrology	<ul style="list-style-type: none"> • Two (2 no.) surface water features (ponds) were identified on site at Tower End in addition to a drainage ditch running around the field boundaries; • The nearest off-site surface water feature (river) is located 227m west; and • The site has limited potential for groundwater flooding to occur.
Environmental Database Search	<ul style="list-style-type: none"> • The nearest discharge consent is located 145 m southwest of site; • There are no groundwater abstraction licences within a 1 km radius of site; • Potentially infilled land is located approximately 206m southwest of the site; and • A Public Right of Way runs along the southern boundary of site.
Preliminary Conceptual Site Model (CSM) and Risk Assessment	<p>In summary, the following potential contamination sources were identified:</p> <ul style="list-style-type: none"> • On Site: Residential/equestrian use of the site; and, • On and Off-Site: Agricultural activities; construction and demolition activity. <p>The main potential receptors include future site users, site neighbours, construction workers, controlled waters, ecological receptors and buried services.</p> <p>A Moderate/Low risk to human health was identified associated with localised stockpiles of made ground (PPLB-1-a). All other plausible pollution linkages (PPL) were considered to pose a Low or Very Low risk to identified receptors.</p>
Conclusions and Recommendations	<p>On the basis of the Phase I Geoenvironmental Assessment, the site is considered suitable for the proposed residential end use, subject to the following recommendations:</p> <ul style="list-style-type: none"> • Geotechnical investigation will be required to inform the civil and structural engineering of the proposed development; • An intrusive geo-environmental investigation with sample collection is required to confirm the extent and nature of made ground at the site. The investigation should include chemical laboratory analysis to quantify potential contaminants of concern within the made ground. It would be prudent to carry this out in combination with the geotechnical investigation; • Prior to demolition all on-site structures will require an HSG264 Demolition Survey for asbestos; and • A discovery strategy (see Section 5.5) should be in place during all the development works. <p>A copy of this report should be forwarded to the Local Planning Authority in support of any application made.</p>
<p><i>This Executive Summary only provides a summary of the site data and its assessment. It does not provide a definitive environmental analysis and is for guidance purposes only. It is recommended that the reader reviews the reporting its entirety and any material referenced therein.</i></p>	

ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations	
Acronym / Abbreviation	Definition
ACM or PACM	Asbestos or potential asbestos containing material
ADE	Average Daily Exposure
ASPT	Average Score Per Taxon
BOD	Biochemical Oxygen Demand
BGS	British Geological Survey
BH	Borehole
BS	British Standard
BTEX	Benzene, Toluene, Ethyl benzene and Xylenes
CAT	Cable avoidance tool
CIRIA	Construction Industry Research and Information Association
CLEA	Contaminated Land Exposure Assessment
CLR	Contaminated Land Research reports
Defra	Department of the Environment, Food and Rural Affairs (formerly the DoE and DETR)
DETR	Department of the Environment, Transport and the Regions (formerly the DoE and now Defra)
DO	Dissolved oxygen
DoE	Department of the Environment (then DETR and later Defra)
DQRA	Detailed quantitative risk assessment (Tier 2)
EA	Environment Agency
EPH	Extractable Petroleum Hydrocarbons
EQI	Environmental Quality Index
EQS	Environmental Quality Standards
FID	Flame ionisation detector
GAC	Generic assessment criteria
GC	Gas chromatography
GEMCO	Green Earth Management Co Ltd
GQA	General quality assessment
GQRA	Generic quantitative risk assessment (Tier 1)
ha	Hectare
HCV	Health criteria value
HHRA	Human health risk assessment
ICRCL	Interdepartmental Committee on the Redevelopment of Contaminated Land
ID	Index dose
LEL	Lower explosive limit
LOD	Limit of detection
m	Metres
mAOD	Metres above ordnance datum
mbgl	Metres below ground level
MCERTS	Monitoring Certification Scheme
MDI	Mean daily intake
MTBE	Methyl tertiary butyl ether

Acronyms and Abbreviations	
Acronym / Abbreviation	Definition
NGR	National grid reference
NHBC	National House Building Council
NRA	National Rivers Authority (now the Environment Agency)
PACM	Potentially asbestos containing material
PAH	Polyaromatic hydrocarbon (a.k.a. polynuclear aromatic hydrocarbon)
pH	A measure of the acidity or basicity of an aqueous solution. Defined as the negative logarithm of the concentration of hydrogen ions in a substance
PID	Photo Ionisation Detector
PPE	Personal Protective Equipment
RBCA	Risk-based contamination assessment
RMS	Remediation Method Statement
RQO	River Quality Objective
S4UL	Suitable for Use Level
SGV	Soil Guideline Value
SNIFFER	Scotland and Northern Ireland Forum for Environmental Research
SPT	Standard penetration test
SSTL	Site-specific target level
SVOC	Semi Volatile Organic Compounds
QRA	Quantitative risk assessment
TDI	Tolerable daily intake
TDSI	Tolerable daily soil intake
TP	Trial pit
TPH	Total petroleum hydrocarbon
TPHCWG	Total petroleum hydrocarbon criteria working group
TOX	CLR 9 Toxicological Reports
UKAS	United Kingdom Accreditation Service
USEPA	United States Environmental Protection Agency
UXB	Unexploded Bomb
VOC (TVOC)	Volatile Organic Compounds (Total VOC)
WHO	World Health Organisation
WQS	Water Quality Standards
WS	Window sample

1 INTRODUCTION

1.1. Project Details

Green Earth Management Company Limited (GEMCO) were commissioned by Marden Homes Ltd (the Client) to undertake a Phase I Geo-environmental Assessment at Land South of Kelvedon Road, Tiptree, Colchester, CO5 0LU. The site location is shown in Figure 1.

1.2. Proposed Development

It is understood that the proposed development will comprise the construction of 130 (no.) dwellings with associated landscaping, access and infrastructure. A copy of the proposed development plan is presented in Figure 2.

1.3. Objectives

The objectives of this Geoenvironmental Assessment are to:

- Carry out a review of the environmental setting of the site and surrounding area in order to determine any potentially significant pollution linkages relative to sensitive receptors identified;
- Prepare a preliminary conceptual site model;
- Provide recommendations for further works if necessary;
- Undertake all works in accordance with relevant statutory and local guidance as appropriate; and
- Produce a report for use by the Client.

1.4. Scope of Work

The scope of work for the Geoenvironmental Assessment has included the following:

- A desk-based review of available information obtained from an Envirocheck environmental database search report (R.1; included as Appendix 3) and other available sources of information;
- A site walkover survey;
- Provision of a preliminary conceptual site model, detailing all potential pollutant linkages; and
- Summary of any recommended additional work based on the findings of the Geoenvironmental Assessment.

1.5. Methodology

The methodology of assessment applied in the production of this report is in accordance with the current industry standards and supplementary guidance as appropriate, including Land Contamination Risk Management (LCRM), Model Procedures produced by DEFRA and the EA (R.2), British Standard Code of Practice for Site Investigations BS5930:2015+A1:2020 (R.3), British Standard Code of Practice for Investigation of Potentially Contaminated Sites BS10175:2011+A2:2017 (R.4). For the purposes of this report the word 'contamination' relates to the statutory definition of contaminated land under the Environmental Protection Act 1990 (R.5), unless otherwise stated.

With regard to groundwater, reference has been made to the Water Framework Directive (R.6) and the Water Supply Regulations (R.7). A list of references used in the production of the report is included in Section 6.

1.6. Terms of Reference

This desk study (herein referred to as the “Report”), has been prepared for Marden Homes Limited (herein referred to as the “Client”), for the purposes agreed and in general accordance with the terms and conditions set out in proposal reference ‘1342 181205 GEMCO S&P Quotation’ dated 5th December 2018 and the Agreement between Green Earth Management Co Ltd (the “Consultant”) and The Client. At the request of Marden Homes Limited the Report has been updated to reflect an amended site layout plan and updated following a recent site walkover (12th November 2020).

1.7. Report Limitations and Conditions

For the work, reliance has been placed on publicly and privately available data from the sources identified; the sources are not exhaustive, and further information relevant to the site may be available from other sources. When using the information, it has been assumed it is correct. No attempt has been made to verify the information.

In addition to the above, GEMCO note that when investigating or developing land, it is important to recognise that sub-surface conditions may vary spatially and over time. Therefore, GEMCO cannot guarantee that conditions other than those discussed in the report do not occur elsewhere on the site.

New information, revised practices, or changes in legislation may necessitate the re-interpretation of the report, completely or in part.

Further detail regarding report conditions is included as Appendix 1.

2 SITE DETAILS

2.1. Site Setting

2.1.1. Site Location

The site is located at Land South of Kelvedon Road, Tiptree, Colchester, CO5 0LU and is centred upon approximate National Grid Reference (NGR) 645680, 258210. A site location plan is presented as Figure 1.

2.1.2. Site Description

GEMCO visited site on the 12th November 2020 to undertake a site walkover. The site layout at the time of the walkover is indicated on Figures 3-6 and a selection of photographs taken at this time are included in Appendix 2.

The development site was irregular in shape measuring approximately 5 ha in area and 270 m north-south by 205 m east-west at its widest points. The site comprised three connecting parcels of land, primarily composed of soft landscaping (disused fields, laid to grass), horse paddocks and residential dwellings bounded to the north by the B1203 Kelvedon Road, to the east by a residential dwelling and fields, to the south by a public footpath and fields and to the west by residential properties, the Water Tower and fields.

Tower End & The Annexe

The western parcel of land consisted of two single storey residential dwellings (Tower End and The Annexe), accessed from the B1203 Kelvedon Road. The properties both had areas of private garden and ancillary buildings including a stable block, office and shed. In the rear garden of Tower End there were two ponds. The garden areas backed on to paddocks which were bounded to the east and south by a ditch containing ponded water. Anecdotal evidence (Tower End resident) suggests that a water main recently leaked at the southern end of the paddocks causing localised flooding and was recently repaired. One small heating oil tank (1,800 litre) was present to the west of the Annexe; and two small tanks (<1,200 litre each) were present to the east of Tower End. All tanks were noted to be in a good condition with no evidence of recent or historical leaks identified. A site layout plan for Tower End is presented in Figures 4 & 5.

Pony's Farm

The central parcel of land consisted of a single storey chalet-type residential dwelling accessed from Kelvedon Road. No heating oil tank was identified and anecdotal information (Tower End resident) suggests that this property is heated by gas. A concrete track ran along the eastern property boundary to a small hardstanding courtyard providing access to a large warehouse/barn building (inaccessible) noted to be clad in suspected asbestos containing materials (ACMs) comprising fibre-cement sheeting, downpipes, guttering and render. South of this was a brick built stable building and wooden annexe (currently used as a place of worship). The concrete track ended at the entrance to a large field (Field 2 – see below) at the rear of the property, the northwest corner of which was fenced off and apparently associated with Pony's Farm. This corner of the field was covered with asphalt/rubble surfacing to approximately 0.5m higher elevation than the remainder of the field. There was also evidence of recent localised burning.

During the previous site walkover (15th January 2019) the gravel area was noted to be used for the storage of caravans and other vehicles, and included a large stockpile of gritting salt. A site layout plan for Ponys Farm is presented in Figure 6.

Two Fields

The eastern parcel of land consisted of two adjoining fields. Field 1 fronted onto the B1023 to the north and was bounded by residential properties (not part of the proposed site boundary) to the west and east respectively and to the south by Field 2. Field 1 comprised long grass with dense brambles around the perimeter. Along the southern end of the field was a small ditch containing ponded water. Access was via a gap in the bracken along the southern boundary.

Field 2 is bounded by Field 1 and the rear gardens of residential properties to the north, to the east by grassed fields, to the south by a public footpath and to the west by paddocks at Tower End. Field 2 comprised grass and was notably less overgrown than Field 1. A ditch containing ponded water ran along the north, east, south and partway along the western boundaries of the field. A localised area of flooding was present in the northeast corner of the field. In the southwest corner there were a number of vehicle tyres in the undergrowth and centrally along the western boundary was a small stockpile measuring 3m x 3m x 0.5m high, comprising of soil, rubble and suspected ACM fragments (fibre-cement).

Localised evidence of recent excavations was present in both fields understood to be associated with recent archaeological investigations. The excavations had been reinstated to ground level. A site layout plan for Fields 1 & 2 is presented in Figure 7.

2.1.3. Topography

Topographically the site was moderately flat with a slight decline towards the east by approximately ~1 metre.

2.1.4. Surrounding Area

The surrounding area was primarily residential and commercial with agricultural land and fields laid to grass in the wider area. Tower Business Park was located approximately 40m west of the site beyond an adjacent field.

2.2. Geological Setting

2.2.1. Geological Setting

The geological setting has been derived from the Envirocheck report (R.1) and British Geological Survey (BGS) online records.

2.2.2. Published Geology

The site is directly underlain by bedrock of the London Clay Formation. Geological mapping indicates that the Glaciofluvial Deposits (Mid Pleistocene) run parallel with the sites eastern boundary and possibly outcrop in the north-eastern corner of site.

Online BGS records (R.10) show a borehole 600 m southeast of the site on Vine Road, identified as TL81NE78, which is within the same geological strata as the site. The stratigraphy encountered in that borehole is presented in Table 2.1.

Table 2.1 BGS Borehole Geology			
Classification	Lithology	Thickness (m)	Depth (m)
Glaciofluvial Deposits	Running Sand	0.79	2.70
	Gravel	1.57	4.60
London Clay & Oldhaven Beds	Clay	79.85	84.43
Weathered Reading Beds	Mottled Clay	3.66	88.08
	Sand & Clay	3.05	91.13
	Stone	1.22	92.35
	Sand & Clay	2.74	95.09
	Sand and Pebbles	2.13	97.23
Lower London Tertiaries	Black Sand & Clay	3.96	101.19
	Hard Sand	3.05	104.24
	Black Sand & Clay	12.50	116.73
	Clay	2.13	118.87
	Sand & Clay	1.83	120.69
	Sand Clay & Pebbles	1.22	121.91
	Brown Clay & Sand	0.91	122.83
Upper Chalk	Sand and Clay	1.52	124.35
	Chalk	59.13	183.48

Note: Water was encountered at 46.93 mbgl.
There is a possibility of fault repetition in the L.L. Tertiaries as they are anomalously thick. It is difficult to understand the section between the London Clay and the Chalk, as the details do not agree with what one would expect in the Lower London Tertiaries here.

2.2.3. Geological Hazards

The Envirocheck report indicates the following potential geological hazards:

Table 2.2 Geological Hazards	
Geological Hazard	Hazard Potential
Collapsible Ground	Very Low
Compressible Ground	No Hazard
Ground Dissolution Stability	No Hazard
Ground Stability (Landslides)	Very Low
Running Sand	Very Low
Shrinking or Swelling Clay	Moderate

2.2.4. Mining Records

The Envirocheck report did not identify any coal mining affected areas within 1 km of the site and identifies the site as in an area that might not be affected by coal mining. No hazard from non-coal mining is identified.

Mapping dated 1874-1875 identified an Old Gravel Pit (assumed Sand & Gravel workings) 200 m southeast of site, with more represented on the 1924 map approximately 50 & 100 m northeast and 150 m east and southeast. The pits are no longer labelled as such on the 1955 - 1958 maps, assumed infilled, but the outlines / impressions remained.

By 1973 a large 800 m x 400 m sand and gravel pit with associated infrastructure and buildings had been excavated 700 m south of site, however, this has since been infilled and restored as woodland and grassland.

2.2.5. Radon

The Envirocheck report states that information provided by the BGS and National Geoscience Information Service indicate that the site is in a lower probability radon area (less than 1% of homes are estimated to be at or above actionable level).

No radon protective measures are considered necessary in the construction of new dwellings or extensions.

2.3. Hydrogeological Setting

The London Clay Formation is designated as Unproductive Strata. The Glaciofluvial Deposits that may outcrop in the north-eastern corner of site are designated as a Secondary A Aquifer.

The site is located within the G78 Sandlings and Chelmsford Nitrate Vulnerable Zone for groundwater and both the S431 Layer Brook and the S434 River Blackwater Nitrate Vulnerable Zone for surface water. The site is also located within the GB105037034130 - Layer Brook Drinking Water Protected Area and SWSGZ1023 Anglian, Stour and Abberton Drinking Water Safeguard Zone.

2.4. Hydrological Setting

The site walkover and a review of the Ordnance Survey mapping of the area identified two surface water features on the site (ponds).

There are 29 (no.) OS Water Network Lines within a 1 km radius of site within the Colne Essex and Chelmer catchment area, the closest being 227 m west of site.

There are no water abstraction licenses within 1 km. The closest is located 1351 m east of site and relates to General Agriculture: Spray Irrigation - Direct. These are not considered significant with respect to the site.

There are 24 (no.) discharge consents within 1 km. The closest is located 145 m southwest of site, registered to Anglian Water Services Limited, ref. Asenf12068 and relates to Trade Discharges - Process Effluent - Waster Company (Wtw) to a tributary for the River Blackwater. These are not considered significant with respect to the site.

The site has limited potential for groundwater flooding to occur.

Tiptree Pumping Station, located 150 m south of site is labelled on the 1955 Historical Mapping with a large reservoir of approximately 80 m x 80 m in size. It remains to this day, but is now labelled as a covered reservoir. A singular small reservoir is also located just north of Tiptree Pumping Station.

2.5. Site History

The purpose of determining the site history is to identify the past uses of the site, the potential for historic on- and off-site sources of contamination, changes in landform, site structures and construction and their potential impact on the geology, hydrogeology and hydrology. The site history will assist in the design of site investigations by identifying features that warrant a more detailed assessment.

A summary of the relevant site history derived from a review of the historical maps provided in the Envirocheck Report (R.1 and Appendix 3) is presented in Table 2.3.

Table 2.3 Historical Map Summary			
Maps Dated	On / Off Site	Description	Potential Contamination Sources
1874 - 1875 (1:2,500)	On-site	The site formed a series of agricultural fields with vegetated (tree) boundaries. A footpath runs along the rear boundary towards Perry Wood in the west.	Agricultural activities.
	Off-site	The surrounding area mostly comprises agricultural farm land. A depression marked Old Gravel Pit is located 200 m south east of site.	Agricultural activities. Quarrying and infilling activities.
1881 (1:10,560)	On-site	No significant changes.	No additional significant sources.
	Off-site	The surrounding area remains mostly agricultural farm land and wood. The village of Tiptree has been constructed 250 m southeast of site.	Construction & Demolition activities. Infilling activities.
1897 (1:2,500) & 1898 (1:10,560)	On-site	No significant changes.	No additional significant sources.
	Off-site	Two properties have been constructed just west of site on the opposite side of the northern boundary road.	No additional significant sources.
1922 (1:2,500) & 1924 (1:10,560)	On-site	No significant changes.	No additional significant sources.
	Off-site	The Kelvedon, Tiptree & Tollesbury Light Railway has been constructed running northwest to southeast and parallel with the southern boundary of site. A series of Old	Construction & Demolition activities. Railway sidings.

Table 2.3 Historical Map Summary			
Maps Dated	On / Off Site	Description	Potential Contamination Sources
		Gravel Pits are depicted 50m and 100 m northeast, 150 m east and southeast of site. A series of residential properties and associated buildings have replaced the two original dwellings just west of site on the opposite side of the northern boundary road.	
1938 (1:10,560)	On-site	No significant changes.	No additional significant sources.
	Off-site	A pumping station has been constructed approximately 200 m south of site.	Construction & Demolition activities.
1945 (Aerial Photography)	On-site	No significant changes.	No additional significant sources.
	Off-site	A residential dwelling has been constructed between the two northern fields of site. Residential dwellings have been constructed adjacent to the western and eastern boundaries. Tiptree has continued to expand.	Construction & Demolition activities.
1954 (1:2,500) & 1955 - 1958 (1:10,000)	On-site	No significant changes.	No additional significant sources.
	Off-site	The road running parallel with the northern boundary is now labelled as Kelvedon Road (B1023) and Oak Road is now labelled at the T junction. A few properties have been constructed along Oak Road within 150 m of site. A small pond is labelled within a vegetated plot between the southern boundary and railway. The pumping station has been extended to include a trio of tanks, a large reservoir and series of auxiliary buildings. A smaller reservoir is labelled just east of the pumping station. The Old Gravel pits are no longer labelled as such, assumed infilled, but the outlines/impressions of several remain.	Construction & Demolition activities. Infilling activities.
1960 - 1973 (1:2,500)	On-Site	The north-western field has been developed with Tower End residential dwelling and 2 (no.) auxiliary buildings.	Construction & Demolition activities.

Table 2.3 Historical Map Summary			
Maps Dated	On / Off Site	Description	Potential Contamination Sources
		<p>The properties built on the opposite side of Kelvedon Road are now labelled Sun House. A Coal Yard and Highland Nursery both with associated structures and buildings have been constructed on the opposite side of Kelvedon Road.</p> <p>The railway running along the southern boundary of site has been labelled as dismantled.</p> <p>The pumping station is now labelled as a Water Works and some of the associated buildings as Waterworks cottages. The road it fronts onto is now labelled as Grange Road. The small reservoir just east remains.</p>	Construction & Demolition activities.
1973 - 1975 (1:2,500) & 1978 - 1993 (1:2,500) & 1973-1974 (1:10,000)	On-site	Partial Map. The site has been developed into the modern-day layout, with the majority of current day buildings and structures now constructed, including the pond in Tower End rear garden.	Construction & Demolition activities.
	Off-site	<p>Partial Map. An electrical substation has been constructed within the Water Works site boundary. Some of the dismantled railway remains along the southern boundary.</p> <p>A large 800 m x 400 m sand and gravel pit with associated infrastructure and buildings has been excavated 700 m south of site and just east of Tiptree.</p>	<p>Construction & Demolition activities.</p> <p>PCB's</p>
1982 (1:2,500)	On-site	No Map	No additional significant sources.
	Off-site	No Map	No additional significant sources.
1993 (1:2,500) & 1999 (1:10,000) & 1999 (Aerial Photography)	On-site	No significant changes.	No additional significant sources.
	Off-site	The railway has been completely dismantled and the sidings/embankments removed to return the land to agricultural fields.	<p>Construction & Demolition activities.</p> <p>Infilling activities.</p>

Table 2.3 Historical Map Summary			
Maps Dated	On / Off Site	Description	Potential Contamination Sources
		<p>The construction of commercial / industrial park with associated access and infrastructure 50 m west has begun.</p> <p>The sand and gravel pit remains, however much of the previously excavated area has now become surface water features (ponds). Much of the original infrastructure remains, with the addition of a saw mill and series of tracks running through the pit.</p>	
2006 (1:10,000)	On-site	The field on the eastern side of The Gables residential dwelling has been labelled as Ponys Farm.	No additional significant sources.
	Off-site	<p>The commercial / industrial park has been expanded to include the majority of current day buildings and structures.</p> <p>The sand and gravel pit has been restored with a series of vegetated areas and more surface water features.</p>	<p>Construction & Demolition activities.</p> <p>Infilling and restoration activities.</p>
2018 (1:10,000)	On-site	Tower End has seen the construction of Aquanera offices and store room, the creation of the second garden pond and the splitting of the rear field into a number of horse paddocks.	Construction & Demolition activities.
	Off-site	The sand and gravel pit is no longer labelled and the associated infrastructure has been removed, however the restored ground remains as an accessible woodland / heathland and surface water features for the public.	<p>Construction & Demolition activities.</p> <p>Infilling activities.</p>

3 ENVIRONMENTAL SEARCHES

3.1. Environmental Search Data

The next sections have been produced following a review of the Envirocheck environmental database search report (R.1; Appendix 3) unless otherwise indicated.

3.2. Environmental Permits, Pollution Incidents and Registers

The Envirocheck report identifies that within 1 km of the site there are:

- 24 (no.) Discharge Consents; the closest located 145 m southwest, with registered to Anglian Water Services Limited, at Tiptree Water Treatment Works, Highfield Lane, ref. Asenf12068 for the discharge of trade discharges - process effluent - water company (Wtw) into a tributary of the River Blackwater; and
- 1 (no.) Registered Waste Transfer Site, licenced to M. R Payne T/A M P Skips, located at Basket Works, Grange Road, ref. Eawml71261, authorised for household / commercial / industrial waste transfer.

None of these are considered significant with regard to the subject site.

3.3. Historical Landfill and Other Waste Sites

There are no historical or active landfill sites recorded within a 1 km radius of site. There are 6 (no.) records of Potentially Infilled Land (Non-water) and 9 (no.) records of Potentially Infilled Land (Water) within 1 km. The closest non-water infilled land feature is located 206 m southwest of site, recorded on the 1974 map referenced as an unknown filled ground (pit, quarry, etc.).

3.4. Current Industrial Land Use Data

The Envirocheck report identified 41 (no.) contemporary trade directory entries within a 1 km radius of site, with only a single entry listed as being historically operational on site; Tiptree Carriage Co. located at Tower End, a car dealership.

Six (6 no.) commercial Services, seven (7 no.) manufacturing and production and six (6 no.) public infrastructure points of interest are located within a 1 km radius of site.

3.5. Environmentally Sensitive Areas

The site is located within the G78 - Sandlings and Chelmsford Nitrate Vulnerable Zone for groundwater and both the S431 Layer Brook and the S434 River Blackwater Nitrate Vulnerable Zone for surface water. The site has limited potential for groundwater flooding to occur.

Perrys Wood, located 188 m northwest and Inworth Wood, located 788 m north are labelled as areas of Ancient Woodland.

3.6. Air Quality Management Areas

On the basis of data Air Quality Management Area (AQMA) maps available on the Defra website (R.8), the site is not located within an AQMA.

4 PRELIMINARY RISK ASSESSMENT AND CONCEPTUAL SITE MODEL

4.1. Introduction

In order to determine if land contamination is present, a tiered risk assessment process is adopted to provide a robust approach to the management of risks due to land contamination. The risk assessment process can be highly detailed and there are a range of factors that need to be considered in assessing risks. The adoption of a staged approach is in line with current industry legislation and guidance. There are principally three tiers applied as follows:

- Tier 1: Preliminary Risk Assessment (PRA) (generally qualitative);
- Tier 2: Generic Quantitative Risk Assessment (GQRA); and
- Tier 3: Detailed Quantitative Risk Assessment (DQRA).

The purpose of the current work is to undertake a Tier 1 preliminary assessment.

Land is considered to be contaminated if significant **pollutant linkages**, comprising a source, pathway, and receptor are present. **Source, pathway, and receptor** can be defined as follows:

- **Source** (contaminant/pollutant) – “a substance [or range of chemically related substances] which is in or under the land and which has the potential to cause harm or to cause pollution of controlled waters.”
- **Pathway** One or more routes by which a receptor can be exposed to or affected by a contaminant.
- **Receptor** (target) – humans, living organisms, ecological systems, buildings, controlled waters.

Pollutant linkages are deemed significant if there is a significant potential of significant harm to a sensitive receptor being exposed to a specific contaminant(s) via an identified and active pathway.

4.2. Contamination Sources

The site has comprised undeveloped farmland / fields from the earliest available mapping, dated 1874, before being developed with residential properties, associated auxiliary buildings, infrastructure and access. Historically, the local surrounding area has been agricultural / heathland, residential with the wider area being used for the quarrying of sands and gravels.

A summary of the potential contamination sources derived from the preliminary assessment is presented in Table 4.1:

Table 4.1 Potential Sources of Contamination		
Potential Source	Potential Contaminants	Probability
On Site		
Residential/Equine Use of the Site	Hydrocarbons (TPH, PAH), asbestos, heavy metals.	Low likelihood
On Site & Off Site		
Historical Agricultural Activity	Agrichemicals, hydrocarbons (TPH, PAH), heavy metals, asbestos.	Low likelihood

Table 4.1 Potential Sources of Contamination		
Potential Source	Potential Contaminants	Probability
Construction & demolition activities.	Hydrocarbons (TPH, PAH), asbestos, heavy metals, ground gases.	Low likelihood

4.3. Migration Pathways

The following potential migration pathways have been identified with regard to the site and the current development proposals:

- Direct contact with contaminated soil;
- Ingestion of contaminated soil or soil dust;
- Inhalation of contaminated soil dust or asbestos fibres;
- Uptake of contaminants by home-grown produce;
- Ingestion of contaminated vegetable produce;
- Ingress / accumulation of gas or vapours into buildings;
- Indoor and outdoor inhalation of ground gas or vapours;
- Potential leaching and migration of contaminants to and within surface waters and/or to ground groundwater and migration within the groundwater;
- Direct contact with underground services and other building material or leaching of contaminants into underground service corridors; and
- Uptake by fauna and flora.

Consideration of the pathways has been taken with respect to the boundaries and the development proposed on the site.

4.4. Receptors

The following sensitive receptors have been identified:

- Future site users;
- Site neighbours;
- Construction workers;
- Controlled Waters: Secondary A Aquifers in superficial geology (NE corner only);
- Future building(s) and building materials;
- Buried services; and
- Ecological receptors.

4.5. Preliminary Conceptual Site Model

The source-pathway-receptor linkages that are applicable are summarised in Table 4.2 below:

Table 4.2 Preliminary Conceptual Site Model

Source(s)	Pathway(s)	Receptor(s)	Risk ¹	Justification for Risk/Comment
On and Off-Site Sources				
PPL A Historical farming and general agricultural usage (Agrichemicals, hydrocarbons (TPH, PAH), heavy metals, asbestos)	1. Direct contact with soils; ingestion of soil, or soil dust; ingestion of contaminated vegetable produce; Inhalation of dust, or asbestos fibres.	a. Future Site Users	PPL A-1-a Low	Contamination associated with farming unlikely to be present in concentrations which may affect future residents.
		b. Neighbouring Residents	PPL A-1-b Low	Contamination associated with farming unlikely to be present in concentrations which may affect neighbouring properties.
		c. Construction Workers	PPL A-1-c Very Low	With the use of appropriate controls and PPE.
	2. Leaching of contaminants; infiltration to groundwater; movement within the groundwater; runoff to surface waters.	a. Controlled Waters: Surface Waters	PPL A-2-a Low	Likelihood of significant contamination low; potential contaminants generally relatively insoluble.
		b. Controlled Waters: Groundwater (Secondary A Aquifer – NE corner of site only)	PPL A-2-b Low	Low likelihood of significant contamination low, potential contaminants generally relatively insoluble and likely significant depth to water table.
	3. Contact with building materials / services; leaching into services trenches.	a. Buried Services	PPL A-3-a Low	Low likelihood of damage being caused to buried services.
	4. Direct contact with soils / uptake by plants.	a. Ecological Receptors	PPL A-4-a Low	Low likelihood of damage being caused to ecological receptors.

Table 4.2 Preliminary Conceptual Site Model					
Source(s)	Pathway(s)	Receptor(s)	Risk ¹	Justification for Risk/Comment	
PPL B Construction & Demolition related activities (Hydrocarbons (TPH, PAH), asbestos, heavy metals, ground gases)	1. Direct contact with soils; ingestion of soil, or soil dust; ingestion of contaminated vegetable produce; inhalation of dust, or asbestos fibres.	a. Future Site Users	PPL B-1-a Low to moderate	Localised evidence of made ground was identified during the site walkover. The presence of suspected ACMs within this material may pose a potential risk to future site users where coincident with areas of softstanding at a depth <0.60m bgl. Further the origin and chemical composition of the material is unknown.	
		b. Neighbouring Residents	PPL B-1-b Low	Low likelihood of on-site construction and demolition materials migrating off-site.	
		c. Construction Workers	PPL B-1-c Low ²	Assuming use of appropriate PPE and safe methods of work.	
	2. Outdoor inhalation of vapours and gases.	a. Future Site Users	PPL B-3-a Low	Unlikely for gas generation potential from construction and demolition activities.	
	3. Ingress of vapours into buildings; inhalation of vapours (indoor) or explosion.	a. Future Site Users	PPL B-4-a Low	Unlikely for gas generation potential from construction and demolition activities.	
		b. Construction Workers	PPL B-4-b Low	Unlikely for gas generation potential from construction and demolition activities.	
		c. Future Buildings	PPL B-4-c Low	Unlikely for gas generation potential from construction and demolition activities.	
	4. Contact with building materials / services; leaching into services trenches	a. Buried Services	PPL B-4-a Low	Low likelihood of materials with the potential to leach onto site.	
	PPL C	1. Direct contact with soils; ingestion of soil, or soil dust;	a. Future Site Users	PPL C-1-a Low	Low probability of contamination.

Table 4.2 Preliminary Conceptual Site Model				
Source(s)	Pathway(s)	Receptor(s)	Risk ¹	Justification for Risk/Comment
Residential/Equine use of the site (Hydrocarbons (TPH, PAH), asbestos, heavy metals)	ingestion of contaminated vegetable produce; inhalation of dust, or asbestos fibres	b. Neighbouring Residents	PPL C-1-b Low	Unlikely that any contamination associated with the equestrian centre will affect neighbouring residents.
		c. Construction Workers	PPL C-1-c Low ²	Assuming appropriate controls, PPE and safe methods of work.
	2. Leaching of contaminants; infiltration to groundwater; movement within the groundwater; runoff to surface waters	a. Controlled waters: surface waters	PPL C-2-a Low	Likelihood of significant contamination low due to geology present and depth to water table; potential contaminants generally relatively insoluble.
		b. Controlled waters: groundwater (Secondary A Aquifer– NE corner only)	PPL C-2-b Very Low	Likelihood of significant contamination low due to geology present and significant depth to water table likely.
	3. Outdoor inhalation of vapours and gases	a. Future site users	PPL C-3-a Low	Unlikely. No evidence of a significant source of ground gas.
		b. Neighbouring residents	PPL C-3-b Low	Unlikely. No evidence of a significant source of ground gas.
	4. Ingress of vapours into buildings; inhalation of vapours (indoor) or explosion	a. Future site users	PPL C-4-a Low	Unlikely. No evidence of a significant source of ground gas.
		b. Neighbouring residents	PPL C-4-b Low	Unlikely. No evidence of a significant source of ground gas.
		c. Construction Workers	PPL C-4-c Low ²	Unlikely. No evidence of a significant source of ground gas. Use of appropriate controls and PPE.
		d. Future buildings	PPL C-4-d Low	Unlikely. No evidence of a significant source of ground gas.

Table 4.2 Preliminary Conceptual Site Model				
Source(s)	Pathway(s)	Receptor(s)	Risk¹	Justification for Risk/Comment
	5. Contact with building materials / services; leaching into services trenches	a. Buried services	PPL C-5-a Low	Overall likelihood low
	6. Direct contact with soils / uptake by plants	a. Ecological receptors	PPL C-6-a Low	Low likelihood of contamination which may cause damage to ecological receptors.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary of Site Walkover and Desk Study Information

5.1.1. Site Description and Development History

The proposed development site was irregular in shape measuring approximately 5 ha in area and 270 m north-south by 205 m east-west at its widest points.

GEMCO visited the Site on the 12th November 2020 to undertake a site walkover. The layout at the time of the walkover is presented in Figures 3 - 7 and a selection of photographs are included in Appendix 2.

Access was from Kelvedon Road to the north of the Site. The Site comprised three residences (Tower End, The Annexe and Pony's Farm) and associated ancillary buildings and fields. Fields to the rear of tower end were used as paddocks and to the rear of Pony's Farm appears to be disused. Localised areas of made ground, historical burning and flooding were noted during the walkover.

5.1.2. Surrounding Area

The surrounding area comprised residential properties and open fields with a small industrial estate (Tower Business Park) 40m west.

5.1.3. Geology, Hydrogeology and Hydrology

The published geology indicates that the majority of the site is directly underlain by the Bedrock comprising the London Clay Formation (clay, silt and sand).

Superficial Deposits comprising the Glaciofluvial Deposits (Mid Pleistocene) run parallel with the eastern boundary and possibly outcrop in the north-eastern corner of site.

The superficial Glaciofluvial Deposits are designated as a Secondary A aquifer and the London Clay Formation is designated as Unproductive Strata.

Two surface water features were identified on site (ponds), both of which fed into a drainage ditch running along the eastern boundary to the field behind. The nearest off-site surface water feature is located 227 m west, identified as an inland river.

5.1.4. Environmental Searches

The Envirocheck report identifies that within 1 km of the site there are:

- 24 (no.) Discharge Consents, the closest being located 145 m southwest relating to the discharge of trade discharges - process effluent;
- The site and surrounding area are located within 3 (no.) Nitrate Vulnerable Zones (NVZ's);
- The site and surrounding area are located within a Drinking Water Protected Area and Drinking Water Safeguard Zone;
- There are 15 (no.) records of Potentially Infilled Land, 6 (no.) Non-Water and 9 (no.) Water;
- One (1 no.) Registered Waste Transfer Site, but there are no historical or active landfill activities; and

- There are 41 (no.) contemporary trade directory entries, with only a single entry listed as being historically active on site.

5.2. Summary of Preliminary Conceptual Site Model

The preliminary conceptual site model is presented in Table 4.5. In summary, the following potential contamination sources were identified:

- On-site: Residential and equine site uses.
- On- and Off-site: Agricultural and farming activities; and, construction and demolition activities.

The sensitive receptors identified were future site users, site neighbours, future buildings, construction workers, controlled waters, ecological receptors and buried services.

A Moderate/Low risk to human health was identified associated with localised stockpiles of made ground (PPLB-1-a). The chemical composition and origin of the made ground is unknown and suspected asbestos containing material was identified within the stockpile. All other plausible pollution linkages (PPL) were considered to pose a Low or Very Low risk to identified receptors.

5.3. Conclusions

The Phase I Geoenvironmental Assessment has identified that made ground at the site has the potential to pose a Moderate/Low risk to future site users where coincident with areas of softstanding within the final development and present at depths 0.60m bgl. All other PPL are considered to pose a low/very low risk to identified receptors in the context of the proposed development.

On the basis of the findings of this Phase I Geoenvironmental Assessment, it is considered that the site is suitable for the proposed residential end use subject to the recommendations made in Section 5.4.

5.4. Recommendations

On the basis of the Phase I Geoenvironmental Assessment, the site is considered suitable for the proposed residential end use, subject to the following recommendations:

- Geotechnical investigation will be required to inform the civil and structural engineering of the proposed development;
- An intrusive geo-environmental investigation with sample collection is required to confirm the extent and nature of made ground at the site. The investigation should include chemical laboratory analysis to quantify potential contaminants of concern within the made ground. It would be prudent to carry this out in combination with the geotechnical investigation;
- Prior to demolition all on-site structures will require an HSG264 Demolition Survey for asbestos; and
- A discovery strategy should be in place during all the development works (see Section 5.5).

5.5. Discovery Strategy

Should any evidence of unexpected or otherwise exceptional contamination be identified works should be halted in that area, and the Local Authority informed. In the event of a discovery, the potential contamination should be inspected by a suitably qualified environmental consultant and any remediation measures required implemented to the satisfaction of the Local Authority and Building Warranty Provider.

5.6. Regulatory Liaison

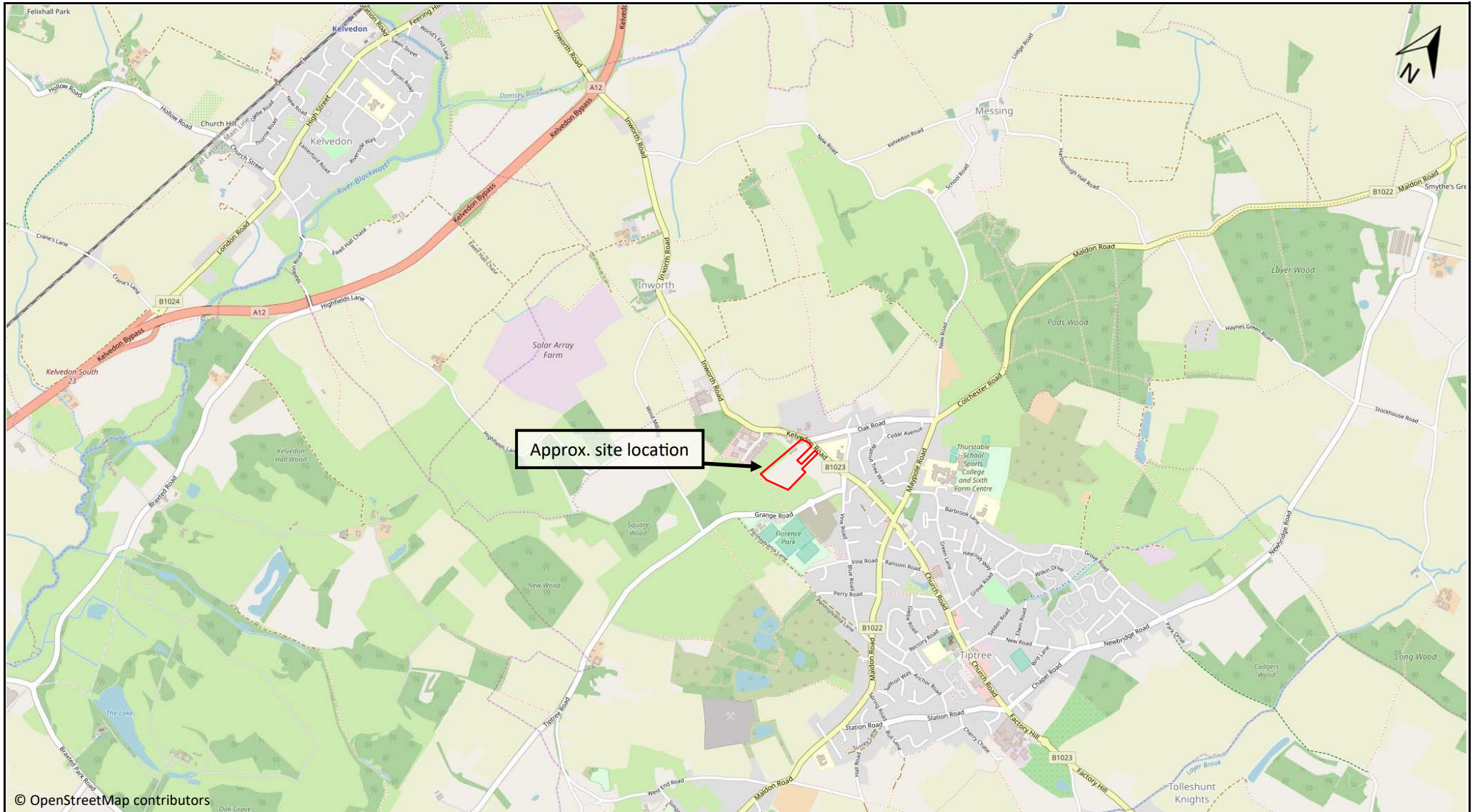
A copy of this report should be forwarded to the Local Planning Authority in support of any Planning Application made.

REFERENCES

- R.1. Envirocheck Report Ref. 190899269_1_1 dated 11th January 2019 (included as Appendix 3).
- R.2. Environment Agency (EA), Land Contamination Risk Management (LCRM), October 2020.
- R.3. British Standard, Code of Practice for Site Investigations BS 5930:2015+A1:2020.
- R.4. British Standard, Code of Practice for Investigation of Potentially Contaminated sites BS 10175:2011+A2:2017.
- R.5. Environmental Protection Act 1990: Part IIA, Contaminated Land Statutory Guidance, April 2012.
- R.6. Water Framework Directive 2000/60/EC.
- R.7. Water Supply Regulations 2010.
- R.8. Department of Environment, Transport and Rural Affairs (DEFRA) Air Quality Management Area (AQMA) maps - <https://uk-air.defra.gov.uk/aqma/maps>
- R.9. Environment Agency: Flood map for planning (2018) <https://flood-map-for-planning.service.gov.uk/>
- R.10. BGS Online Borehole Records (TL81NE78)

Figure 1

Site Location Plan



© OpenStreetMap contributors

Site:	Land South of Kelvedon Road	Date:	November 2020
Address:	Tiptree, Colchester	Scale:	Not to Scale
Post Code:	CO5 0ND	Drawing:	Figure 1
Grid Ref:	588700, 217000	Drawn by:	HS
Title:	Site Location Plan	Checked by:	DR
Client:	Marden Homes Limited	Project No:	1342

Legend:
 Site Boundary



Green Earth Management Co Ltd
 Broomfield Park
 Coggeshall Road
 Essex CO6 2JX
 Tel: 01245 206129
 www.gemcoltd.co.uk

Figure 2

Proposed Development Plan



Plan provided by Client



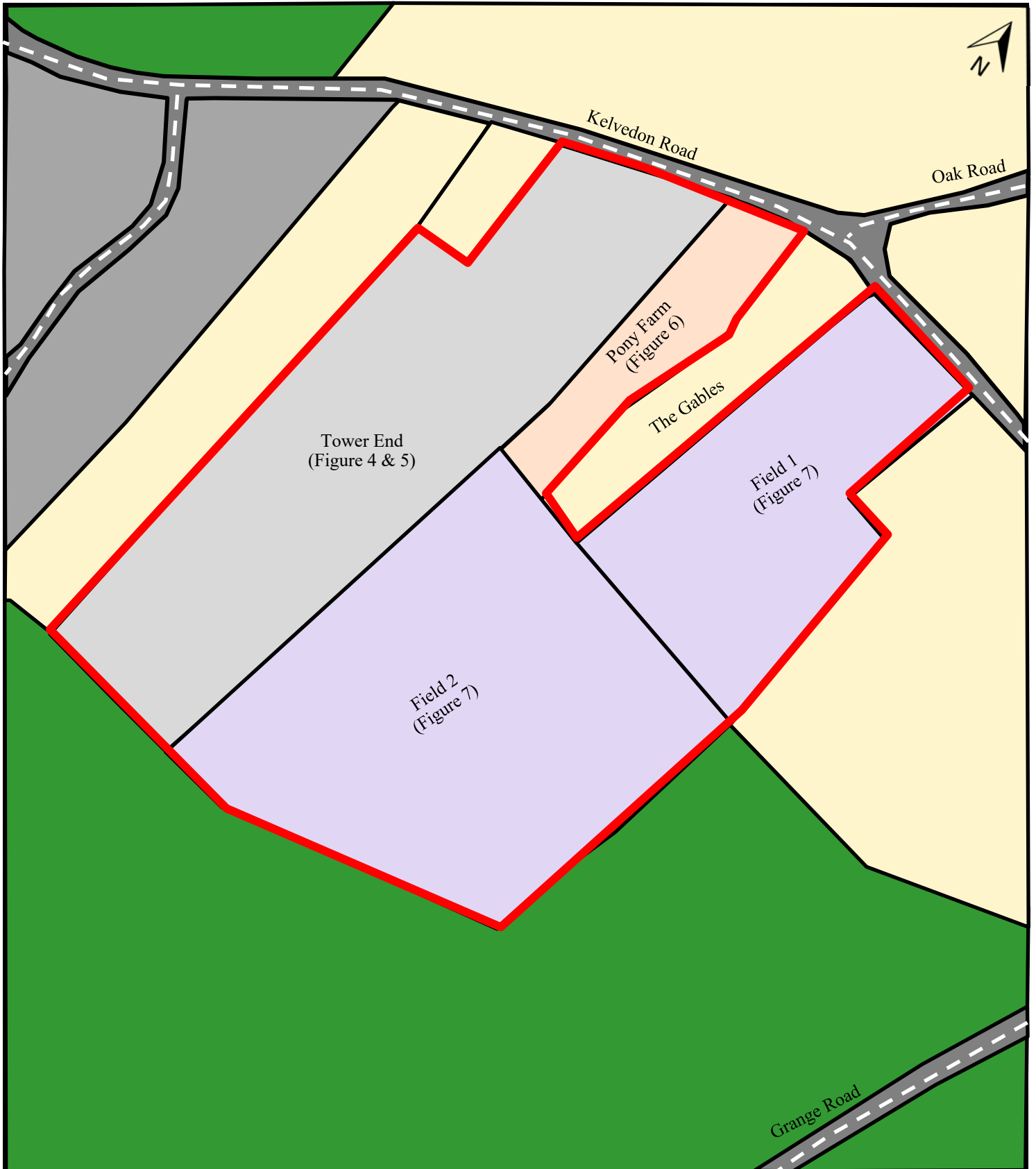
Site:	Land South of Kelvedon Road	Date:	November 2020	Legend:  Site Boundary	 REMEDIATION SPECIALISTS GEMCO Green Earth Management Co Ltd Broomfield Park Coggeshall Road Essex CO6 2JX Tel: 01245 206129 www.gemcoltd.co.uk
Address:	Tiptree, Colchester	Scale:	Not to Scale		
Post Code:	CO5 0ND	Drawing:	Figure 2		
Grid Ref:	588700, 217000	Drawn by:	HS		
Title:	Proposed Development Plan	Checked by:	DR		
Client:	Marden Homes Ltd	Project No:	1342		

Figure 3

Site Layout Plan (Overview)





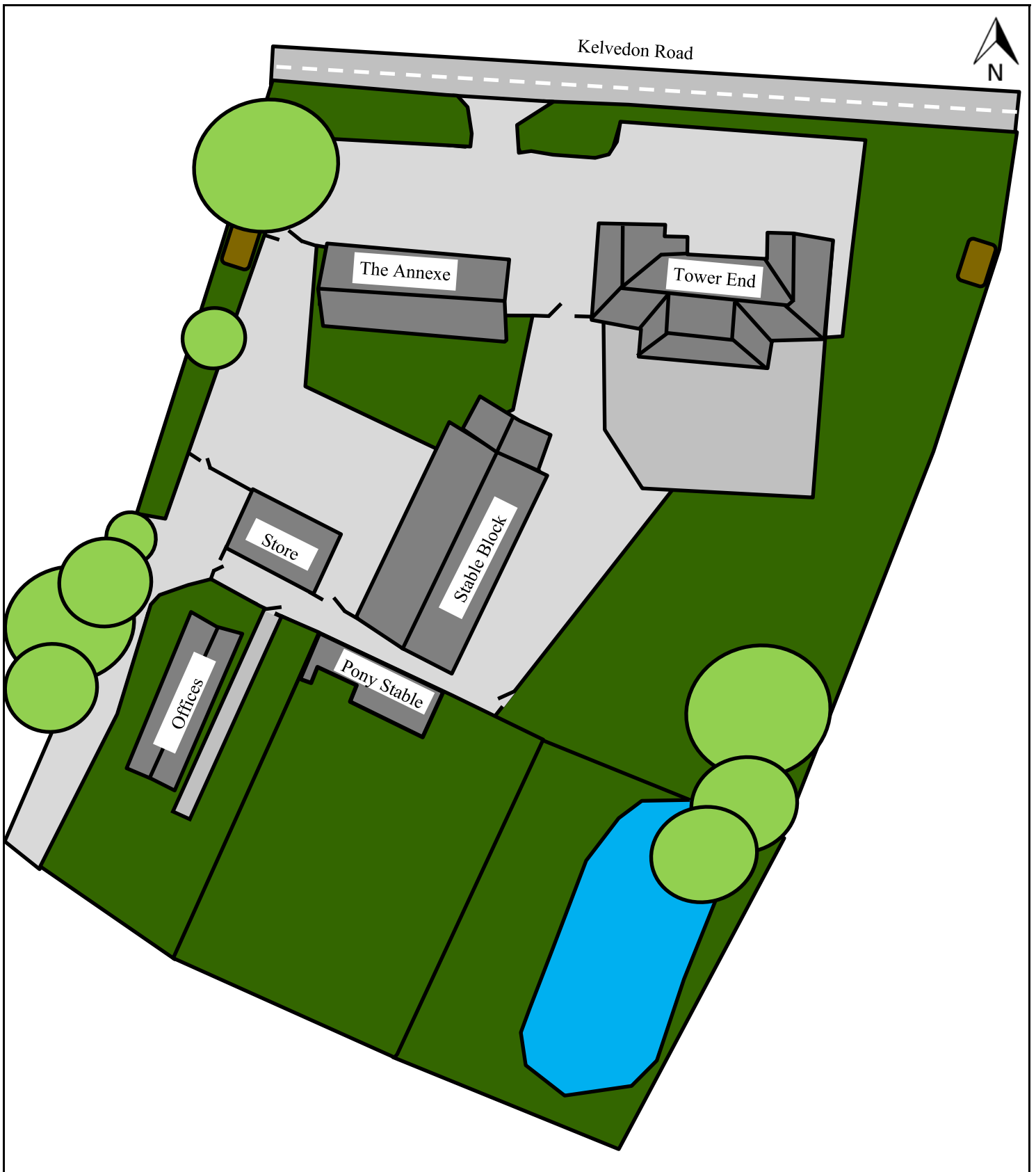




Site:	Land South of Kelvedon Road	Date:	November 2020	Legend:  Site Boundary	 REMEDIATION SPECIALISTS Green Earth Management Co Ltd Broomfield Park Coggeshall Road Essex CO6 2JX Tel: 01245 206129 www.gemcoltd.co.uk
Address:	Tiptree, Colchester	Scale:	Not to Scale		
Post Code:	CO5 0ND	Drawing:	Figure 3		
Grid Ref:	588700, 217000	Drawn by:	HS		
Title:	Site Layout Plan (Overview)	Checked by:	DR		
Client:	Marden Homes Lintied	Project No:	1342		

Figure 4

Tower End Layout Plan 1



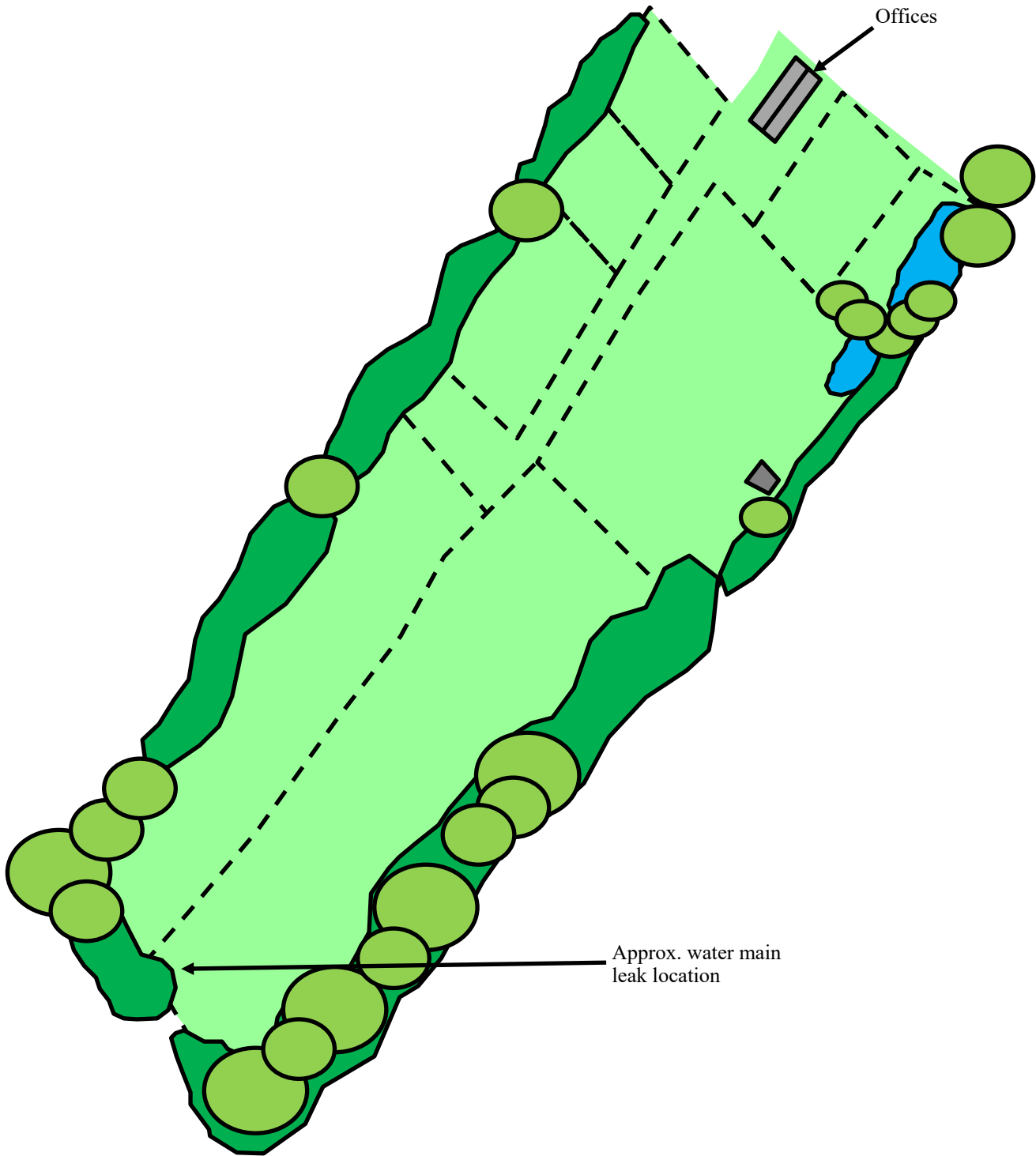
Site:	Land South of Kelvedon Road	Date:	November 2020	Legend:  Site Boundary  Tree  Pond  Oil Tank
Address:	Tiptree, Colchester	Scale:	Not to Scale	
Post Code:	CO5 0ND	Drawing:	Figure 4	
Grid Ref:	588700, 217000	Drawn by:	HS	
Title:	Tower End Layout Plan 1 (North)	Checked by:	DR	
Client:	Marden Homes Ltd	Project No:	1342	



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Figure 5

Tower End Layout Plan 2



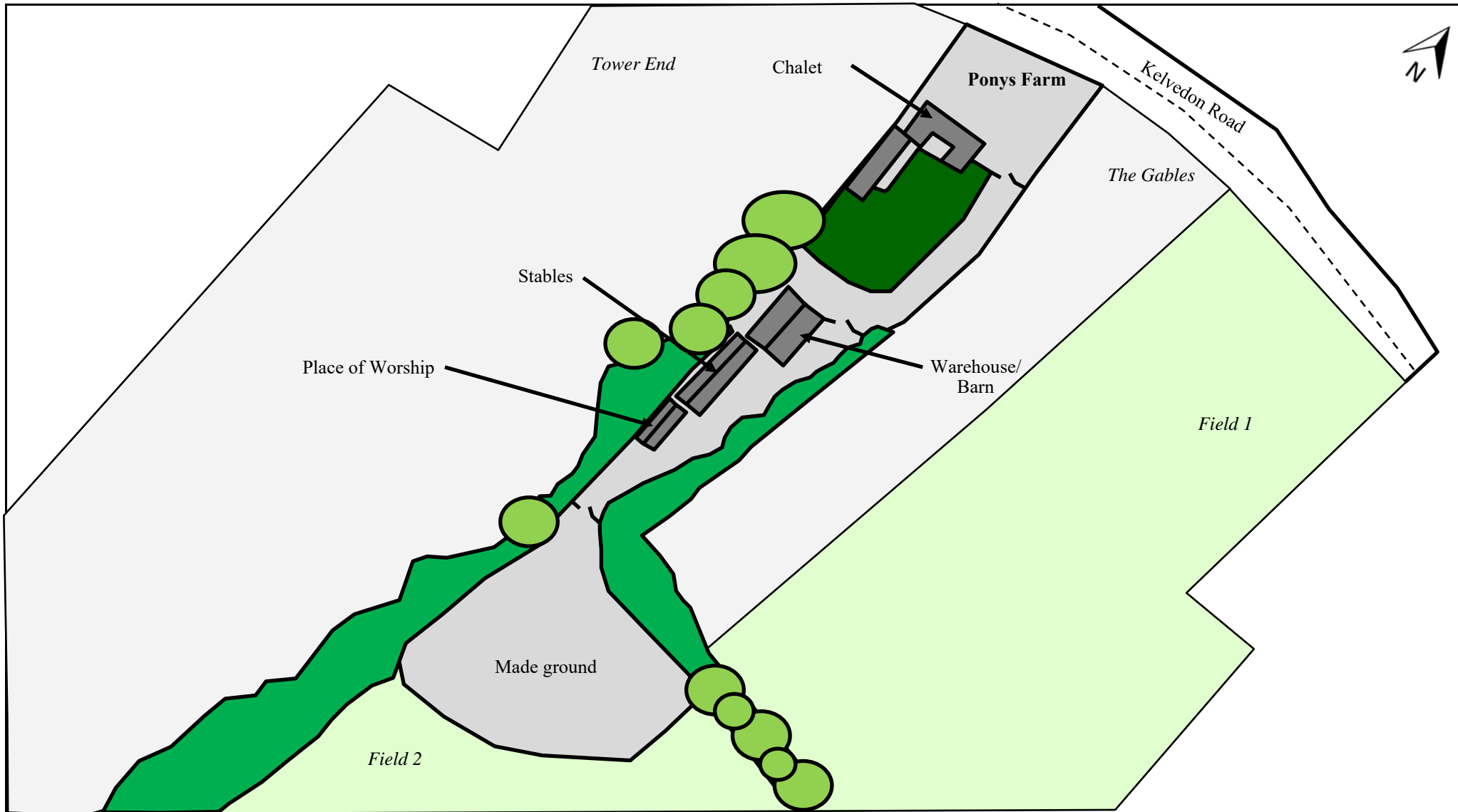
Site:	Land South of Kelvedon Road	Date:	November 2020
Address:	Tiptree, Colchester	Scale:	Not to Scale
Post Code:	CO5 0ND	Drawing:	Figure 5
Grid Ref:	588700, 217000	Drawn by:	HS
Title:	Tower End Layout Plan 2 (South)	Checked by:	DR
Client:	Marden Homes Limited	Project No:	1342

Legend:	Site Boundary
Tree	
Pond	
Paddock	

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Figure 6

Ponys Farm Layout Plan



Site:	Land South of Kelvedon Road	Date:	November 2020
Address:	Tiptree, Colchester	Scale:	Not to Scale
Post Code:	CO5 0ND	Drawing:	Figure 6
Grid Ref:	588700, 217000	Drawn by:	HS
Title:	Ponys Farm Layout Plan	Checked by:	DR
Client:	Marden Homes Limited	Project No:	1342

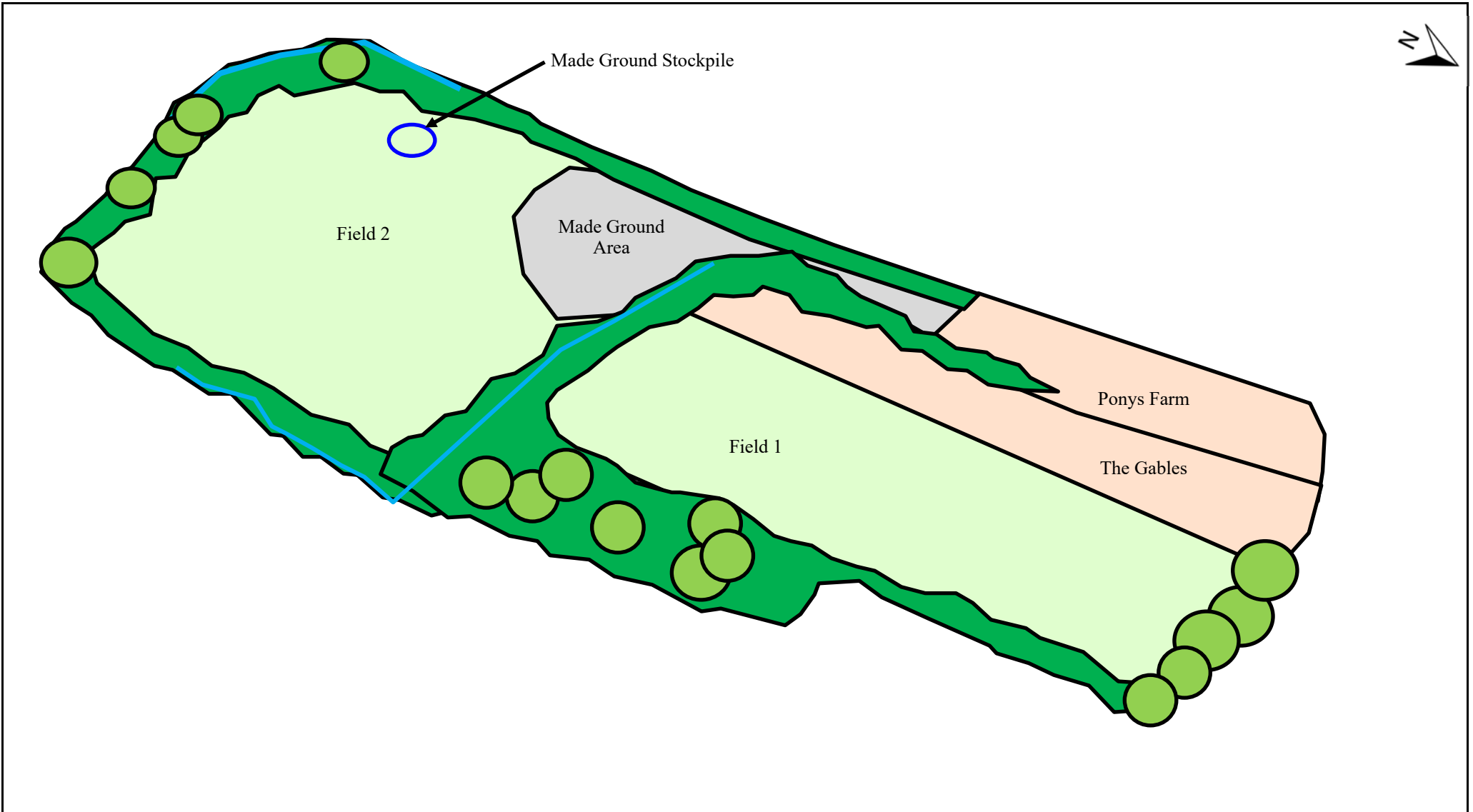
Legend:
Site Boundary
Tree
Vegetated Boundary



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Figure 7

Field 1 & 2 Layout Plan



Site:	Land South of Kelvedon Road	Date:	November 2020
Address:	Tiptree, Colchester	Scale:	Not to Scale
Post Code:	CO5 0ND	Drawing:	Figure 7
Grid Ref:	588700, 217000	Drawn by:	HS
Title:	Field 1 & 2 Layout Plan	Checked by:	DR
Client:	Marden Homes Limited	Project No:	1342

Legend:
Site Boundary
Tree
Vegetated Boundary
Identified Surface Water Feature



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