



THOMAS HOMES LTD

Remediation Action Plan

Corner of Crown Street and Silver Street, Reading, Berkshire
RG1 2SE

Project Ref. 28957-R02 (01)

MAY 2017

RSK



RSK GENERAL NOTES

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Title: Remediation Action Plan: Corner of Crown Street and Silver Street, Reading, Berkshire RG1 2SE

Client: Thomas Homes Ltd

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RSK office: RSK Environment Limited, 18 Frogmore Road, Hemel Hempstead, Herts, HP3 9RT

Tel: 01442 437500, contact: John R Pulsford

Status: Final

Author	<u>Joshua Tee</u>	Technical reviewer	<u>John R Pulsford</u>
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Signature

Date:

May 2017

Signature

Date:

May 2017

Project manager	<u>John R Pulsford</u>	Quality reviewer	<u>Pip Gobby</u>
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Signature

Date:

May 2017

Signature

Date:

May 2017

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1 INTRODUCTION

RSK Environment Limited (RSK) was commissioned by Thomas Homes Ltd (THL) to prepare a remediation action plan (RAP) for a new residential development on land on the corner of Crown Street and Silver Street, Reading RG1 2SE hereafter referred to as 'the site'.

The objectives of this RAP are to satisfy a planning requirement ref. 151702, to ensure the safe development of the site with respect to future residents and other sensitive receptors.

1.1 Project background

It is understood the redeveloped is for a 5-storey block of flats with a part single storey basement car park and plant room including a communal soft landscaping area.

A site location plan is presented as **Figure 1** and details of the proposed development layout are shown as **Figure 3**.

The site has been the subject of previous investigations as detailed as follows:

- Phase 1 Geo-environmental report by Haigh Huddleston & Associates (HHA), ref. E14/6083/R001 dated April 2014; and
- Phase 2 Geo-environmental Assessment by RSK, reference 28957-R01 (00), dated January 2017.

This RAP should be read in conjunction with the previous reports referenced above.

1.2 Scope and limitations

The scope of this report is limited to activities identified in the Options Appraisal stage as defined in CLR11⁽¹⁾. The purpose of the report is to document measures required to minimise environmental risk at the site and to provide the regulatory and planning authorities with sufficient information to enable them to make decisions and provide approvals necessary to allow the development to proceed.

This report is subject to the RSK Environment Limited service constraints given in **Appendix A**.

The activities covered by this report are summarised as follows:

- **Remedial Options Identification:** Identifies feasible remediation options applicable to the identified contamination and site characteristics and demonstrates that the site can be remediated for the end use proposed.
- **Remedial Options Appraisal:** Evaluates the feasible options identified against the identified remedial and development objectives for the site and the proposed development.
- **Remedial Action Plan:** Presents the selected remedial option or options and describes the approach to remediation proposed.

Reference should be made to CLR11 for the relationship between these and other preceding or succeeding activities.

The remedial action plan is presented to a level of detail considered to be sufficient for the requirements of the planning and regulatory authorities.

The comments given in this report and the opinions expressed are based on the ground conditions reported during the site investigation work and that reported by HHA, on the results of tests made in the field and in the laboratory and on information provided. However, there may be conditions pertaining to the site that were not disclosed by the investigation and which therefore could not be taken into account. In particular, it should be noted that there may be areas of made ground not detected due to the limited nature of the investigation or the thickness and quality of made ground may differ from that found in the investigation. Also groundwater levels vary due to seasonal or other effects and at times may vary significantly from those reported.

1.3 Description of the site

The site is located on the corner of Silver Street and Crown Street at National Grid reference SU 71867 72845, as shown on **Figure 1**.

The site covers approximately 0.33ha at an elevation of approximately 50m above Ordnance Datum (AOD) and comprises the following main attributes some of which are shown on **Figure 2**:

1. Derelict buildings occupy a significant area of the site including an above ground fuel tank and a basement of unknown extent;
2. External areas comprise concrete and bituminous hardstanding of generally poor quality used in more recent times currently as a car park; and
3. Dense shrub vegetation along the northern and eastern boundaries.

More recently, the site has been used for car hand washing, 'Crown Hand Car Wash and Valleting Services'.

2 SUMMARY OF THE CONCEPTUAL SITE MODEL AND RISK ASSESSMENT

2.1 Refined conceptual site model

This section summarises the Conceptual Site Model (CSM), which was originally developed by HHA and refined following the site investigation and risk assessment work undertaken by RSK.

The CSM is a key tool to enable linkages between contaminant sources, pathways, and receptors to be assessed, relevant to the proposed end-use. The CSM has been developed in accordance with the CLR11 procedures.

2.1.1 Geology and groundwater

Typically, the geological sequence identified by RSK beneath the site comprises the following:

Made ground

Made ground was encountered within all exploratory holes locations below any hardstanding and extended to depths ranging between 1.1m and 2.8m below ground level (mbgl). The made ground generally comprised brown to dark brown slightly clayey gravelly sand. This was intermixed with occasional anthropogenic materials comprising fragments of brick, glass, mortar, concrete, metal, plastic, rubber and ash.

A buried masonry wall was exposed in location TP2. It is considered to be potentially associated with a former basement structure relating to terraced housing that was present on the corner of Crown Street and Silver Street.

Natural deposits

Beneath the made ground, superficial River Terrace Deposits (RTD) were encountered to depths between 1.1mbgl and 2.8mbgl and varies between 0.6m and 3.6m in thickness. The RTD generally comprises orangish brown gravelly sand or sandy slightly gravelly clay.

Beneath the RTD, Chalk was encountered at depths of between 5.2mbgl and 5.3mbgl and was recovered as a structureless melange as a result of the percussive drilling technique adopted.

Groundwater

During the intrusive investigation, groundwater was encountered within BH1 and BH2 at depths ranging from 11.1mbgl and 11.4mbgl. In addition, a subsequent monitoring visit encountered water at a depth of 9.38mbgl.

Observed contamination

A small amount of discoloured black hardstanding was noted on the ground surface next to the fuel storage tank within the main building. Exploratory location TP1 was chosen to target this potential contamination. PID readings within this trial pit were all recorded <0.1ppm indicating an absence of significant volatile organic compounds.

In numerous locations, made ground was present, comprising anthropogenic materials such as brick, glass, mortar, concrete, metal, plastic, rubber and ash.

2.1.2 The Conceptual Site Model (CSM)

The ground conditions encountered during the investigation by RSK differed to those proposed in the initial conceptual model by HHA. Therefore, refinement of the CSM was considered necessary.

The initial CSM indicated the presence of the Lambeth Group beneath the site; however it was not encountered during the site investigation by RSK. The presence of this strata and its cohesive nature would prevent vertical movement of contamination between the made ground and the Seaford Chalk Formation (Primary Aquifer). However, due to the granular nature of the Taplow Gravel Formation, which separates the two strata, a potential pollutant linkage could be present. Therefore, a contaminant linkage between the Made Ground and the Chalk formation was considered plausible by the migration pathway.

Whilst the previous Phase 1 investigation by HHA has not identified an unacceptable risk to vegetation, the site is underlain by relatively thick made ground and therefore has been included as a potential pathway for investigation.

The CSM highlighted a potential linkage associated with contaminants in the vapour phase. However, given that all samples were analysed with a Photo-Ionisation Detector (PID) immediately after being taken, this pollutant linkage can be deemed not to exist and therefore, was not considered further.

2.2 Quantitative risk assessment

This section summarises the stages of quantitative risk assessment carried out to evaluate the potentially complete pollutant linkages identified by the CSM.

2.2.1 Direct contact with impacted soil by future residents

The results of laboratory tests were assessed against Generic Assessment Criteria for a residential without home grown produce end. On this basis, no potentially significant risks were identified and therefore the site was assessed to be suitable for the proposed end use.

2.2.2 Inhalation exposure of future residents to asbestos fibres

The laboratory screening for asbestos identified detectable asbestos fibres within one sample of made ground (WS3 at 0.5mbgl). This sample was then further analysed and the presence of fibres of chrysotile were confirmed (0.001% by weight).

2.2.3 Uptake of contaminants by vegetation potentially inhibiting plant growth

The results indicate that a relevant pollutant is unlikely to exist associated with phytotoxic effects.

2.2.4 Impact of organic contaminants on potable water supply pipes

The results indicate that a relevant linkage is unlikely to exist associated with organic contaminants and therefore, PVC (polyvinyl chloride) pipe was considered suitable for use on the development.

2.2.5 Leaching of contaminants to groundwater in principal aquifer and subsequent migration to surface watercourse

The results indicate slight exceedances in a number of metals. Given the site is considered to be of low sensitivity i.e. no abstraction of groundwater within the vicinity and is not located within a Source Protection Zone; it is considered that these exceedances do not pose an unacceptable risk to site development including future residents.

2.2.6 Migration of ground gases

Ground gas monitoring undertaken on three occasions, indicated gas screening values (GSV) for methane of 1×10^{-4} l/hr and carbon dioxide of 3×10^{-4} l/hr. Based on these GSVs, the site has been assessed to be Characteristic Situation 1 (CS1) i.e. the site is considered to be at low risk from ground gases and therefore, gas protection measures were not considered necessary.

2.2.7 Conclusions

The results of the GQRA indicate that no potentially significant risks associated with soil contamination have been identified with respect to human health receptors or groundwater beneath the site apart from the potential for asbestos in made ground.

In summary, no significant remediation measures are considered necessary based upon the current development proposals although consideration will need to be given to the following:

- Prior to demolition of existing structures, an asbestos survey following removal of identified materials will need to be undertaken by an approved contractor;
- Removal of waste materials in existing buildings and the identified basement structure will need to be undertaken by an approved contractor;
- Whilst the results of chemical analyses would suggest the site is at low risk from contamination, there is potentially contamination beneath the footprint of existing of structures which has not been assessed and therefore has not been considered;
- There is the potential for contamination to be present including asbestos in any made ground beneath proposed soft landscaping areas. To mitigate against any unacceptable risk, a suitable capping layer is recommended;
- Relating to the above ground fuel tank, this will need to be removed along with any underlying impacted materials by an improved contractor. Should this area fall with proposed soft landscaping, then validation of remaining soils will need to be undertaken to demonstrate no remaining unacceptable risk; and
- During site development, should any unforeseen contamination be encountered then advice must be sought from an environmental consultant.

3 SITE CHARACTERISTICS AFFECTING REMDIAL OPTIONS SELECTION

There are a number of site characteristics which may affect the remedial options which are viable for the site. These are summarised below.

3.1 Ground levels

The existing ground levels across the site are to be retained as far as possible.

3.2 Structures

Existing buildings on site will all be demolished and associated services removed, prior to site redevelopment.

3.3 Subsurface conditions

The ground conditions and groundwater regime are summarised in **Section 2.1.1** of this report, and in greater detail within the previous geo-environmental site assessment reports.

3.4 Neighbouring properties and land uses

The site is bordered by Crown Street and the A4 road to the north, Silver Street and a residential development to the east, a residential area to the south and rear gardens associated with terraced housing along Newark Street to west.

4 REMEDIAL AND DEVELOPMENT OBJECTIVES

4.1 Remedial objectives and aims

The objectives of the remedial works is to mitigate any unacceptable risk from potential contamination to human health, controlled waters and other sensitive receptors such that the site is considered suitable for use, as well mitigation any potential risks to construction works and off site receptors during the construction phase.

The following objectives were considered to be the drivers for remediation in terms of this remedial strategy:

- Protection of construction workers, neighbours and future site residents from potentially contaminated soils and construction materials associated with demolition of the existing structures, removal of waste materials within the existing buildings and basement and decommissioning and removal of the above ground fuel tank;
- Protection of construction workers, neighbours and future site residents from potentially contaminated made ground associated with the earthworks phase of construction , particularly associated with the construction of the basement; and
- Protection of human health with respect to asbestos and asbestos-containing materials via the inhalation of particulates, affecting construction workers, neighbours and future residents.

In addition to the objectives above, the following aims have been taken into account in formulating the remedial strategy:

- Limit off-site removal of soil;
- Removal of waste materials in existing buildings and identified basement structure;
- Isolate site users and grounds maintenance workers from contact with contaminants remaining on site; and,
- Comply with regulatory environmental protection requirements.

4.2 Development objectives

The following development objectives are taken into account in formulating this strategy:

- Minimise delay to development programme;
- Minimise impact of development activities on the surrounding area;
- Maintain economy of development by maximising use of development materials (e.g. hard surfacing, building construction) in arriving at a remedial solution;
- Minimise off-site disposal of soils by re-using chemically and geotechnically suitable soils where possible and selecting materials as suitable for a particular purpose, e.g. some soils may be suitable beneath hardstanding but unsuitable in areas of soft landscaping; and,
- Minimise long-term maintenance requirements.

5 REMEDIATION OPTIONS

5.1 Initial identification

The initial identification of potentially applicable remediation options in this section has been carried out by reference to the Remediation Option Applicability Matrix taken from CLR11. **Table 1** presents this initial identification process, incorporating only the contaminants/issues that have been identified in the risk assessment to be of concern at this site, specifically:

- Risk to construction workers, neighbours and future site residents from potentially impacted soils beneath existing structures on site;
- Removal of waste materials in existing buildings and identified basement structure; and,
- Risk to construction workers, neighbours and future residents from asbestos, via inhalation of particulates.

This initial identification is only applicable as an initial stage to reduce the number of options to manageable levels. It takes no account of the nature of the site conditions such as soil properties, or of the remedial and development objectives.

- ✓✓ denotes applicable to site
- ✓ denotes potentially applicable technique
- × denotes technique that is not applicable
- ? means a pre treatment step may be necessary prior to the method being suitable.

Table 1: Remediation option applicability matrix

Remediation Option	Contaminants Present	
	Asbestos	Other contaminants
CIVIL ENGINEERING METHODS		
Containment – cover systems	✓✓	✓✓
Containment – hydraulic barriers	✓	✓
Containment – in ground barriers	✓	✓
Excavation and disposal	✓✓	✓✓
BIOLOGICAL METHODS		
Biopiles	×	✓
Bioventing	×	✓
Biosparging	×	✓
Landfarming	×	✓
Natural attenuation	×	✓

Remediation Option	Contaminants Present	
	Asbestos	Other contaminants
Slurry phase biotreatment	x	✓
Windrow turning	x	✓
CHEMICAL METHODS		
Chemical dehalogenation	x	x
Chemical oxidation	x	✓
Soil flushing	x	✓
Solvent extraction	x	✓
Surface amendments	x	x
PHYSICAL METHODS		
Air sparging	x	x
Dual phase SVE	x	x
Permeable reactive barriers (PRBs)	x	✓
Soil vapour extraction (SVE)	x	x
Soil washing	x	✓
STABILISATION AND SOLIDIFICATION METHODS		
Hydraulic binders (e.g. cement)	✓	✓
Vitrification	✓	✓
THERMAL METHODS		
Incineration	✓	✓
Thermal desorption	x	✓

Note: Table reproduced from DEFRA/Environment Agency Contaminated Land Report CLR11. Refer to report text for details of Options Appraisal.

5.2 Remedial options appraisal

The feasibility of the remedial options identified is considered as follows.

5.2.1 Civil engineering methods

For soils containing potentially elevated compounds:

- **Containment: cover systems** - a cover system could be provided which would consist of clean soils, membranes or hardstanding to isolate potential receptors from direct contact with elevated concentrations within soils; and,
- **Containment: excavation and disposal** - this would be considered to be a feasible remediation option in respect of the removal of made ground containing elevated chemical compounds. However, the removal of materials from the site is not ideal if other alternatives are available.

For soils containing asbestos:

- **Containment: cover systems** - a cover system could be provided which would consist of clean soils, membranes or hardstanding to isolate potential receptors from direct contact with asbestos fibres within soils; and,
- **Containment: excavation and disposal** - are considered to be feasible remediation options in respect of the treatment of soils containing asbestos. Removal of material from site would not be ideal due to the additional risks of making asbestos airborne.

5.2.2 Other methods

All other treatment methods are potentially applicable given that the demolition of existing structures is yet to be undertaken, however none were considered to be specifically suitable to the site in terms of the quantity of material that is impacted and the development end use.

5.2.3 Feasible options

Options considered feasible in the context of the relevant hazard, the site conditions and the remediation and development objectives, are considered to be civil engineering methods, which include either containment (cover system) or excavation and disposal (or combination of the two) of any contaminated soils encountered during redevelopment of the site. These solutions are applicable for both soils with elevated concentrations and for material containing asbestos.

Soils containing elevated concentrations of chemical compounds including asbestos

The made ground encountered across the site is variable in composition. Where suitable, material will be retained on-site where possible.

Due to the nature of the development, there are numerous locations where made ground can be contained beneath proposed buildings and areas of hardstanding, to prevent a complete linkage between potentially impacted soils and future site residents.

Where made ground remains beneath areas of soft landscaping, the capping strategy given in **Section 6.2.5** should be adopted.

This thickness of clean cover material will break this linkage, hence protecting human receptors from any risk from potentially contaminated made ground.

5.2.4 Final considerations

Where re-use of soils is envisaged on site, or where clean material is to be imported the works should be carried out in accordance with the CLAIRE document "The Definition of Waste: Development Industry Code of Practice". This will include preparation of a material management plan and declaration by a Qualified Person. Evidence will be required to demonstrate the suitability of soils for the proposed end uses.

The reuse of suitable materials is considered a sustainable approach to site development although given the nature of the scheme and site constraints, the likelihood of significant reuse of suitable materials is likely to be low.

6 REMEDIATION ACTION PLAN

6.1 Remedial actions

6.1.1 Made ground materials

The objective of the remediation at the site is to address the potential for contamination present in soils underlying the footprint of existing buildings and the above ground fuel tank that remain on the site. The remedial actions that are considered feasible to break the potential pollutant linkage that has been identified include the placement of made ground materials beneath buildings and areas of hardstanding, thus removing the potential contact pathway for both chemical compounds and asbestos fibres. Where bulk asbestos is identified, hand picking should be carried out prior to movement and placement of the material.

6.1.2 Ground gases

The site has been categorised with a risk classification of CS1 and therefore, gas protection measures are not considered necessary.

Construction of the basement will need to consider the potential for groundwater ingress. Reference should be made to the British Standards Institute 8102:2009 – ‘Code of practice for protection of below ground structures against water from the ground’. London, BSI, 2009. A well ventilated basement car park including ventilated plant rooms will reduce any risk significantly further.

6.1.3 Re-use of materials

Soils that are planned to be excavated as part of the site development will be temporarily stockpiled and kept strictly segregated to ensure there is no mixing of the different material types:

- Material derived from made ground and suitable for use as general fill material beneath proposed buildings and hard surfaces
- Natural soil material suitable for inclusion within areas of soft landscaping.

In addition to general excavations, fill material is expected to be generated from the processing of concrete slabs and old foundations. The re-use of suitable materials on site, and the transfer of unsuitable materials off-site, shall be subject to the provisions of a Materials Management Plan which will be produced in accordance with the CLAIRE document “The Definition of Waste: Development Industry Code of Practice”. The document will include an appropriate declaration by a Qualified Person and it will include evidence to demonstrate the suitability of soils for the proposed end uses.

6.2 Requirements for verification

6.2.1 Site visits and record keeping

In order to be able to provide a verification report on completion of the earthworks, the following validation visits will need to be undertaken by the Environmental Consultant to document the works undertaken:

- Site visits to assess any made ground deposits beneath buildings and areas of hardstanding, and that there has been no movement of made ground deposits into areas of previously natural soils. Records will include a diary of the site visit, photographs and annotated site plans;
- Validation of the surface soils following removal of above ground fuel tank;
- Any suspect material i.e. asbestos-containing materials that are visually identified by construction workers will require a site visit from the Environmental Consultant to sample the material and supervise appropriate transportation for laboratory analysis; and
- Validation of a suitable capping layer in soft landscaping areas.

6.2.2 Site records

A record of all soil imports and exports to site for the purpose of installing a suitable cover will be maintained and this will include:

- Delivery tickets - the origin of the soil can be traced to the specific donor site;
- Chemical test data – all data obtained from the donor site or from site initiated chemical testing; and
- Storage – the location of temporary storage or quarantine areas will be recorded including plans/photographs.

Site records will be maintained so that sufficient data is available for the purpose of compiling a robust verification report. In addition, where further testing and assessment of asbestos in soil for in situ soils/site-derived soils is undertaken, details of this will be retained (along with any mitigation measures implemented) for inclusion in the site health and safety file.

Chemical test data and visual confirmation of suitability will be recorded prior to confirming the imported soils as being suitable. Validation records relating to cover soils will be collated in a verification report on completion of all site works.

6.2.3 Chemical testing frequency

The type and frequency of confirmatory soil laboratory analysis will be in accordance with that in **Table 2**. Where appropriate chemical test data is not available, additional sampling will be undertaken once the material is received at site.

Imported soil material will either be quarantined in a temporary storage area where its use will await confirmation of chemical test data or it will be placed directly into the final place of use. Soils may need to be removed from site if the chemical test data shows it

is not suitable. Any imported soils will be clearly labelled as awaiting clearance until suitable data confirms its acceptance.

Material arriving at the site will be visually assessed for suitability before it is either placed in quarantine or directly in the final location.

Table 2: Sampling and testing requirements

	Number of samples	Testing schedule
Site derived soils		
Topsoil	No topsoil present on site that is considered suitable for use.	
Natural soil	To be used as subsoil in soft landscaping areas. 1 sample per 15m ³ .	Speciated PAH-16MS, TPHCWG (spec.TPH), pH, As, Cd, Cr, Cu, Hg, Pb, Ni, Se, Zn, Total Sulphate, ws Sulphate, asbestos fibre screen.
Imported cover soil		
Greenfield soils	Minimum 3 samples, or 1 sample per 20m ³ (whichever is the greater)	Speciated PAH-16MS, TPHCWG (spec.TPH), pH, As, Cd, Cr, Cu, Hg, Pb, Ni, Se, Zn, Total Sulphate, ws Sulphate
Brownfield /screened soils	Minimum 3 samples or 1 sample per 20m ³ (whichever is the greater)	Speciated PAH-16MS, TPHCWG (spec.TPH), pH, As, Cd, Cr, Cu, Hg, Pb, Ni, Se, Zn, Total Sulphate, ws Sulphate, asbestos in soil and any additional analysis depending on the history of the donor site

6.2.4 Chemical validation criteria

Imported and/or site-derived soils destined for use as part of a simple soil cover system will be scheduled for chemical testing in accordance with the determinants listed in **Table 2**, and their suitability assessed by comparison of the chemical data with RSK's generic assessment criteria (GAC) for human health (residential without home grown produce). A copy of the GAC are presented in Appendix J of the previous RSK report of January 2016.

Where asbestos in soil analysis is undertaken, materials will only be deemed suitable for use as part of a simple cover system should no visible pieces ACM be identified and asbestos fibres below the laboratory detection limit of 0.001% are recorded.

6.2.5 Physical validation of cover soil thickness

A clean cover horizon should be included through the area of soft landscaping.

A 450mm clean cover horizon will be required with a geotextile membrane placed at the base of the cover layer (to be approved by the Environmental Consultant) to mark the presence of potentially contaminated soils beneath. The cover layer will need to include a minimum of 150mm of certified clean topsoil, which may be required to extend to a greater depth (at the discretion of the landscape architect) where planting beds or shrubs/tree pits are to be included.

Should natural ground be encountered in areas of proposed soft landscaping then, subject to chemical validation of the proposed formation soils, the capping thickness can be reduced to permit the placement of a minimum of 150mm of topsoil.

All imported material should be from a known source, preferably 'Greenfield' or from a reputable source with haulage certification provided to confirm collection and delivery addresses. Before importing to site, the materials should be provided with a current certificate of analyses with concentrations of analytes not exceeding the limits given in **Appendix B, Table A**. This should be confirmed by the Environmental Consultant who will then liaise with the local authority to confirm suitability. Validation should be carried out by the Environmental Consultant who will provide a validation report to include details of the capping thickness, photographs with clear depth indication including the presence of the membrane, nature of the capping materials and provide appropriate certification of imported materials. Validation testing of the materials must be carried out irrespective of the source. In-situ sampling and testing must be carried out at a frequency of at least one sample per 20m³ with each sample obtained from no deeper than 0.5m depth. Testing must include the full analytical suite set out in **Appendix B, Table A**.

A validation report should be prepared for inclusion in the Verification Report.

6.2.6 Above ground fuel tank

There is an above ground fuel tank located internally. This will need to be decommissioned by a suitably qualified contractor and certified by them that work has been carried out in accordance with current best practise. Following this the tank can then be removed from site to a specialist waste transfer centre for recycling. Duty of Care documentation must be obtained by the groundworkers for inclusion in the Verification report.

Following removal, an Environmental Consultant should undertake an inspection of the soils beneath the tank location including carrying out screening of soils for potential hydrocarbons using a portable photo-ionizer detector (PID). Should impacted soils be identified, these should be removed to a dedicated skip for offsite disposal. Laboratory testing including WAC testing will be required to provide information for waste disposal.

Validation of the remaining soils is required to demonstrate no remaining unacceptable risk from hydrocarbons.

A validation report should be prepared for inclusion in the Verification report.

6.2.7 Material of a Suspect Nature and Discovery Strategy

It is possible that during the earthworks phase, different conditions from those revealed by the site investigation might be encountered that may require remedial works.

Where unexpected contamination or potentially suspect materials are encountered, the contractor shall immediately inform the Environmental Consultant who shall then carry out an inspection as soon as is reasonably practical. During or immediately following the inspection, the Environmental Consultant shall consult with the local authority to agree a remedial strategy.

A record of unforeseen ground conditions, including where contamination is to remain in-situ, will be included in the Verification Report along with details of remedial works undertaken, where relevant.

6.2.8 Verification Report

A verification report must be produced by the Environmental Consultant following completion of the earthworks phase of the development. The purpose of this is to demonstrate that work has been carried out in accordance with the RAP and is therefore suitable for its intended end-use.

The Verification Report should include the following elements:

1. Validation report relating to the decommissioning of the above ground fuel tank (**Section 6.2.6**);
2. A record of any unforeseen contamination encountered including details of remedial works and validation undertaken (**Section 6.2.7**);
3. Validation of soft landscaping area including a record of imported topsoil and subsoil(**Section 6.2.5**); and
4. A record of waste removal (**Sections 7.3 and 7.4**).

A copy of the report should be forwarded to the local authority for approval and for discharge of any planning condition.

7 CONSTRAINTS AND OTHER COMMENTS

7.1 Potential constraints

It is not anticipated that there will be any significant constraints to the requirements of this remediation action plan during construction. Where appropriate, the storage of material will need to be carefully considered, to ensure that there is no mixing of made ground materials with natural materials.

Careful consideration will need to be given to bulk removal of waste materials.

7.2 Unanticipated contamination

The contractor's staff/operatives will be notified of the potential presence of asbestos-containing materials on-site as part of inductions to ground workers and plant operatives via Toolbox talks.

It is possible that small localised pockets of contamination may be located within the site that have not been identified by the intrusive site works given the former use of the site particularly beneath the footprint of existing structures that have not been assessed. In the event that unexpected horizons of contaminated soils are identified during excavation works, the contractor will inform the site manager and/or contact the environmental consultant immediately. Work will be postponed in the area of discovery with the work area cordoned off. The soils will be inspected, sampled and analysed to assess the potential risks. The environmental consultant will document any potential findings and inform the Local Authority environmental health officer to agree any measures not already defined within the remediation action plan.

7.3 Bulk waste

Bulk waste materials currently present within existing structures including the basement will require offsite disposal. A specialist waste contractor should be employed to segregate material for recycling and for disposal.

There is the potential for hazardous waste to be present i.e. amongst others, asbestos containing materials, paints/solvents etc. Waste consignment notes should be retained by the appointed contractor to be included in the Verification Report.

7.4 Bulk earthworks

The proposed development includes a single storey part basement for car parking including a plant room. Construction will require bulk removal of made ground and natural soils, predominantly sands and gravels.

Dust suppression and air monitoring including wheel washing will need to be considered to mitigate any unacceptable risks to site operatives and off site receptors.

Soil and other materials that are found not to be hazardous may be classified as either non-hazardous or inert. In order to determine whether they can be classed as inert, the soil must be tested and found to be below the inert waste acceptance criteria (WAC).

Waste consignment notes should be retained by the appointed contractor to be included in the Verification Report.

7.5 Vehicle Movements

Given the site setting and requirement for offsite disposal of waste materials, a “Construction Logistics Plan” is likely to be a requirement of planning.

The plan will need to typically demonstrate, amongst others, the following:

1. How construction traffic (Including all delivery vehicles) can safely access the site.
2. How the potential for conflicts between construction traffic and normal traffic on the adjacent public highway network can be mitigated.
3. Routeing arrangements for all deliveries.
4. Hours of operation and any restrictions on times for deliveries.
5. Details of any holding area, turning area, haulage yards and compounds etc.
6. Details in relation to any service diversions, service protection measures etc.

8 REMEDIATION REQUIREMENTS TO BE INCORPORATED INTO DEVELOPMENT

These requirements will be implemented within the development, brought to the attention of the development team and where appropriate incorporated into contractual requirements for the relevant building contractors/subcontractors engaged in the development.

8.1 Engineering issues

Specification of compaction and materials classification requirements are outside the scope of this remediation action plan. However it should be noted that materials selected (be it from re-use of materials on site or imported to site) should be geotechnically suitable, and be backfilled and compacted in accordance with the design requirements, taking into account the needs of the proposed foundation solution, and requirements for minimum CBR values at the locations of car parks and roadways.

Foundation design shall need to take into account the nature of the soils and potential for residual contamination to remain beneath the site.

8.2 Ground gas ingress preventative measures

The site has been categorised with a risk classification of CS1 and therefore, gas protection measures are not considered necessary.

8.3 Cover for soft-landscaping

- Where encountered on other parts of the site during construction works, unsuitable made ground may also need to be removed (e.g. concrete obstructions, old basement structure, drainage etc); and,
- If made ground is encountered that is observed to be contaminated, it may be necessary to suspend works while a suitable approach is determined by the environmental consultant.

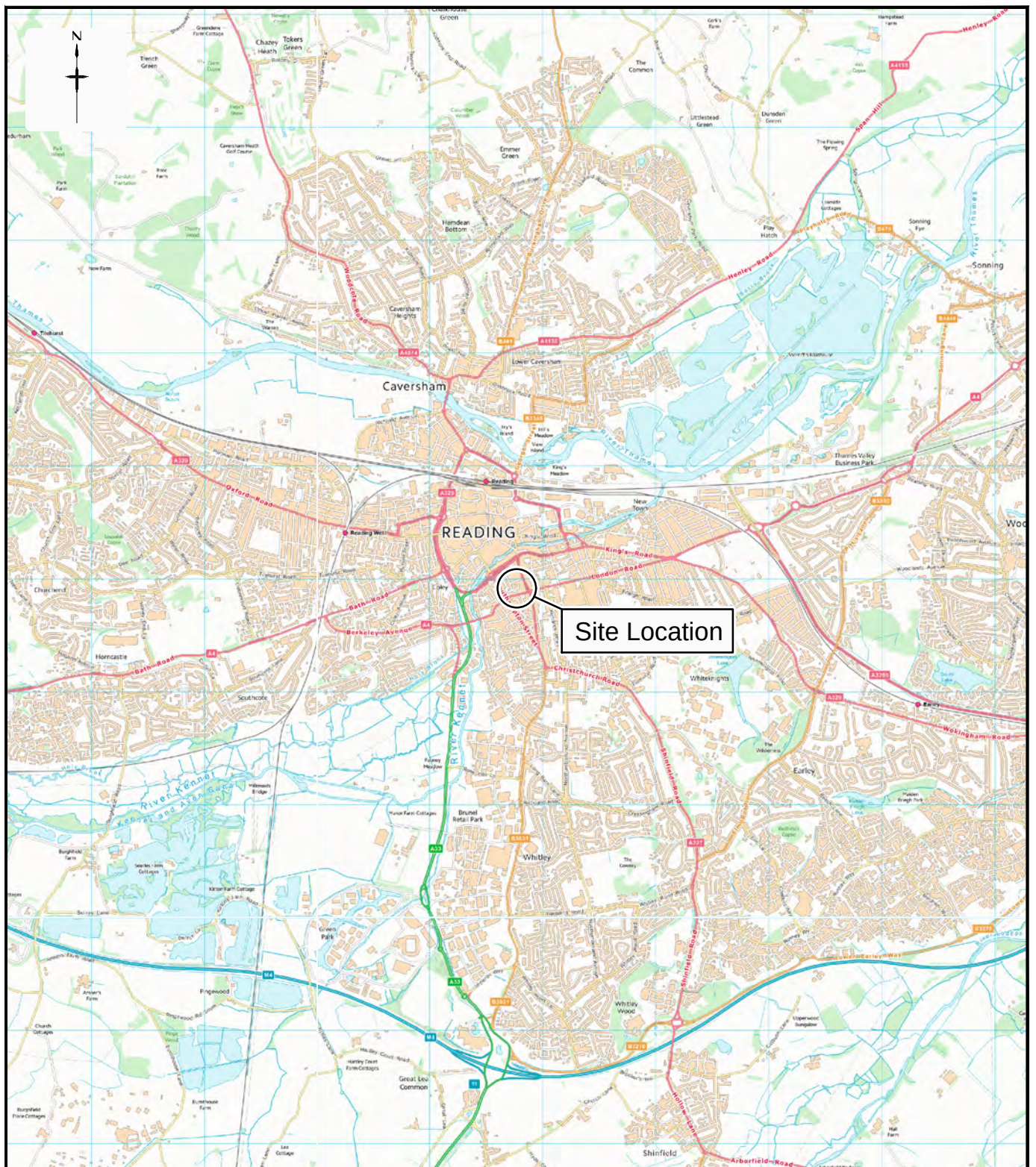
8.4 Water supply pipes

Although it is not anticipated that specialist water supply pipes will be required for this scheme, it should be noted that the local water company will need to be consulted once final routes for water supply pipes have been determined. If the assessment undertaken by RSK (report reference 28957-R01 (00)) is insufficient to fulfil their requirements, additional site investigation work may be requested.

9 REFERENCES

1. BRE, 2004. Cover Systems for Land Regeneration: Thickness design of cover systems for contaminated land. Building Research Establishment, 2004.
2. BS3882: 2007. Specification for topsoil and requirements for use. British Standards Institute, 2007.
3. DEFRA and the Environment Agency, 2004. Model Procedures for the Management of Land Contamination. Contaminated Land Report 11 (CLR 11). Published by DEFRA and the Environment Agency, September 2004.
4. Environment Agency and National Groundwater and Contaminated Land Centre (no date). Decommissioning of Redundant Boreholes and Wells.
5. RSK Environment Limited. Geo-environmental Assessment: Crown Street, Reading, report reference 28957-R01 (00), January 2017.

FIGURES



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18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT
United Kingdom

Tel: +44 (0) 1442 437500
Fax: +44 (0) 1442 437550
Email: info@rsk.co.uk
Web: www.rsk.co.uk

Client

THOMAS HOMES LTD

Project Title

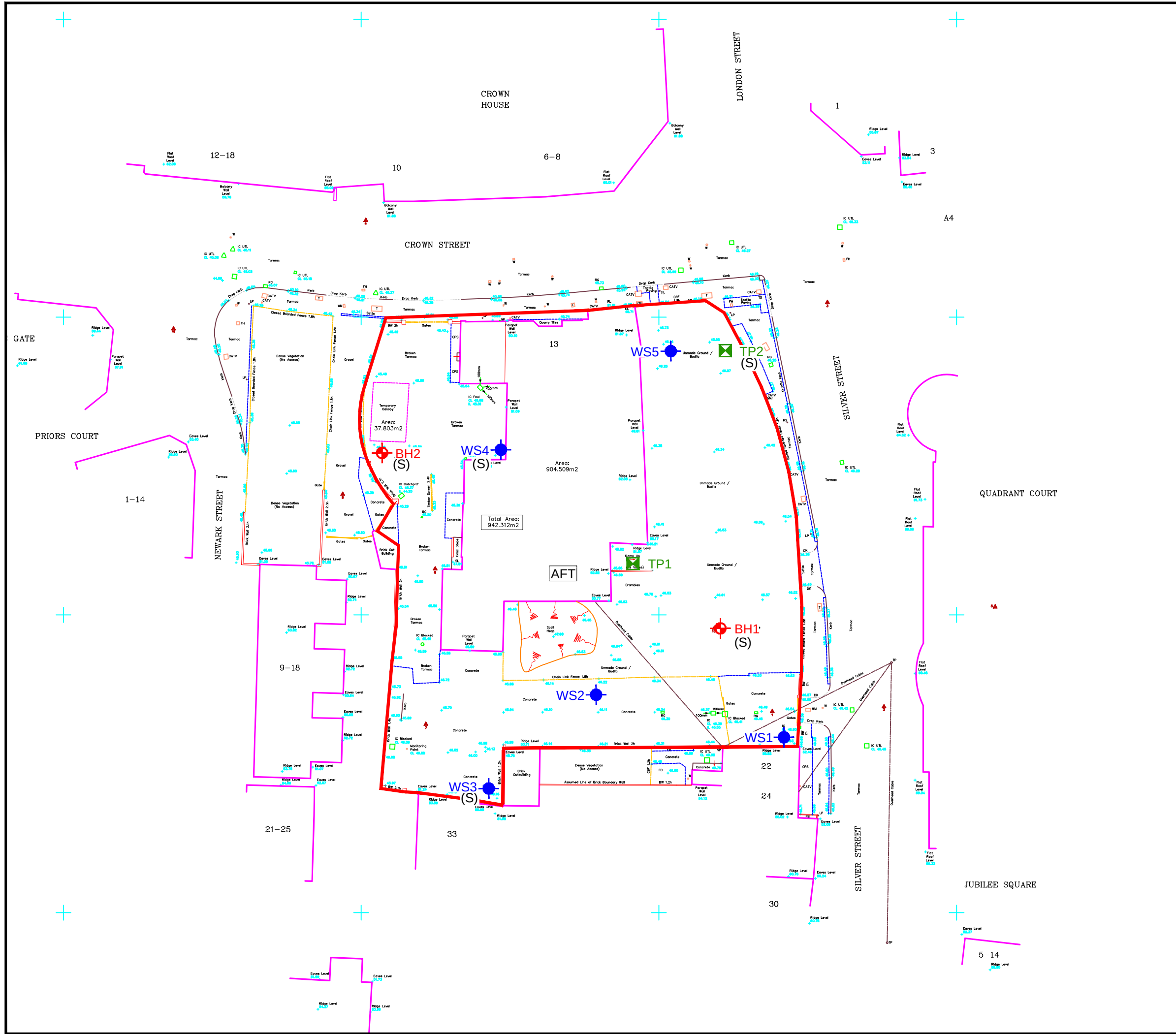
CROWN STREET,
READING

Drawing Title

SITE LOCATION PLAN

Rev	Drawn	Date	Checked	Date	Approved	Date
01	AP	23.03.17	JT	23.03.17	JRP	23.03.17
Dimensions		Scale		Original Size		
m		1:50,000		A4		

Project Number	Drawing File	Drawing Number
28957 - R02 (01)	28957 - SLP.dwg	FIGURE 1



LEGEND

- Approximate Site Boundary
- Borehole Location
- Drive-in Sample Location
- Trial Pit Location
- (S) Standpipe Locations
- AFT Approximate Location of an Above Ground Fuel Tank

Rev.	Date	Amendment	Drawn	Chkd.	Appd.

18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT
United Kingdom

Tel: +44 (0) 1442 437500
Fax: +44 (0) 1442 437550
Email: info@rsk.co.uk
Web: www.rsk.co.uk

Client

THOMAS HOMES

Project Title

CROWN STREET, READING

Drawing Title

EXPLORATORY HOLE LOCATION PLAN

Drawn	Date	Checked	Date	Approved	Date
ASC	03.05.17	JRP	03.05.17	JRP	03.05.17
Scale	Orig Size	Dimensions			
1:500	A3	m			

Project No.	Drawing File
28957 - R02 (01)	28957 (R02-00) Fig 2.dwg
Drawing No.	Rev.
FIGURE 2	P1

Scale

0 5 10 15 20 25m



LEGEND

- Approximate Site Boundary
- Borehole Location
- Drive-in Sample Location
- Trial Pit Location
- (S) Standpipe Locations

Rev.	Date	Amendment	Drawn	Chkd.	Appd.

RSK

18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT
United Kingdom

Tel: +44 (0) 1442 437500
Fax: +44 (0) 1442 437550
Email: info@rsk.co.uk
Web: www.rsk.co.uk

Client
THOMAS HOMES LTD

Project Title
CROWN STREET, READING

Drawing Title
PROPOSED DEVELOPMENT PLAN

Drawn	Date	Checked	Date	Approved	Date
AP	16.15.17	JRP	16.15.17	JRP	16.15.17

Scale	Orig Size	Dimensions
1:400	A3	m

Project No.	Drawing File
28957 - R02 (01)	28957 (R02-00) Fig 3.dwg

Drawing No.	Rev.
FIGURE 3	P1

Scale 1 : 400
0 5 10 15 20 25 30m



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 Thomas Homes Ltd (the "Client") in accordance with the terms of a contract 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, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a walk-over survey 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. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and 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 borehole and soil vapour locations based on the 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 soil and groundwater conditions, together with the position of any current structures and underground 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 (boreholes, trial pits 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

SOIL CONTAMINATION OBJECTIVES

Table A: Soil contamination objectives for imported material

General Suite of Determinands	Mean Concentration not Exceeding (mg/kg)	Rational
Arsenic	37	RSK GAC adopted for the protection of human health (with home grown produce)
Cadmium	30	RSK GAC adopted for the protection of human health (with home grown produce)
Chromium (VI)	21	RSK GAC adopted for the protection of human health (with home grown produce)
Lead	200	RSK GAC adopted for the protection of human health (with home grown produce)
Total Mercury	1	Soil Code (1998) adopted for potential phytotoxic effects
Selenium	258	RSK GAC adopted for the protection of human health (with home grown produce)
Copper	200	Soil Code (1998) adopted for potential phytotoxic effects
Nickel	110	Soil Code (1998) adopted for potential phytotoxic effects
Zinc	300	Soil Code (1998) adopted for potential phytotoxic effects
pH value	>pH5	Conservative value
Asbestos	None	Conservative value
TPH with column clean up ^{*1}	100	Conservative trigger value adopted for the protection of human health
Semi Volatile Organic Compounds (1% SOM)		
Phenols (total)	180	RSK GAC adopted for the protection of human health (with home grown produce)
Acenaphthene	230	RSK GAC adopted for the protection of human health (with home grown produce)

General Suite of Determinands	Mean Concentration not Exceeding (mg/kg)	Rational
Acenaphthylene	180	RSK GAC adopted for the protection of human health (with home grown produce)
Benzo(a)anthracene	7	RSK GAC adopted for the protection of human health (with home grown produce)
Chrysene	15	RSK GAC adopted for the protection of human health (with home grown produce)
Fluoranthene	280	RSK GAC adopted for the protection of human health (with home grown produce)
Fluorene	170	RSK GAC adopted for the protection of human health (with home grown produce)
Phenanthrene	100	RSK GAC adopted for the protection of human health (with home grown produce)
Naphthalene	13	RSK GAC adopted for the protection of human health (with home grown produce)
Benzo-a-pyrene	5	RSK GAC adopted for the protection of human health (with home grown produce)
Dibenzo(a,h)anthracene	0.25	RSK GAC adopted for the protection of human health (with home grown produce)
Indeno(1,2,3-cd)pyrene	27	RSK GAC adopted for the protection of human health (with home grown produce)