

Gladman Developments Limited

Land off Cross Road, Deal, Kent, CT14 9JN

Phase 1 Geo-environmental site assessment

302162 R01 (01)




MAY 2019

The logo for RSK, consisting of the letters 'RSK' in a bold, green, sans-serif font. The letters are closely spaced and have a slight shadow effect, giving them a three-dimensional appearance.



RSK GENERAL NOTES

Project No.: 302162 R01 (01)
Title: Phase 1 Geo-environmental site assessment: Land off Cross Road, Deal Kent, CT14 9JN
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Status: FINAL

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Revision control sheet

Revision reference	Date	Reason for revision
Rev 00	17/05/2019	First issue
Rev 01	28/05/2019	Second Issue

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd.

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1 INTRODUCTION

1.1 Commissioning

RSK Environment Limited (RSK) was commissioned by Gladman Developments Limited to carry out a Phase 1 Geo-environmental site assessment on land located at Cross Road, Deal, Kent, CT14 9JN.

This report is subject to the RSK service constraints provided in Appendix A and limitations that may be described through this document.

1.2 Proposed development

The Site in question is being considered for development for a residential use. The planned layout of the site is shown in Appendix B.

1.3 Objectives

The objective of the work is to identify any material land contamination and/or geotechnical constraints to the proposed development and to support discharge of relevant planning conditions and relevant building control requirements.

1.4 Scope of works

The scope of this assessment has been developed in accordance with relevant British Standards and authoritative technical guidance as referenced through the report. The assessment of the contamination status of the site is in line with the technical approach presented in CLR 11 Model Procedures for the Management of Land Contamination (Environment Agency, 2004) and in general accordance with BS 10175: 2011 + A2 2017 (BSI, 2017). It is also compliant with relevant planning policy and guidance.

A brief summary of relevant legislation and policy relating to contaminated land is given in Appendix C.

The scope of works for the assessment has included the following:

- review of the history of development on the site and surroundings, including a study of historical ordnance Survey mapping and other sources of historical information via an environmental database report
- assessment of local geology, hydrogeology and surface water setting, including the identification of potential geological hazards including mining etc.
- assessment of the potential risks from past, present and future coal mining activities obtained from a Coal Authority Mining Report
- review of relevant information held by appropriate statutory authorities, e.g. local authority Environmental Health Departments and Environment Agency, obtained from the environmental database report and/ or consultations

- review of any previous site investigation reports made available
- completion of a site reconnaissance survey to assess the visual condition of the site
- development of an initial conceptual site model (CSM) identifying potential contaminant linkages for potential contaminants, completion of a preliminary risk assessment (PRA) and identification of key uncertainties and assumptions in the CSM
- preliminary consideration of geotechnical constraints and hazards
- identification of the need for further action, e.g. intrusive investigations, if any.

1.5 Existing reports

RSK have previously prepared the following reports for the site. Pertinent information relevant to the subject site is included within this report.

- Preliminary risk assessment, ref: 289826-R01 (01), dated April 2016
- Trial pits and soakage testing, ref: 28926L01/mc, dated 3 March 2017

1.6 Limitations

The comments given in this report and the opinions expressed are based on the desk-based assessment and ground conditions encountered during site work in February 2017. and on the results of tests made in the field and in the laboratory. However, there may be conditions pertaining to the site that have not been disclosed by the investigation and therefore could not be taken into account.

2 SITE DETAILS

2.1 Site location

Site location details are presented in Table 1 and a site location plan is provided on Figure 1.

Table 1: Site location details

Site name	Land off Cross Road, Deal, Kent
Full site address and postcode	Cross Road, Deal, Kent, CT14 9JN
National Grid reference (centre of site)	636220E, 150420N

2.2 Site description and site reconnaissance findings

The Site boundary and current site layout are shown on Figure 2.

The Site covers an area of 3.94 hectares which currently comprises arable farmland. The topography of the site consists of a moderately planar surface, gently sloping towards Station Road to the south-west at 18.50m AOD from 30.50m AOD in the north-east (See Figure 3).

A site reconnaissance survey was completed on 03/05/2019 by RSK. A photographic log of the walkover survey is presented as appendix F.

Site surface conditions were observed to consist of reworked topsoil with an arable crop. Frequent flint quartzite and chalk was noted within the topsoil.

No buildings or areas of hardstanding were observed on the site. Furthermore, no site drainage pipes, ditches or infrastructure was observed on site.

Overhead electricity services were observed along the eastern boundary of site (Photograph 8). Overhead telecommunication services were observed parallel to the western boundary in the adjacent field to the west (Photograph 9).

No potentially significant land contamination or geotechnical issues were identified during the site reconnaissance survey.

2.3 Surrounding land uses

The Site is located at the western outskirts of the town of Walmer, approximately 2Km south of Deal, Kent. The site lies within a predominantly residential setting. Immediate surrounding land uses are described in Table 2.

Table 2: Surrounding land uses

To the North:	Residential dwellings.
To the East:	Residential dwellings immediately east, with Walmer train station and railway line beyond.
To the South:	Station Road immediately south, with further agricultural fields beyond.
To the West:	Cross Road immediately west, with further agricultural fields beyond.

2.4 Development plans

The proposed layout of the site, at the time of preparing this report, is shown in Appendix B.

Development Framework drawing (Ref: 7572-L-03_L) shows areas of Public Open Space (POS), woodland preservation and a building development area of 2.74Ha, including 100 residential dwellings with soft landscaping and private gardens.

No details of the proposed ground levels have been provided. Therefore, for the purpose of this report it has been assumed that the current levels will remain generally unchanged.

3 DESK-BASED ASSESSMENT

3.1 History of site and surrounding area

The development history of the site and surrounding area based upon assessment of historical plans and records is detailed in Table 3. The historical maps reviewed are shown within the environmental database report in Appendix D.

Table 3: Summary of historical development

Date	Historical Land Use (on-site)
1872 1:2,500	<ul style="list-style-type: none"> Two open fields assumed agricultural land use Trees shown to run along sites eastern boundary
1898, 1906 1:2,500	<ul style="list-style-type: none"> Unknown small square building located in south eastern corner of site
1938, 1:2,500	<ul style="list-style-type: none"> Rectangular features (Potential pens / enclosures) located in the south-eastern corner of site
1957-1958 1:2,500	<ul style="list-style-type: none"> Only a single suspected pen / enclosure is indicated in the south-east corner of the site.
1957 – 1990 1:2,500	<ul style="list-style-type: none"> Rectangular features no longer present Site layout comparable to current
2019 1:2,500	<ul style="list-style-type: none"> No significant change indicated Current site layout
Date	Historical Land Use (off-site)
1872 1:2,500	<ul style="list-style-type: none"> Site surrounded by open field, assumed agricultural land use Roads running along site's southern and western boundary
1898 1:2,500 1898-1899 1:10,560	<ul style="list-style-type: none"> The Walmer railway station and associated railway line running in a north east to south west direction approximately 60m off sites eastern boundary Several chalk pits located north of site, the closest pit and associated lime kilns are located approximately 130m to the north Some residential development adjacent to the site's south-eastern boundary
1906 1:2,500	<ul style="list-style-type: none"> Further residential development adjacent to the site's eastern boundary A pit, assumed for abstraction of chalk, located approximately 120m north east
1938 1:2,500	<ul style="list-style-type: none"> The Chalk Pit to the north has expanded to the east Residential development adjacent to the site's northern boundary An Access Shaft is recorded approximately 160m north of the site, 30m from a Chalk Pit Pre-Roman Graves and pottery approximately 170m north of the site

1977 – 1985 1:2,500	<ul style="list-style-type: none"> • The unmarked pit to the north-east of the site appears to have been infilled • The northern Chalk Pit has been described as disused • Pre-Roman Graves and pottery no longer shown
1989 1:2,500	<ul style="list-style-type: none"> • The northern Chalk Pit appears to have been infilled and is no longer recorded on OS mapped data
1996 1:2,500	<ul style="list-style-type: none"> • Development within the vicinity of the chalk pit
2019 1:2,500	<ul style="list-style-type: none"> • No significant change indicated
<p><i>Note: Reference to published historical maps provides invaluable information regarding the land use history of the site, but historical evidence may be incomplete for the period pre-dating the first edition and between successive maps.</i></p>	

With the exception of local features in the south western corner of the site, the historical OS and County Series maps show that the site has remained undeveloped since the earliest of the recorded data in 1872.

The surrounding land to the north and east of the site, has predominantly developed with residential dwellings from 1907 onwards. A former Chalk Pit located approximately 130m north of the site remained present within the residential developments until c.1989 when the pit had been backfilled. The location of the former northern Chalk Pit is suspected to have been utilised as a landfill, due to the location of the pit coinciding with the St Richards Road landfill, which was operational from 1976 to 1987. A further Chalk Pit located approximately 120m north of the site was indicated to have been infilled on the 1977 map.

3.1.1 Unexploded ordnance

A review of publicly available unexploded ordnance (UXO) risk maps indicates that the site is located in an area with **High potential** for wartime bombs to be present. Areas with a High potential are indicated as having a bombing density of 50 bombs per 1000acre or higher (Zetica, 2019). A copy of the search is included as Appendix H.

Therefore, provision of an unexploded ordnance (UXO) desk study and risk assessment report is recommended.

3.2 Information from environmental database report

Relevant information, including environmental permits and incidents, detailed within the environmental database report (see Appendix D) are summarised below in Table 44.

Table 4: Summary of environmental permits, landfills and incidents

Data type	Entries on-site	Entries <250m from site	Entries >250m from site of relevance	Details
Agency and hydrological				
Environmental permits – incorporating Integrated Pollution Prevention and Control, Integrated Pollution Controls, Local Authority Integrated Pollution Prevention and Control	0	0	2	Off-site 320m/329m NW: DIY Motorist PG1/1Waste oil burners, less than 0.4MW net rated thermal input - Permitted
Enforcement and prohibition notices	0	0	0	-
Pollution incidents to controlled waters, Prosecutions relating to controlled waters, Substantiated pollution incident register, Water Industry Act referrals	0	0	2	Substantiated pollution indicted registered. Major Impact to water 376m north. Incident dated, 25 th September 2012 (unidentified microbiological pollutant) An EA Category 2 significant incident located 536 north involving the release of waste oil expected due to fire in scrapyards, dated May 1996
Discharge consents	0	1	0	Storm Sewage Overflow, 12m SW, located Ellens/Cross Road. Revoked 1996/2002
Registered radioactive substances	0	0	0	-
Landfill and waste				
Active landfills	0	0	0	-

Data type	Entries on-site	Entries <250m from site	Entries >250m from site of relevance	Details
Historic / closed landfills	0	2	0	148m North, St Richards Road, Mill Hill landfill. First input date 01/01/1976. Last input date 31/12/1987. Specified waste: Inert and household waste 212m North, St Richards Road, Mill Hill landfill. First input date 01/01/1976. Last input date 31/12/1987. Specified waste: Inert waste
Other waste management licences	0	0	2	364m Northwest, The DIY Motorist. Metal Recycling Site (Vehicle Dismantlers) 752m north, The Chalk Pit, Metal Recycling Site (Mixed)
Hazardous substances/ industrial land uses				
Control of Major Accident Hazards (COMAH) sites	0	0	0	-
Explosives sites, Notification of Installations Handling Hazardous Substances (NIHHS), Planning hazardous substance consents/ enforcements	0	0	0	-
Contaminated land Part 2A register entries and notices	0	0	0	-
Contemporary trade directory entries	0	5	9	Includes: Cleaning services 73m SE, Damp & Dry Rot Control 157m NE, Wrought Ironwork 161m NE, Car body repairs 213m SE, Cleaning services 249m E and salvaging and repairs body shop 280m NE. Full list provided within the Envirocheck report.

Data type	Entries on-site	Entries <250m from site	Entries >250m from site of relevance	Details
Fuel station entries	0	0	3	Nearest located 938m North
<i>Note: Entries have only been included within the table where they are located within a 2Km radius of the site or, where they fall outside of this radius but are considered to comprise a significant entry – See Envirocheck report 202512460_1_1 – Appendix D.</i>				

In summary, items that have been identified to represent an on-going potential source of contamination that could affect the site comprise quarry/abstraction activities and subsequently infilling and/or landfilling.

3.3 Local Authority environmental health department information

RSK Environment Ltd submitted requests for information to the Environmental Health Department of Dover District Council (DDC) on 16th November 2016 and again on 3rd May 2019.

DDC's response on 21st November 2016 in connection with the site, states that; '*DDC can find no information that warrants carrying out a further search. There are no contaminated land issues and the site is not included in any Part IIA prioritised list. As far as DDC is aware, there is no planning history on site.*'

3.4 Ground conditions

3.4.1 Published geological sequence

The BGS viewer indicates that the northern portion of the site is underlain by the Margate Chalk Member. The Seaford Chalk Formation is recorded to be present in the southern portion of the site. Both are indicated to be part of the 'Newhaven Chalk Formation'.

No superficial deposits are indicated to be present on site. The BGS viewer indicates Head deposits are present approximately 30m south of the site.

The BGS lexicon description of the underlying chalk is presented within Table 5.

Table 5: Site geology

Strata	Description	Estimated thickness
Margate Chalk Member	Marl-free smooth white chalk with little flint, weakly developed indurated iron-stained sponge beds.	Up to 24m
Seaford Chalk Formation	Firm white chalk with conspicuous semi-continuous nodular and tabular flint seams. Hardgrounds and thin marls are known from the lowest beds. Some flint nodules are large to very large.	55 – 60m

3.4.2 RSK exploratory logs, 2017

RSK completed three trial pits (TP5, TP6 and TP7) across the site in February 2017 to allow completion of soakaway testing as part of works undertaken across a wider area. Details of the soakaway testing is presented within RSK letter report 28926L01/mc, dated 3 March 2017. Trial pit locations are included within Figure 3.

The trial pits revealed topsoil over predominantly cohesive head deposits with chalk thought to be associated with the Seaford Chalk Formation at depth. Detailed descriptions of the strata encountered is provided within the exploratory hole logs (Appendix G).

3.4.3 BGS logs

Nearby BGS historical boreholes available online are not considered to reflect the shallow soil profile of the subject site.

3.4.4 Radon

The environmental database report indicates that the site is located within an Intermediate probability radon area where 1 to 3% of homes are above the Action Level of 200 Bq m⁻³.

The envirocheck report confirms that 'No radon protection measures are necessary in the construction of new dwellings or extensions'.

3.5 Potential geotechnical hazards

The envirocheck report indicates that all geological hazards pose a 'very low' hazard or 'no hazards' to the site.

3.5.1 Chalk Cavity Risk Assessment

In view of the prevailing ground conditions, with Chalk at shallow depth beneath the site, it is normal practice to consider the potential risk of ground subsidence related to the presence of swallow holes and other natural chalk solution features or man-made cavities.

Based on the Edmund's risk assessment model for natural dissolution features referred to in CIRIA Report C574 (Lord et al. 2002), the site falls into the '**very low**' anticipated subsidence risk' category. With reference to Edmund's database of known natural and man-made chalk solution features there are no such features in the immediate vicinity of

the site. There are no natural recorded solution features within 500m of the site boundary. The nearest feature is a swallow hole located 3.3Km south west of site.

This inference is supported by the environmental database report which, based on the database provided by the British Geological Survey (BGS) identifies a '**very low**' potential for ground dissolution stability hazards on the site.

With regard to man-made cavities, the environmental database report identifies a series of chalk pits within 1km of the site, the closest of which is the former Mill Hill Chalk Pit, located 117 m north east of the site. Chalk was extracted from the chalk pits using opencast methods, and operations are shown to have ceased at all of the identified sites. In addition, the environmental database report identified a brick lined shaft some 600m south east of the site, further details pertaining to which were not available.

It should be appreciated, however, that the available records do not indicate the presence of such features on or within the immediate vicinity of the site. Risks associated with the previous man-made cavities are therefore considered to be relatively low.

3.6 Mining and quarrying

Evidence has been sought to identify any mining, quarrying, landfilling and land reclamation operations, past and present, which have taken place within 500m of the site.

3.6.1 Coal mining area

The site is indicated to be located over Coal Measures bedrock within the Kent Coalfield, which underlies the site at significant depth and may therefore have been affected by coal mining activities. In these areas the assessment of mining legacy issues should be carried out in accordance with the guidance provided by the Coal Authority, who adopt a risk-based approach for the advice that they offer on proposed development sites. The Coal Authority are a statutory consultee to Local Planning Authorities in respect of building development within the defined coal mining areas of England, Wales and Scotland where a planning application is required.

An initial site appraisal has been carried out based on the information provided on the Coal Authority Interactive Viewer of the UK Coalfield areas.

The Coal Authority indicates that the site lies within the Coal Authority Consultation Area but does not include Development High Risk areas. In these areas there is no requirement under the current planning regime to complete a CMRA, however in accordance with best practice we have obtained a Coal Authority Consultants Coal Mining report for the site. 51002123390001, dated 1st May 2019 is included in Appendix E.

The key findings from review of the datasets from the Coal Authority Interactive Viewer and the Coal Mining report are summarised in Table 66.

Table 6: Summary of key coal mining information

Item	Applicable to site?	Comment
Development High Risk Area on-site	No	
Coal mine entries	No	
Past shallow workings (recorded)	No	
Probable shallow workings	No	
Coal seam outcrops	No	
Surface mining (opencast)	No	

In accordance with the above the site is not considered likely to be impacted by coal mining.

3.6.2 Areas of other (rock or mineral) mining

The environmental database report indicates that there are three areas of historical chalk pit mining within 250m of the site. The nearest area lies approximately 130m north of the site, with a known history of mining chalk, which has ceased activity.

Where Chalk deposits are present at surface, historical mining activities may have resulted in unrecorded mines.

3.7 Hydrogeology

A summary of the hydrogeological setting of the site, with respect to the anticipated geological sequence set out in Section 3.5 is presented below in Table 7.

Table 7: Summary of hydrogeological setting

Condition	Description
Aquifer characteristics	The site is underlain by a Principal Aquifer relating to the Newhaven Chalk Formation. The Environment Agency (EA) describe Principal Aquifers as layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
Groundwater recharge/attenuation	Site is currently unsurfaced and will therefore drain to the ground.
Licensed groundwater abstractions	The environmental database report indicates that there are eight current licensed groundwater abstractions, the nearest of which is 367m to the north-east of site and is utilised for public water supply.
Source protection zones	Information available in the Envirocheck report indicates that the site lies within Zone 1, Zone 2 and Zone 3 groundwater Source Protection Zone (SPZ).

3.8 Hydrology

A summary of the hydrology within the site area is summarised in Table 8.

Table 8: Summary of hydrology in the site area

Condition	Description
Surface watercourses / features	There are no ponds, streams or drainage ditches on or adjacent to the site. The nearest identified surface watercourse to the site is an unnamed stream located approximately 900m to the west of the site.
Surface water abstractions	The environmental database report indicates that there is one current licensed surface water abstraction within a 2km radius of the site. The abstraction point is described as a lake in the town of Ripple, located 1280m south-west of the site boundary and is utilised for public water supply.
Site drainage	Site reconnaissance shows no evidence of any surface water courses or drainage features, including ditches, to be present.
Preliminary flood risk assessment	The indicative floodplain map for the area, shows that the entirety of the site lies within the designated floodplain of the unnamed stream approximately 1000m north-west of the site. The BGS has characterised the site as having a 'limited potential for groundwater flooding to occur'. The indicative floodplain map for the site, produced by the EA, shows that the site does not lie within 100m of a Zone 2 or Zone 3 flood risk area.

3.9 Sensitive land uses

No national or internationally designated sensitive land uses were identified within 500m of the site (Nitrate vulnerable zones are not considered relevant to the site).

4 INITIAL CONCEPTUAL SITE MODEL (ICSM)

In line with CLR11 (Environment Agency, 2004) and BS 10175: 2011 + A2 2017 (BSI, 2017), RSK has used information in the preceding sections to identify sources of contaminants, receptors that may be impacted and plausible linking pathways. Where all three are present this is termed a potentially complete contaminant linkage and a qualitative risk estimation is made.

4.1 Potential sources of contamination

Potential sources of contamination identified from current activities and the history of the site and surrounding area are presented in Table 9.

Table 9: Potential sources of contamination

Potential sources	Contaminants of concern
Onsite	
Possible made ground	Unknown fill material, but potentially including heavy metals, ash, clinker, sulphates, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons, asbestos, etc.
Pesticides / herbicides associated with agricultural use of the land	Pesticides/Herbicides
Natural carbonate-rich strata	Ground gas (typically carbon dioxide but a low gas generation potential)
Offsite	
Infilled land / Made Ground including historical Mill Hill landfill 148 – 162m north of the site boundary on St. Richards Road.	Ground gas (carbon dioxide and methane)

No potentially significant ground contamination issues were visually identified during the site walkover. Given the current site usage as arable fields, it is possible that pesticides and herbicides have historically been used onsite. However, there is no evidence to suggest that on-site storage of pesticides and/or herbicides has occurred on site in the past.

4.2 Sensitive receptors and linking exposure/ migration pathways

Sensitive receptors identified at or in the vicinity of the site that could be affected by the potential sources identified above comprise:

- Future site users – residential users [oral, dermal and inhalation exposure with impacted soil and dust, ingestion of home-grown produce];

- Future site users – public open space users, [oral, dermal and inhalation exposure with impacted soil and dust];
- Current adjacent site users – residential, commercial, public open space users [migration of contamination via dust];
- Groundwater in principal aquifer and source protection zone (SPZ) 1, 2 and 3 within the Newhaven Chalk Formation [leaching from soils and percolating to aquifer / lateral migration of dissolved phase];
- Future site users – residential [migration and ingress of ground gases into buildings, build-up in confined spaces and explosion / asphyxiation];

Potential linking pathways are shown in brackets for each item above.

Please note that construction workers and future maintenance workers have not been identified in the conceptual model as receptors because risks are considered to be managed through health and safety procedures according to the CDM Regulations.

Risks may still be present to construction workers especially where works include the entry into excavations within the ground. Construction workers should undertake appropriate risk assessments and risks should be managed through health and safety procedures and the use of PPE.

4.3 Preliminary risk assessment

The preliminary risk assessment findings and potentially complete contaminant linkages are shown in Table 14 overleaf. The risk classification based on the combination of hazard consequence and probability using a risk matrix from CIRIA C552 (Rudland et al., 2001), a summary of which is included in Appendix C. The initial conceptual site model is shown schematically in Table 20.

Table 20: Risk estimation for potentially complete contaminant linkages

Potential source	Potential receptor	Possible pathway	Likelihood	Severity	Risk and justification
Possible made ground	Future site users	Direct contact (Oral, dermal and inhalation exposure, ingestion of home-grown produce)	Low	Medium	Low: No significant signs of contamination land use or previous phases of development have been identified. Localised areas of Made Ground may be present in discrete pockets associated with construction of the nearby roads or small structures in the south eastern corner of the site.
	Future buildings and services	Direct contact of foundations / services with contaminated soil and groundwater	Unlikely	Mild	Very Low: No significant signs of contamination land use or previous phases of development have been identified. Localised areas of Made Ground may be present in discrete pockets associated with construction of the nearby roads or small structures in the south eastern corner of the site.
	Future site users and structures	Migration and ingress of ground gases into buildings, build-up in confined spaces and explosion/ asphyxiation	Unlikely	Severe	Low / Moderate: made ground, if present onsite, is not likely to be present in qualities sufficient to pose a risk to the proposed end users including structures. However, given the severity should an event take place, a risk of Low/Moderate is determined.
	Groundwater abstraction - potable	Lateral migration of groundwater	Unlikely	Medium	Low: A groundwater abstraction Zone 1, Zone 2 and Zone 3 is present. However, no significant contaminative land uses have been identified at the site.

Potential source	Potential receptor	Possible pathway	Likelihood	Severity	Risk and justification
Pesticides / Herbicides associated with the agricultural use of the land.	Future users	Oral, dermal and inhalation exposure, ingestion of home-grown produce	Unlikely	Medium	Low: Recent or current agricultural practises have been subject to modern controls and residual contamination associated with this possible use is considered unlikely to be of concern for future receptors at the site.
Off-site ground gas generation associated with the former Chalk Pit / Mill Hill landfill located at St. Richards Road.	Future use - residential	Migration and ingress of ground gases into buildings, build-up in confined spaces and explosion/ asphyxiation	Low likelihood	Severe	Moderate: Potential off-site sources of ground gas (methane and carbon dioxide) may be associated with the former St Richards Road landfill site approximately 148 - 162m to the north that was infilled with inert and household waste between 1976 and 1987 which in accordance with BS8576 represents a high ground gas generation potential. The site is underlain by chalk which is likely to be permeable and may act as a plausible pathway for ground gas. Consequently, at this stage, a plausible contaminant linkage may exist.
Ground gas generation associated with the underlying carbonaceous chalk deposits of the Margate Formation and Seaford Formation.	Future use – residential and structures	Migration and ingress of ground gases into buildings, build-up in confined spaces and explosion/ asphyxiation	Unlikely	Severe	Low / Moderate: Chalk is a natural source of ground gas (CO ₂), although generation potential is typically low. Risks from ground gas are acute and therefore a severity rating of severe has been determined.

Potentially complete contaminant linkages with a potential risk of **'Moderate'** identified which are thought to drive further site investigation comprise:

- Future site users (including buildings and services) exposure to generation of ground gases associated with the former Chalk Pit / Mill Hill landfill located at St. Richards Road, via migration and ingress of ground gases into buildings, build-up in confined spaces, resulting in explosion / asphyxiation;
- Although a 'low' risk, it is also considered provident to undertake pesticide / herbicide testing in the topsoil to confirm their absence (a potential requirement of the Local Authority).

4.4 Preliminary Geotechnical Assessment

4.4.1 Foundations

Based on the published geological records, the Seaford and Margate Chalk Formations are likely to be present at shallow depth.

Subject to site investigation to confirm the condition of the shallow chalk and the degree of near surface weathering, the ground conditions may be suitable for the design and construction of relatively shallow spread foundations for the proposed residential development.

As discussed within Section 3.2.1.1 above, the risk associated with natural dissolution features beneath the site is considered to be 'very low'.

It is therefore recommended that standard site investigation works are carried out in order to inspect the competency of the shallow chalk, confirm the absence of any unrecorded shallow features, and enable the estimation of the allowable bearing pressure for design purposes.

Standard Penetration Tests (SPTs) should be undertaken within boreholes to assess the in-situ strength / density of the materials encountered.

In the event that the investigation identifies the presence of possible solution features beneath the site, further targeted investigation is likely to be required, in the form of geophysical surveys, dynamic probing, or a combination of the above.

Should such features be encountered, the design mitigation options include stabilising the ground beneath spread foundations by a technique such as grouting, designing spread foundations to span over any future subsidence features, or piling down into stable chalk strata.

4.4.2 Drainage

The adoption of soakaway drainage or some other form of Sustainable Urban Drainage Systems (SUDS) into the Chalk should be assessed by a drainage engineer, together with consultation with the Environment Agency.

The infiltration characteristics associated with the shallow chalk may be suitable for the adoption of soakaways to discharge surface run off, subject to confirmation via in-situ testing. There is, however, the potential for future soakaways to exacerbate any existing unrecorded solution features, or initiate a new phase of solution feature formation,

particularly in low-density chalk. For this reason, any soakaways should be sited well away from foundations for structures or roads, with general guidance indicated below:

- In areas where dissolution features are known to be prevalent, soakaways should be avoided if at all possible but, if unavoidable, should be sited at least 20m away from any foundations;
- Where the chalk is of low density, or its density is not known, soakaways should be sited at least 10m away from any foundations;
- Where the chalk is of medium density (or higher), the closest part of the soakaway should be at least 5m away from any foundations.

For the drainage systems, flexible jointed pipes should be used wherever possible; particular care should be taken for the avoidance of leaks in both water supply and drainage pipework in order to negate the potential for leaking infrastructure to channel water from a point source into the underlying chalk.

In addition, as the Chalk is an important aquifer, the Environment Agency and local authority must be consulted when planning soakaway installations where chalk lies below the site.

4.5 Recommendations for further work

The following investigation works should be undertaken at the site as part of a Phase II intrusive ground investigation to address the potential contaminant linkages identified within the desk study and to provide further geotechnical information;

- A programme of exploratory holes providing general coverage across the site to allow for sample collection and in-situ geotechnical testing;
- An appropriate suite of geotechnical and environmental soil analysis, including presence pesticide / herbicide within the surface soils.
- Installation of ground gas monitoring wells across the site. Monitoring wells should be designed to target any made ground at the site and potential pathways, such as underlying permeable chalk, connecting the site to the former landfill (~120 m to the north); and

Additional infiltration rate tests may be required to confirm the suitability of the underlying geology for soakaway drainage (3No. tests have already completed as part of a wider site investigation).

4.6 Data gaps and uncertainties

Key data gaps and uncertainties identified in the CSM at desk study stage include:

- Limited information in relation to the former St Richards Road landfill site, with regard to any gas protection lining of the landfill and nature of fill material;
- At this stage the presence and constituents of made ground at the site is not known;
- Groundwater depth and flow direction; and

- Ground gas regime of the site.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Based on the results of the preliminary risk assessment, the contaminant linkages that have been identified to be potentially complete and to require further action are:

- Future residents / buildings and services exposure to off-site ground gas generation, associated with the former Chalk Pit / Mill Hill landfill located at St. Richards Road, via migration and ingress of ground gases into buildings, build-up in confined spaces, resulting in explosion / asphyxiation;
- Although a 'low' risk, it is also considered provident to undertake pesticides / herbicides testing in the topsoil to confirm their absence;
- A UXO Desktop Study report is likely to be required prior to commencing site investigation / construction works.

REFERENCES

Previous SI reports and other site related information

Preliminary risk assessment, ref: 289826-R01 (01), dated April 2016

Trial pits and soakage testing, ref: 28926L01/mc, dated 3 March 2017

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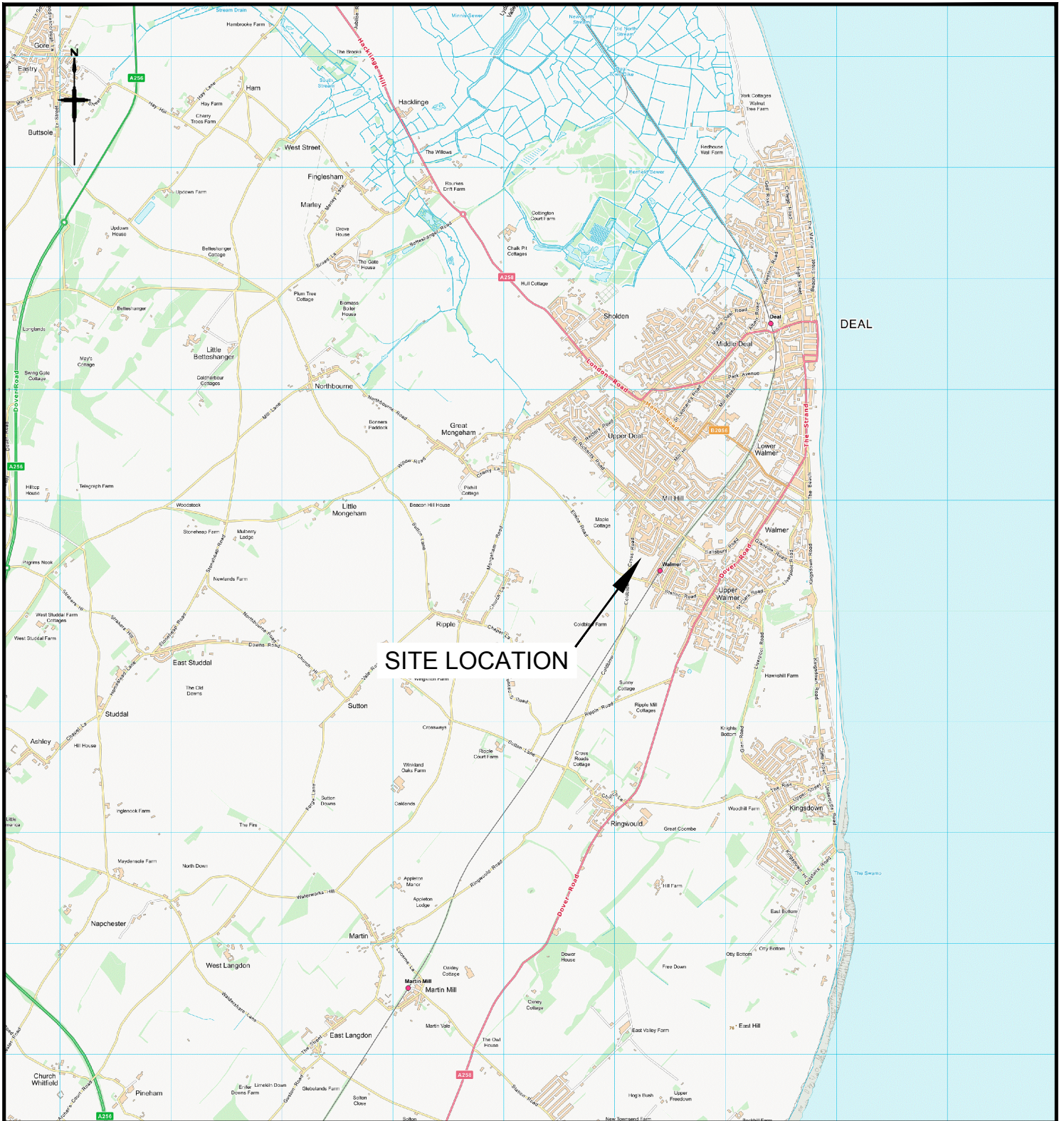
Coal Authority Consultants Coal Mining report 51002123390001, dated 1st May 2019

Environment Agency (2004), Model Procedures for the Management of Contaminated Land. Contaminated Land Report Number 11 (CLR11), September (Bristol: Environment Agency).

Landfill Sites National Dataset (Environment Agency, 2017) online resource. <https://www.qmul.ac.uk/geog/research/research-projects/historiclandfill/maps/> (accessed May 2019)

Landmark Information Group (2016), 'Envirocheck report reference 202512460_1_1, dated 1st May 2019.

FIGURES



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Client	GLADMAN DEVELOPMENT LIMITED	
Project Title	CROSS ROAD, KENT	
Drawing Title	SITE LOCATION PLAN	

Drawn	Date	Checked	Date	Approved	Date	Project No.	Drawing File
AP	01.05.19	JH	01.05.19	JH	01.05.19	302162	302162-R01(00)D001A
Scale	Orig Size	Dimensions	Drawing No.			Rev.	
1:50000	A4	—	FIGURE 1			A	

LEGEND:

- Site boundary
- ✕ RSK Trial pit 2017
- Pylon
- Overhead electricity services
- Overhead telecommunication
- Public footpath



Notes

Base plan from FPCR, Drawing No. 7572-L-07, Revision C, Dated 10.04.19

A	01.05.19	FIRST ISSUE	AP	JH	JH
REV.	DATE	DESCRIPTION	BY	CHD.	APR.
Dimensions		Projection	Scale	Orig Size	
m			1:1500	A3	



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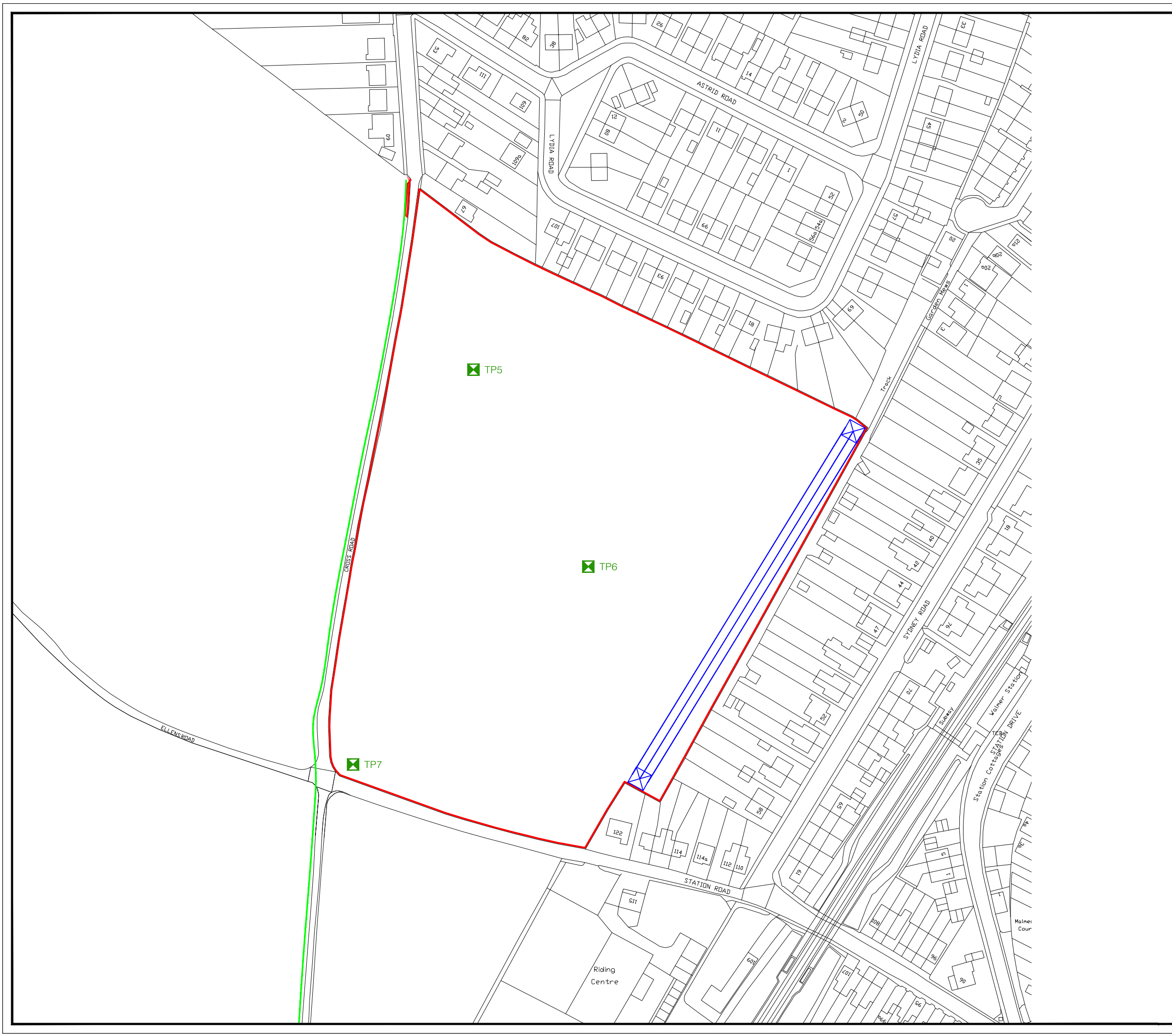
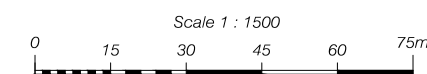
CLIENT
GLADMAN DEVELOPMENT LIMITED

PROJECT
CROSS ROAD, KENT

TITLE
SITE LAYOUT PLAN

JOB No.: 302162 DRAWING FILE: 302162-R01(00)D002A

BY:	DATE:	CONTRACT NO.:	REV:
AP	01.05.19		FIGURE 2 A



LEGEND:

- Site boundary
- ✕ RSK Trial pit 2017



Notes
 Base plan from FPCR, Drawing No. 7572-L-07, Revision C,
 Dated 10.04.19

REV.	DATE	DESCRIPTION	BY	CHD.	APR.
A	21.05.19	FIRST ISSUE	AP	KH	KH
Dimensions		Projection	Scale	Orig Size	
m			1:1500	A3	

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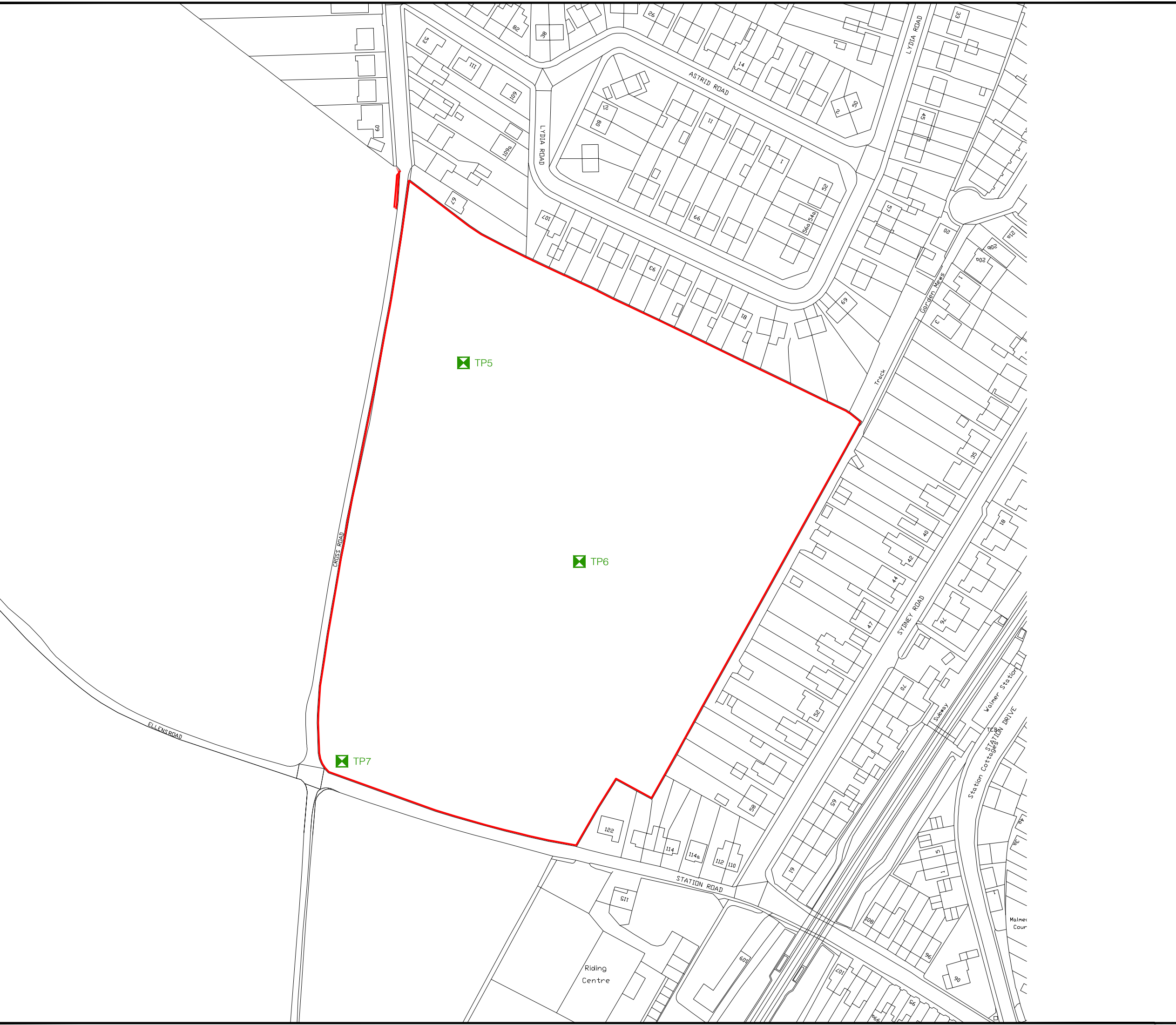
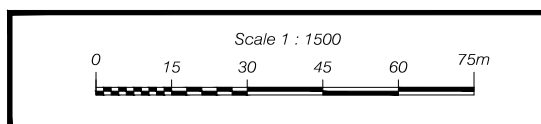
CLIENT
GLADMAN DEVELOPMENT LIMITED

PROJECT
CROSS ROAD, KENT

TITLE
**HISTORIC EXPLORATORY
 HOLE LOCATION PLAN**

JOB No.: 302162 DRAWING FILE: 302162-R01(00)D003A

BY:	DATE:	CONTRACT NO.	REV:
AP	21.05.19		A





APPENDIX A

SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for Gladman Developments Limited (the "client") in accordance with the terms of a contract [RSK Group Standard Terms and Conditions] between RSK and the "client". The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
2. Other than that, expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed in writing the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, invasive plants, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials, unless specifically identified in the Services.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a visual inspection of the site together with RSK's interpretation of information, including documentation, obtained from third parties and from the client on the history and usage of the site, unless specifically identified in the Services or accreditation system (such as UKAS ISO 17020:2012 clause 7.1.6):
 - a. the Services were based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely
 - b. the Services were limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the visual inspection
 - c. the Services did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services.

RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.








8. The intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined locations based on the known historic / operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the properties of the materials adjacent and local conditions, together with the position of any current structures and underground utilities and facilities, and natural and other activities on-site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.
9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on-site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.











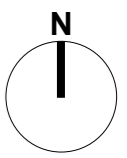
APPENDIX B DEVELOPMENT DRAWINGS





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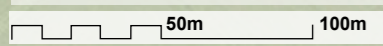
-  Application Boundary **[3.94 Ha]**
- BUILT DEVELOPMENT**
-  Residential Area **[2.74 Ha]**
(Up to 100 dwellings at 36 DPH)
- ACCESS**
-  Proposed Indicative Roads
-  Proposed Vehicle Access
-  Proposed Pedestrian Links

- GREEN INFRASTRUCTURE [1.20 Ha]**
-  Existing Hedgerows
-  Public Open Space (Amenity) **[0.88 Ha]**
-  Proposed Woodland **[0.24 Ha]**
-  Proposed Trees
-  Proposed Swale
-  Community Orchard **[0.05 Ha]**
-  Proposed Play Area **[0.03 Ha]**
-  Proposed Attenuation Pond **365m²**



Typology	Standard Required per 1000 pop. (Ha)	Required (Ha)	Proposed (Ha)	
Accessible Green Space	2.22	0.52	0.90	
Outdoor Sports Facilities (grass)	1.17	0.27	off-site	n/a
Children's Equipped Play Space	0.06	0.01	0.03	
Allotments/Community Gardens	0.21	0.05	0.05	
Total		0.93	1.00	

Ref:
 - Dover District Council Land Allocations Adopted Plan (2015)
 - Calculations based on 2.4 persons per household based on a density of 35 DPH (giving an estimated population of 235).



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Gladman Developments Ltd
 Cross Road
 Walmer, Kent

DEVELOPMENT FRAMEWORK

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 17 April 2019 TFG/KMN
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masterplanning
 environmental assessment
 landscape design
 urban design
 ecology
 architecture
 arboriculture

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APPENDIX C

SUMMARY OF LEGISLATION AND POLICY RELATING TO CONTAMINATED LAND

Part IIA of the Environmental Protection Act 1990

Part IIA of the Environmental Protection Act 1990 (Part IIA) and its associated Contaminated Land Regulations 2000 (SI 2000/227), which came into force in England on 1 April 2000, formed the basis for the current regulatory framework and the statutory regime for the identification and remediation of contaminated land. Part IIA of the EPA 1990 defines contaminated land as 'any land which appears to the Local Authority in whose area it is situated to be in such a condition by reason of substances in, on or under the land, that significant harm is being caused, or that there is significant possibility of significant harm being caused, or that pollution of controlled waters is being or is likely to be caused'. Controlled waters are considered to include all groundwater, inland waters and estuaries.

In August 2006, the Contaminated Land (England) Regulations 2006 (SI 2006/1380) were implemented, which extended the statutory regime to include Part IIA of the EPA as originally introduced on 1 April 2000, together with changes intended chiefly to address land that is contaminated by virtue of radioactivity. These have been replaced subsequently by the Contaminated Land (England) (Amendment) Regulations 2012, which now exclude land that is contaminated by virtue of radioactivity.

The intention of Part IIA is to deal with contaminated land issues that are considered to cause significant harm on land that is not undergoing development (see Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance, April 2012). This document replaces Annex III of Defra Circular 01/2006, published in September 2006 (the remainder of this document is now obsolete).

Planning Policy

Contaminated land is often dealt with through planning because of land redevelopment. This approach was documented in Planning Policy Statement: Planning and Pollution Control PPS23, which states that it remains the responsibility of the landowner and developer to identify land affected by contamination and carry out sufficient remediation to render the land suitable for use. PPS23 was withdrawn early in 2012 and has been replaced by much reduced guidance within the National Planning Policy Framework (NPPF), reference ISBN: 978-1-5286-1033-9, February 2019.

The new framework has only limited guidance on contaminated land, as follows:

Chapter 11. Making effective use of land

117 Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land.

118. Planning policies and decisions should:

c) give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land.

Chapter 15. Conserving and enhancing the natural environment

170. Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

Ground conditions and pollution

178. Planning policies and decisions should ensure that:

a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);

b) after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990; and

c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.

179. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

Water Resources Act (WRA)

The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009 updated the Water Resources Act 1991, which introduced the offence of causing or knowingly permitting pollution of controlled waters. The Act provides the Environment Agency with powers to implement remediation necessary to protect controlled waters and recover all reasonable costs of doing so.

Water Framework Directive (WFD)

The Water Framework Directive 2000/60/EC is designed to:

- enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands that depend on the aquatic ecosystems
- promote the sustainable use of water
- reduce pollution of water, especially by 'priority' and 'priority hazardous' substances

- ensure progressive reduction of groundwater pollution.

The WFD requires a management plan for each river basin be developed every six years.

Groundwater Directive (GWD)

The 1980 Groundwater Directive 80/68/EEC and the 2006 Groundwater Daughter Directive 2006/118/EC of the WFD are the main European legislation in place to protect groundwater. The 1980 Directive is due to be repealed in December 2013. The European legislation has been transposed into national legislation by regulations and directions to the Environment Agency.

Priority Substances Directive (PSD)

The Priority Substances Directive 2008/105/EC is a 'Daughter' Directive of the WFD, which sets out a priority list of substances posing a threat to or via the aquatic environment. The PSD establishes environmental quality standards for priority substances, which have been set at concentrations that are safe for the aquatic environment and for human health. In addition, there is a further aim of reducing (or eliminating) pollution of surface water (rivers, lakes, estuaries and coastal waters) by pollutants on the list. The WFD requires that countries establish a list of dangerous substances that are being discharged and EQS for them. In England and Wales, this list is provided in the River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010. In order to achieve the objectives of the WFD, classification schemes are used to describe where the water environment is of good quality and where it may require improvement.

Environmental Permitting Regulations (EPR)

The Environmental Permitting (England and Wales) Regulations 2016 (as amended) provide a single regulatory framework that streamlines and integrates waste management licensing, pollution prevention and control, water discharge consenting, groundwater authorisations, and radioactive substances regulation. Schedule 22, paragraph 6 of EPR 2016 states: 'the regulator must, in exercising its relevant functions, take all necessary measures - (a) to prevent the input of any hazardous substance to groundwater; and (b) to limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater.'

Notes:

- 1. The above information is provided for background but does not constitute site-specific advice*
- 2. The above summary applies to England only. Variations exist within other countries of the United Kingdom*