



Ground Condition Consultants

**BELMONT CASTLE CARE/REST HOME, PORTSDOWN HILL ROAD, HAVANT,
PO9 3JY**

REMEDIATION STRATEGY

JULY 2025

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0. EXECUTIVE SUMMARY

Brief	Ground Condition Consultants Ltd. (GCC) was commissioned by Birchmere Ltd in May 2025 to prepare a Remediation Strategy for a known as Belmont Castle Care/Rest Home off Portsdown Hill Road, Havant, PO9 3JY.
Current Site Status	The site is located at Belmont Castle Care/Rest Home off Portsdown Hill Road, Havant, PO9 3JY. The site/area proposed for the development is located to the rear (north) of the existing care/rest home building on-site and is currently undeveloped and forms part of the extended garden area of the existing care/rest home. The area is sloping down towards the north and there are numerous semi-mature/mature trees and shrubs present.
Site History	Historical map extracts reviewed (1866-2025) indicate that the existing property, Belmont Castle, associated ancillary buildings and potential orchard/plantation have been present on site since at least 1866. A wooded depression is also noted in the centre west of the site. A possible chalk pit depression is shown within the western site boundary on the 1960 and 1969 extracts, which is not evident on the 1973 or later extracts and was shown as a wooded area on earlier maps. The original building on the site was extended to the north during the 1990s, to form the current building layout.
Geology	Reference to the British Geological Survey (BGS) Map indicates the southern part (majority) of the site to directly overlie the bedrock geology of the Portsdown Chalk Formation. Superficial Head Deposits (clay, silt, sand and gravel) are shown to be present in the northern part of site, overlying the bedrock geology of the Portsdown Chalk Formation. Previous archaeology works were undertaken in the area of the proposed new building in 2015 and recorded c. 2.20m of variable made ground in the west of the study area. The Made Ground appears to broadly correlate with the possible former chalk pit depression features shown on the map extracts from the 1960s.
Hydrogeology	The Environment Agency Groundwater Vulnerability Map extracts indicate the northern part of the site to be underlain by a superficial Undifferentiated Secondary Aquifer, interpreted as the Head Deposits over a bedrock Principal Aquifer, interpreted as the Portsdown Chalk Formation. The southern part of the site is shown to be directly underlain by a bedrock Principal Aquifer, interpreted as the Portsdown Chalk Formation. The site is located within Groundwater Source Protection Zone – Inner Zone.
Hydrology	The nearest identified surface water feature is an unnamed inland river, located approximately 100m to the north.
Contamination Risks	The conceptual model, based on information obtained as part of the preliminary risk assessment and intrusive ground investigation, identified the following potential contaminant sources: - Asbestos within the Made Ground associated with fill material in the former chalk pit. - Ground gas generation potential of Made Ground associated with fill material in the former chalk pit. It should be noted that additional sources of contamination may become apparent during any future investigation and development of the site. The risks of impact to the proposed development from soil contamination have therefore been assessed to be low/moderate if the asbestos contaminated soil remains at ground surface level in areas of soft landscaping. Where buildings and hard standing are to be placed over the Made Ground or the Made Ground is to be removed, this is considered sufficient to break the pollutant linkage by breaking the exposure pathway between the asbestos impacted Made Ground and the site users.

	Vigilance by the groundworks contractor for asbestos containing material is recommended throughout the development with a discovery strategy in place should any asbestos containing material be encountered. It is good practice for visible suspected asbestos containing materials to be removed from the soil where encountered, even in areas that are to be covered by hard standing, to minimise the overall quantity of asbestos in the ground. The risks from asbestos in Made Ground will need to be mitigated with measures such as source removal and engineered cover system in the soft landscaped areas. The risks to the future site users have therefore been assessed to be low but the current data indicate that a CS2 gas regime should be adopted, with associated ground gas protection measures. However, a programme of ground gas monitoring may indicate that the gas generation of the material has predominantly ceased, potentially reducing the gas regime classification to CS1, not requiring ground gas protection measures.
Remediation Strategy	The most appropriate remedial option for the areas where residual Made Ground is present is considered to be the placement of an engineered cover system in areas of soft landscaping. Hard covered areas, such as beneath buildings, roads, parking areas etc, are not considered to require any additional cover measures. Clean corridors for services through Made Ground, lined with geotextile membrane, will also be required. Where Made Ground is thinner than the proposed cover system, source removal of the Made Ground would become the default remedial solution in these areas. Visible suspected asbestos containing material in soil should be removed and disposed of separately as hazardous waste, where practical and safe to do so, to reduce the quantity of asbestos in excavated and retained Made Ground. CS2 ground gas protection measures are to be installed in the proposed building, unless further monitoring can demonstrate that a CS1 gas regime is more appropriate.
Verification Plan	<u>Cover System</u> An essential element of the performance of a cover system is assurance that it has been installed in accordance with the design. Consequently, the installation of the cover system will be verified upon completion. This will involve two components. The first component is to confirm that a sufficient cover thickness has been installed. The second component is to sample the imported cover material delivered to site to confirm that the cover material delivered and placed on site is chemically suitable for use. <u>Imported Soil Quality</u> Any imported soil brought to site is to be inspected on arrival and any soil deliveries with more than trace amounts of man-made materials is to be rejected and returned to the supplier. It is recommended that the supplier is warned of this before dispatching the soil to prevent unsuitable soil being delivered to site. <u>Ground Gas</u> Independent verification of the installation of the ground gas membrane in the proposed buildings will be required and a separate verification report will be produced for this.
<i>This sheet is intended to provide a summary only of the initial indicative assessment study of the Site in relation to ground contamination. It does not provide a definitive engineering analysis for the purposes of costing or construction, and is subject to the limitation of the agreed brief.</i>	

1. INTRODUCTION

1.1 INSTRUCTION

Ground Condition Consultants Ltd. (GCC) was commissioned by Aria Care in July 2025 to prepare a Remediation Strategy for a site known as Belmont Castle Care/Rest Home, Portsdown Hill Road, Havant, PO9 3JY.

This report should be read in conjunction with the GCC Ltd Ground Condition Assessment Report (Ref: J25-038-R02 V2, dated July 2025).

This report is prepared in line with the agreed brief and is subject to the report conditions shown in Appendix 1.

1.2 LEGAL CONTEXT

Part IIA of the Environmental Protection Act 1990 (inserted by Section 57 of the Environment Act 1995) provides a regime for the control of specific threats to health or the environment from land contamination. In accordance with the Act and the statutory guidance document 'The Contaminated Land (England) Regulations 2000', the definition of contaminated land is intended to embody the concept of risk assessment. Within the meaning of the Act, land is only "contaminated land" where it appears to the Regulatory Authority, by reason of substances within or under the land, that:

- Significant harm is being caused, or there is a significant possibility of such harm being caused; or
- Pollution of controlled waters is being, or is likely to be, caused."

Inherent in this definition is the requirement for contamination risk assessment to be undertaken on a site specific basis, as the potential for harm is determined by the site's end use and its specific environmental setting.

The guidance defines "risk" as the combination of:

- The probability, or frequency, of occurrence of a defined hazard (for example, exposure of a property to a substance with the potential to cause harm); and
- The magnitude (including the seriousness) of the consequences.

While Part IIA of the Environmental Protection Act provides a risk based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment, the regime does not take into account future uses. New developments are therefore controlled by the planning regime, with reference to the National Planning Policy Framework (NPPF), rather than directly by Part IIA of the Environmental Protection Act.

The NPPF is based on the principal that the site should be suitable for its new use, taking account of ground conditions, including from natural hazards or former activities and states that “Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner”. The NPPF also links the planning and Part IIA regimes by stating that “after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990”. Key components of the Part IIA regime, such as the definition of Contaminated Land and the associated risk based assessment approach, are therefore considered to also be applicable to the planning regime.

1.3 METHODOLOGY

This report has been prepared in accordance with published Environment Agency guidance (‘Land Contamination Risk Management (LCRM)’). LCRM provides the technical framework for structured decision making about land contamination and builds on previous work carried out under the Contaminated Land Research Programme (of the former Department of the Environment) and the Model Procedures for the Management of Land Contamination – Contaminated Land Report (CLR) 11. LCRM has adopted and refined the well recognised methodology and terminology that has been used in contaminated land risk assessment for a number of years.

1.3.1. Pollutant linkage concept

In the context of land contamination, there are three essential elements to any risk:

- A **contaminant source** – a substance that is in, on or under the land and has the potential to cause harm or to cause pollution of controlled waters.
- A **receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body.
- A **pathway** – a route or means by which a receptor can be exposed to, or affected by, a contaminant.

Each of these elements can exist independently, but they create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of contaminant–pathway–receptor is described as a pollutant linkage.

1.3.2. Conceptual model

An important thread throughout the overall process of risk assessment is the need to formulate and develop a **conceptual model** for the site, which supports the identification and assessment of pollutant linkages. A conceptual model represents the characteristics of the site in diagrammatic or written form that shows the possible relationships between contaminants, pathways and receptors (pollutant linkages).

1.4 PROPOSED USE

It is currently understood that a new/separate building comprising a care/rest home and associated landscaped areas, is proposed for the site. It is further understood that the new building would be partially cut into the existing slope.

1.5 REPORT SCOPE AND LIMITATIONS

This report is based upon a review of the GCC Ground Condition Assessment Report, dated July 2025, and the data presented within it. The assessment is based on the proposed use stated in Section 1.4 and the outcomes of this assessment could change if the end uses change.

The information contained in this report is intended for the use of Aria Care. GCC can take no responsibility for the use of this information by any other party or for uses other than that described in this report.

2. RISK ASSESSMENT

2.1 SITE LOCATION AND DESCRIPTION

The site is located at Belmont Castle Care/Rest Home off Portsdown Hill Road, Havant, PO9 3JY. The site/area proposed for the development is located to the rear (north) of the existing care/rest home building on-site and is currently undeveloped and forms part of the extended garden area of the existing care/rest home. The area is sloping down towards the north and there are numerous semi-mature/mature trees and shrubs present.

Access into the site is from Portsdown Road, which forms the southern site boundary. An electric sub-station is located along Portsdown Road, close to the entrance to the site. Residential dwellings are located across Portsdown Road. A residential dwelling is located to the immediate west of the site. A combined swim school (Tiny Tots) and residential dwelling is located to the immediate east of the site. An area of woodland is located to the north of the site.

2.2 SITE HISTORY

Historical map extracts reviewed (1866-2025) indicate that the existing property, Belmont Castle, associated ancillary buildings and potential orchard/plantation have been present on site since at least 1866. A wooded depression is also noted in the centre west of the site. The 1868 map shows a road defining the southern boundary of the site and two structures just outside of the southwest boundary of the site. The remainder of the site is bound by fields. Several chalk pits are recorded within 100m metres of the site and Belmont Coppice is shown 100m to the north.

The site and surrounding area remain predominantly the same until the 1907 extracts show new residential dwellings to the east of the site, with associated roads, and a school. From 1930 to 1975 the extracts show a steady increase in the urbanisation and infrastructure of the surrounding area. A possible chalk pit depression is shown within the western site boundary on the 1960 and 1969 extracts, which is not evident on the 1973 or later extracts and was shown as a wooded area on earlier maps. Later maps show little change to the site and the immediate surroundings until the 1975 extract, which shows the A3 road running close to the east boundary running in a north south direction. The original building on the site was extended to the north during the 1990s, to form the current building layout. No significant changes are shown on later map extracts.

The Groundsure report makes reference to historical tanks on the site, although these are not apparent from a review of the available historical maps.

2.3 DOCUMENTATED GROUND CONDITIONS

Ground conditions recorded in readily available sources are summarised below.

2.3.1. Geology

Reference to the British Geological Survey (BGS) Map extracts (see Desk Top Study) indicates the southern part (majority) of the site to directly overlie the bedrock geology of the Portsdown Chalk Formation. Superficial Head Deposits (clay, silt, sand and gravel) are shown to be present in the northern part of site, overlying the bedrock geology of the Portsdown Chalk Formation.

Previous archaeology works were undertaken in the area of the proposed new building in 2015 and recorded a simple deposit sequence of a thin topsoil overlying subsoil contacting directly to upper bedrock chalk in the east of the study area and c. 2.20m deep sequence consisting of variable made ground in the west of the study area. The Made Ground appears to broadly correlate with the possible former chalk pit depression features shown on the map extracts from the 1960s.

2.3.2. Hydrogeology

The Environment Agency Groundwater Vulnerability Map extracts (see Desk Top Study) indicate the northern part of the site to be underlain by a superficial Undifferentiated Secondary Aquifer, interpreted as the Head Deposits over a bedrock Principal Aquifer, interpreted as the Portsdown Chalk Formation.

The southern part of the site is shown to be directly underlain by a bedrock Principal Aquifer, interpreted as the Portsdown Chalk Formation.

Secondary Undifferentiated Aquifers are assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non aquifer in different locations due to the variable characteristics of the rock type.

Principal Aquifers are geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers.

The site is located within Groundwater Source Protection Zone – Inner Zone.

A BGS regional hydrogeology map from 1977 indicates that groundwater in the Chalk aquifer is approximately 0m to -50m AOD.

2.3.3. Hydrology

The nearest identified surface water feature is an unnamed inland river, located approximately 100m to the north.

2.4 MINING AND NATURAL GROUND HAZARDS

2.4.1. Mining

The site is located in an area where underground chalk mine workings are uncommon, although the geology is similar to that worked elsewhere. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.

However, surface chalk mining is noted to have taken place in the vicinity of the site with a possible chalk pit identified on site on the map extracts from the 1960s. The archaeological investigation from 2015 indicates that this feature may have been infilled with Made Ground.

2.4.2. Natural Ground Hazards

The following ground hazards were identified:

Compressible ground stability hazards – Negligible hazard

BGS Notes: Compressible strata are not thought to occur.

Collapsible ground stability hazards – Very Low hazard

BGS Notes: Deposits with potential to collapse when loaded and saturated are unlikely to be present.

Ground dissolution stability hazards – Negligible to Moderate hazard

BGS Notes: Negligible - Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present. (central part of the site)

BGS Notes: Very Low - Soluble rocks are present within the ground. Few dissolution features are likely to be present. Potential for difficult ground conditions or localised subsidence are at a level where they need not be considered. (southern part of the site)

BGS Notes: Moderate - Soluble rocks are present within the ground. Many dissolution features may be present. Potential for difficult ground conditions are at a level where they should be considered. Potential for subsidence is at a level where it may need to be considered. (northern part of the site)

Natural cavities (solution pipes) have been identified some 293m to the east of the site and correspond to an area near the outcrop boundary between the Lambeth Group and Portsdown Chalk Formation. Similar geology is present in the northern part of the study site.

While the depression shown on site on the historical maps from the 1960s has a similar appearance to the chalk pits shown nearby to the west of the site, the feature is not specifically referenced as such. It is possible that the feature could be the result of dissolution.

Landslide ground stability hazard – Negligible to Low hazard

BGS Notes: Negligible - Slope instability problems are not thought to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered. (associated with the southern majority of the site, directly overlying Chalk)

BGS Notes: Low - Slope instability problems may be present or anticipated. Site investigation should consider specifically the slope stability of the site. (associated with the northern part of the site, overlying Head Deposits)

Shrinking or swelling clay ground stability hazard – Negligible to Very Low hazard

BGS Notes: Negligible - Ground conditions predominantly non-plastic (associated with the southern majority of the site, directly overlying Chalk).

BGS Notes: Very Low - Ground conditions predominantly low plasticity. (associated with the northern part of the site, overlying Head Deposits).

Running sand ground stability hazards – Negligible to Very Low hazard

BGS Notes: Very Low - Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly (associated with the northern part of the site, overlying Head Deposits)

BGS Notes: Negligible - Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions. (associated with the southern majority of the site, directly overlying Chalk)

2.5 DEPARTMENT OF ENVIRONMENT – INDUSTRY PROFILES

The Department of the Environment Industry Profiles do not cover the previous or existing site uses of the site.

2.6 UNEXPLODED ORDNANCE

A Zetica UXO Unexploded Bomb (UXB) Risk Map was obtained for the site and is presented in the Desk Top Study. This map indicates the site to be of Moderate risk of potential UXBs to be present following World War Two (WWII) bombing, due to the sites location within an area of moderate density bombing. Zetica UXO typically recommend that a detailed UXO desk study and risk assessment is undertaken for sites in an area with a moderate or high bombing density.

2.7 GROUND CONDITIONS ENCOUNTERED

Ground conditions encountered during the site investigation were in agreement with those presented on the BGS maps and comprised Topsoil and Made Ground, overlying the Portsdown Chalk Formation. Variations in strata thickness are summarised in Table 2.1 and engineering logs are presented in the Ground Condition Assessment.

Table 2.1. Summary of encountered ground conditions

Location	Topsoil		Made Ground		Portsdown Chalk Formation	
	From (mbgl)	Thickness (m)	From (mbgl)	Thickness (m)	From (mbgl)	Thickness (m)
WS101	GL	0.40	N/E		0.40	>2.60
WS102	GL	0.40	0.40	7.50	7.90	>0.60
WS103	GL	0.40	0.40	1.60	2.00	>1.90

2.8 CONCLUSIONS OF RISK ASSESSMENT

The conceptual model, based on information obtained as part of the preliminary risk assessment and intrusive ground investigation, identified the following potential contaminant sources:

- Asbestos within the Made Ground associated with fill material in the former chalk pit.
- Ground gas generation potential of Made Ground associated with fill material in the former chalk pit.

It should be noted that additional sources of contamination may become apparent during any future investigation and development of the site.

The risks of impact to the proposed development from soil contamination have therefore been assessed to be **low/moderate** if the potentially contaminated soil remains at ground surface level in areas of soft landscaping.

Where buildings and hard standing are to be placed over the Made Ground or the Made Ground is to be removed, this is considered sufficient to break the pollutant linkage by breaking the exposure pathway between the potentially asbestos impacted Made Ground and the site users.

Vigilance by the groundworks contractor for asbestos containing material is recommended throughout the development with a discovery strategy in place should any asbestos containing material be encountered. It is good practice for visible suspected asbestos containing materials to be removed from the soil where encountered, even in areas that are to be covered by hard standing, to minimise the overall quantity of asbestos in the ground.

In the areas of proposed soft landscaping, the soil would be considered to present a potentially significant risk, requiring remediation, due to the asbestos content. The remediation is likely to take the form of a cover system or removal of the Made Ground/reworked Topsoil to break the pollutant linkage with future users.

The risks to the future site users have therefore been assessed to be low but the current data indicate that a CS2 gas regime should be adopted, with associated ground gas protection measures.

However, a programme of ground gas monitoring may indicate that the gas generation of the material has predominantly ceased, potentially reducing the gas regime classification to CS1, not requiring ground gas protection measures.

3. REMEDIAL OPTIONS APPRAISAL

The primary risk driver on this site is considered to be the presence of asbestos containing materials in the Made Ground across the site.

The following table summarises the benefits of a number of options that have been evaluated during the reporting period. The most appropriate feasible options have been taken forward in the remediation strategy for the site.

The technologies reviewed during the options appraisal have taken into account the pollutant linkages present on site to provide an options summary in Table 3.1.

Table 3.1: Remedial options appraisal

Option	Applicable Contaminants	Advantages	Disadvantages
Barrier Implementation	All – containment rather than elimination	• Relatively cheap • Will allow site remediation to be completed in a reasonable timeframe	• Does not remove source areas and long term potential of risk. • Investor confidence • Affects site levels
Off-Site Disposal	All contaminants of concern	• Quick • Suitable for untreatable contaminants	• High cost • Unsustainable • Traffic impact
Stabilisation/ Solidification	All contaminants of concern	• Is able to stabilise all contaminants of concern	• High cost • Contaminants are not eliminated • Can cause drainage problems due to reduced permeability

As the asbestos in the Made Ground does not present a significant risk to human health when covered by buildings and hard standing, the areas that require mitigation in the context of the proposed development are the areas of soft landscaping. A cover system or source removal are therefore viable options to address the asbestos risks in the areas of proposed soft landscaping as these will break the inhalation pathways of airborne asbestos fibres.

Due to the contaminated Made Ground having been recorded to extend to a maximum depth of 7.9mbgl during the GCC investigation, it is not considered to be cost effective to remove all of the Made Ground in the soft landscaped areas where Made Ground is present, as a remedial solution. However, a certain amount of source removal will be required to construct the proposed building and to be replaced with Topsoil to accommodate the imported soils of the cover system.

Stabilisation and solidification are not considered likely to be viable due to the cost and constraints created by the stabilised material.

Hand picking of visible asbestos containing materials (ACM) and off-site disposal of these materials could be a viable approach for reducing the asbestos content of the Made Ground on site but it is not viable to remove all of the asbestos from the soil, including microscopic fibre bundles and debris, which would leave a residual risk from the soil. The fibre bundles and debris frequently give rise to greater risks than asbestos cement sheet fragments as there can be a greater risk of fibres becoming airborne from the degraded material. While hand picking and off-site disposal of ACM fragments may reduce the risks associated with exposed Made Ground, this is not considered to be a complete remedial solution.

A CS2 gas regime would require ground gas protection measures for the proposed building unless a programme of ground gas monitoring could confirm that a CS1 gas regime is more appropriate.

4. REMEDIATION STRATEGY

4.1 GENERAL

The following Remediation Strategy is intended to address the risks associated with the identified asbestos impacts to the Made Ground in the infilled former chalk pit.

The ground conditions and contamination regime on the site are considered to be sufficiently well understood from the investigation works undertaken to date that a detailed design of the remediation measures for the site can be presented.

4.2 REMEDIATION SOLUTION SELECTION

4.2.1. Asbestos

The primary contamination risk driver for the site is asbestos within the Made Ground. The primary options for remediation of these contaminants are currently an engineered cover system or excavation and off-site disposal.

With regard to sustainability and cost criteria, it is preferable to retain as much material on site as possible and adjust the site levels accordingly. However, it is anticipated that the site levels will require the removal of a substantial amount of Made Ground anyway.

The most appropriate remedial option for the areas where residual Made Ground is present is therefore considered to be the placement of an engineered cover system in areas of soft landscaping as this is a relatively low cost solution that can be integrated with the proposed development works. Hard covered areas, such as beneath buildings, roads, parking areas etc, are not considered to require any additional cover measures. Clean corridors for services through Made Ground, lined with geotextile membrane, will also be required.

Where Made Ground is thinner than the proposed cover system, source removal of the Made Ground would become the default remedial solution in these areas.

4.2.2. Ground Gas

Due to the presence of organic rich Made Ground beneath the site, the CL:AIRE RB17 assessment approach recommends assuming a Characteristic Situation 2 gas regime, requiring ground gas protection measures. Unless subsequent monitoring can confirm a CS 1 gas regime, ground gas protection measures suitable for a Characteristic Situation 2 gas regime will therefore be installed in the proposed buildings. These protection measures are anticipated to comprise a reinforced cast in-situ floor slab and a gas resistant membrane, but will be confirmed on the architectural details.

4.3 COVER SYSTEM DESIGN

The cover system is intended to be placed in areas of soft landscaping where Made Ground remains at the base of the cover system excavation. Where a cover system excavation reaches natural soil prior to the target depth for the cover system excavation, no further remediation is required in these areas. i.e. remediation via source removal will have been considered to have been undertaken.

4.3.1. Guidance

Design guidance is available for simple cover systems, being unimpacted soil placed on contaminated soil, in Cover Systems for Land Regeneration (BRE 465, March 2004). However, due to the potential presence of asbestos containing material (ACM) in the Made Ground across the site, the cover system is to include a geotextile membrane to prevent the migration of ACM fragments to the ground surface and to act as a marker layer for people excavating in the cover material.

The incorporation of a geotextile membrane makes the cover system an engineered system rather than a simple system, such that the calculations used in BRE 465 are no longer applicable. It is also noted that many regulators disapprove of the use of the approach in BRE 465. Reference has therefore also been made to Barriers, Liners and Cover Systems for Containment and Control of Land Contamination (CIRIA Special Publication 124, 1996).

BRE 465 does, however, provide some useful general guidance for cover system thicknesses that can be applied to the design of engineered cover systems. The first point of note is that a literature review undertaken as part of the preparation of BRE 465 determined that excavation depths by residential gardeners will typically not exceed 600mm (two times a standard spade length of 300mm) and that any digging by children or pets is also not likely to exceed 600mm. This dimension is used as the mixing zone in the design calculations for simple cover systems. The second point of note is that BRE 465 recommends that if a cover system is required, it should have a minimum thickness of 300mm.

It is further understood that BS 3882 specifies a minimum rooting depth should be normally, 450mm for grass, 600mm for shrubs and 900 mm for trees. The depth of topsoil spread should not normally exceed 300mm, with suitable subsoil providing the remaining depth.

4.3.2. Main Cover System Design

Therefore, it is proposed that a cover system comprising 600mm of suitable for use topsoil and sub-soil (in proportion to be specified by the landscape designer) is placed over a robust permeable geotextile marker membrane (Terram Hi-Vis or similar) in the area where shrubs are proposed.

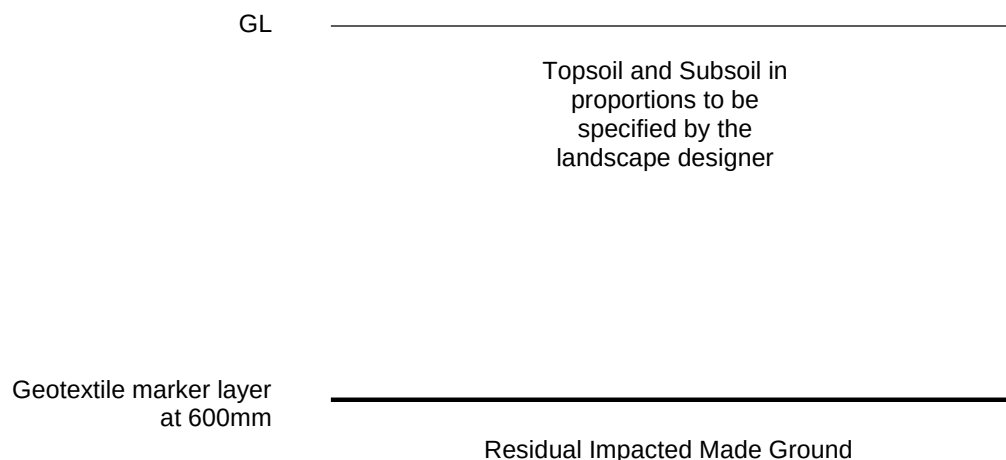
Where excavations into the existing Made Ground are required to create sufficient depth for the cover system to be installed, the geotextile is to be returned up the sides of the excavation to maintain separation between the imported cover material and the adjacent existing Made Ground.

In areas of the proposed soft landscaping where residual Made Ground remains that overlap with the root protection areas (RPAs) of the remaining trees, it is not viable to install a 600mm thick cover system. These areas will therefore be laid to lawn with an underlying make up of 150mm of topsoil over a GR10 grass reinforcement mesh or similar over a permeable geotextile marker membrane (Terram Hi-Vis or similar).

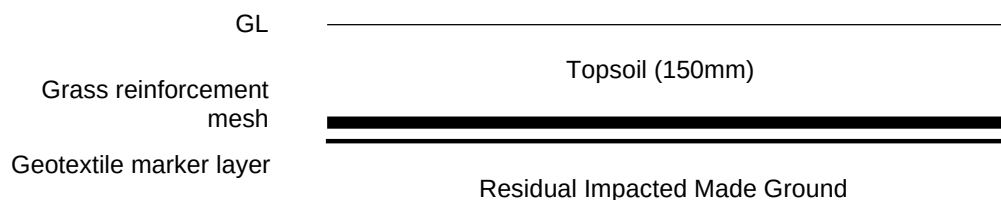
The purpose of the reinforcement mesh is to create a thin permeable layer that will resist excavation and the permeable geotextile marker membrane will prevent soil mixing with the underlying Made Ground.

In areas of proposed lawns, where there is no significant potential for growing shrubs, it is proposed that a cover system comprising 450mm of suitable for use topsoil (150mm) and sub-soil (300mm) is placed over a robust permeable geotextile marker membrane (Terram Hi-Vis or similar).

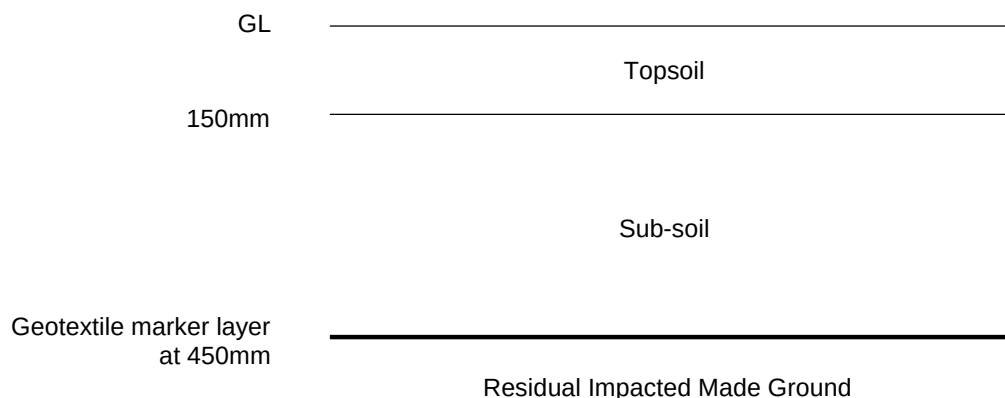
Cover System Diagram for Areas with Shrubs:



RPA Cover System Diagram:



Lawns Cover System Diagram:



4.3.3. Tree Pits

Where tree pits are required, designs are to be proposed by the landscape designers, on the basis of separation of the imported growing medium and any residual contaminated soil, and agreed with the geo-environmental consultant.

4.3.4. Imported Cover Material Quality

For imported cover material to be considered suitable for use at this site, from a human health risk perspective, the contaminant concentrations present within the soil are not to exceed the assessment criteria presented in Appendix 2. Chemical analysis is to be undertaken by a UKAS accredited laboratory and be MCERTS compliant, where possible. **The soil should also be free from asbestos with negligible quantities of metals, plastic, wood, glass, tarmac, paper and odours associated with contaminated soils** and topsoil should also comply with the requirements of BS 3882 – Specification for topsoil and requirements for use. It is noted that where soils are imported from anywhere other than a virgin source, there is a potential for minor quantities of anthropogenic inclusions, but these are to be kept to a minimum.

Any imported soil brought to site is to be inspected on arrival and any soil deliveries with more than trace amounts of man-made materials is to be rejected and returned to the supplier. It is recommended that the supplier is warned of this before dispatching the soil to prevent unsuitable soil being delivered to site.

4.4 PHASING OF REMEDIATION

Source removal works and preparation of the ground levels to accommodate the cover system will form part of the development groundworks.

Placement of cover system membranes and imported soils will be undertaken as part of the landscaping works, towards the completion of the development.

4.5 LONG TERM MONITORING AND MAINTENANCE

The source removal works do not require long term monitoring or maintenance.

The cover system has been designed such that penetration of the cover system is not anticipated as part of ongoing operation and maintenance of the site and associated soft landscaping. Records of the remediation works will be held as part of the Health and Safety file for the new development, for reference during any future redevelopment works.

5. VERIFICATION PLAN

5.1 SOURCE REMOVAL

This approach would be used where excavations to allow for the placement of a cover system remove all of the Made Ground from a particular area of proposed soft landscaping.

Documentation detailing the movement of contaminated soils dispatched from the site will be collated and issued together with the results of confirmatory verification sampling works from completed remediation excavations. The Verification Report will include the following information as a minimum:

- As built drawings (illustrating the extent of remediation and verification works);
- Photographic records;
- The environmental suitability of any retained materials;
- Validation results of the excavations;
- Duty of Care confirmation of any materials removed from site; and
- Discovery strategy findings.

To demonstrate that any remaining material is chemically suitable for the intended commercial end use of the site, verification of soil conditions at the margins of excavation will be required. Verification of the residual conditions will include laboratory sample collection at a frequency not less than:

- 1no sample from the base of the excavation.
- 4no samples from retained soil around the perimeter of the excavation

The soils verification criteria are provided in Appendix 2 although the testing on this site will be focused on asbestos contamination, unless any evidence of other forms of contamination are encountered during the development. These conservative screening criteria have been proposed based on current site knowledge that contamination is in a fairly limited area.

5.2 COVER SYSTEM

An essential element of the performance of a cover system is assurance that it has been installed in accordance with the design. Consequently, the installation of the cover system will be verified upon completion. This will involve two components.

The first component is to confirm that a sufficient cover thickness has been installed and will involve a minimum of two visits by a GCC engineer during the excavation works and on completion of the placement of the cover system to excavate through the cover in a number of locations to ensure a sufficient sub-soil and topsoil thickness has been placed. Evidence of level survey data before and after the placement of the cover system may also be used to verify the cover thickness.

The second component is to sample the imported cover material delivered to site to confirm that the cover material delivered and placed on site is chemically consistent with the material sampled by the supplier and to provide a baseline contamination status of the areas of soft landscaping prior to occupancy of the development to enable comparison to any possible future investigation of the site. The imported soil should be **free from asbestos with negligible metals, plastic, wood, glass, tarmac, paper and odours associated with contaminated soils** and topsoil should also comply with the requirements of BS 3882:2007 – Specification for topsoil and requirements for use.

Any imported soil brought to site is to be inspected on arrival and any soil deliveries with more than trace amounts of man-made materials is to be rejected and returned to the supplier. It is recommended that the supplier is warned of this before dispatching the soil to prevent unsuitable soil being delivered to site.

A sampling frequency of 1 sample per 40 m³ is required where the soils are from a natural source. A minimum of 3 samples are required for each soil type imported (topsoil, subsoil etc). For recycled or manufactured topsoil, or where the source of the soil is unknown, a sampling frequency of 1 sample per 20 m³ is required. Again a minimum of 3 samples are required.

All soil samples are to be analysed for the suite of contaminants identified in Appendix 2 and are to be analysed by a UKAS accredited laboratory and be MCERTS compliant, where possible.

The results of these verification procedures will be reported in a verification report following completion of the installation of the cover system. This verification report will also contain copies of the chemical analysis results for the imported cover material and an assessment of these results against the adopted assessment criteria to verify that the material is suitable for the proposed use.

The final verification report should be a slim report that includes:

- The plan of soft landscaping, annotated with the as built cover depths and membrane details.

- The original chemical test certificates of the imported soil provided by the supplier.
- Transfer notes showing the source and quantity of the imported soil.
- Photographs of cover system soil and membrane placement works in progress.
- The original analysis results for the verification samples and screening results to demonstrate compliance with the assessment criteria presented in Appendix 2.

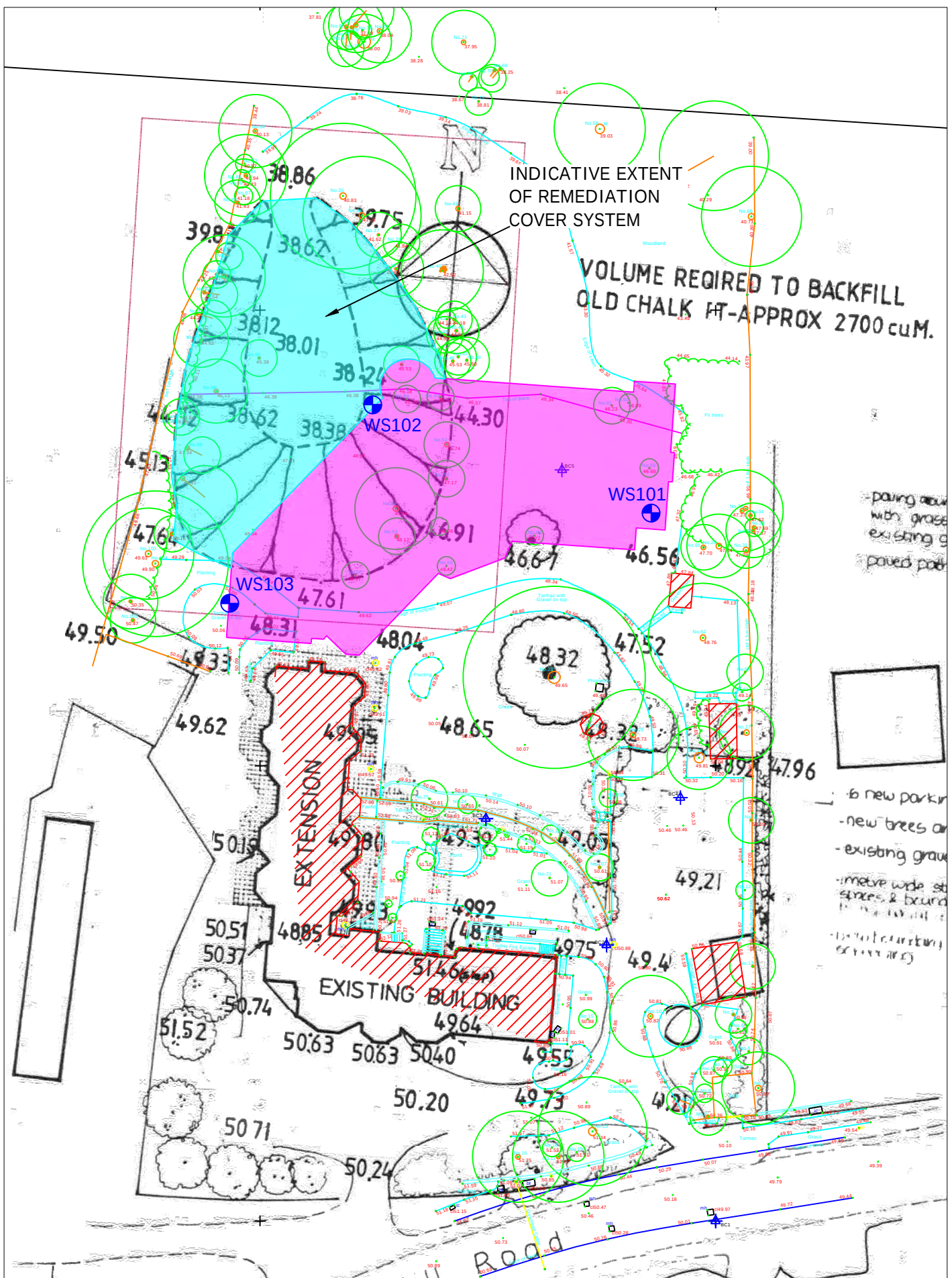
5.3 GROUND GAS PROTECTION MEASURES

Independent verification of the installation of the ground gas membrane in the proposed buildings will be required and a separate verification report will be produced for this.

6. DISCOVERY STRATEGY

A Discovery Strategy is presented in Appendix 3 detailing the evidence of contamination all site personnel should be vigilant for during the development and the procedures to be followed in the event that such evidence of contamination is encountered. It is recommended that these procedures are included in the site induction for development workers and are available to site staff for reference during the development.

FIGURE 1: REMEDIATION PLAN



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client ARIA CARE
site BELMONT CASTLE, HAVANT
title REMEDIATION PLAN

scale	NTS	drawn by	AP	checked by	RP
date	04 JUL 2025	job no	J25-038		
drawing number	FIGURE 1			rev.	-

APPENDIX 1: REPORT CONDITIONS

This report is produced solely for the benefit of **Aria Care** and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

This report refers, within the limitations stated, to the condition of the Site at the time of the inspections. No warranty is given as to the possibility of future changes in the condition of the Site.

This report is based on a visual Site inspection, study of readily accessible referenced historical records, information supplied by those parties noted in the text and preliminary discussions with local and Statutory Authorities. Some of the opinions are based on unconfirmed data and information and are presented in good faith without exhaustive clarification. Where ground contamination is suspected but no physical Site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to detailed activities related to the Site. Where test results undertaken by others have been made available these can only be regarded as a limited sample. The possibility of the presence of contaminants, not revealed by this research cannot be discounted.

Whilst confident in the findings detailed within this report because there are no exact UK definitions of these matters, being subject to risk analysis, we are unable to give categorical assurances that they will be accepted by Authorities or Funds etc. without question, as such bodies may have unpublished, often more stringent objectives. This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to Ground Condition Consultants Ltd. In time improved practices or amended legislation may necessitate a re-assessment.

The report is necessarily limited to those aspects of land contamination specifically reported on and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents that may occur. The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous use and abuse of the Site and adjacent Sites. The report concentrates on the Site as defined in the report and provides an opinion on surrounding Sites. If migrating pollution or contamination (past or present) exists this can only practically be better assessed following extensive on and off Site intrusive investigations and monitoring.

APPENDIX 2: ASSESSMENT CRITERIA

SOIL - HUMAN HEALTH SCREENING VALUES

Status	End Use	Issue No			Issue Date
ISSUE	Residential without Homegrown Produce	1			June 2015
Determinand	Units	SOIL ORGANIC MATTER			SOURCE
		1 %	2.5 %	6 %	
pH		<5, >9			
Asbestos	%	Presence			
HEAVY METALS/METALLOIDS					
Arsenic	mg/kg	40			S4UL
Cadmium	mg/kg	85			S4UL
Chromium (III)	mg/kg	910			S4UL
Chromium (VI)	mg/kg	6			S4UL
Lead	mg/kg	310			C4SL
Mercury	mg/kg	56			S4UL
Nickel	mg/kg	180			S4UL
Selenium	mg/kg	430			S4UL
Boron	mg/kg	11000			S4UL
Copper	mg/kg	7,100			S4UL
Zinc	mg/kg	40,000			S4UL
GENERAL INORGANICS					
Easily Liberatable Cyanide (free)	mg/kg				Acute effects infant 1 dose 3g soil
US EPA PRIORITY PAHs					
Acenaphthene	mg/kg	3000	4700	6000	S4UL
Acenaphthylene	mg/kg	2900	4600	6000	S4UL
Anthracene	mg/kg	31,000	35,000	37000	S4UL
Benzo(a)Anthracene	mg/kg	11	14	15	S4UL
Benzo(b)fluoranthene	mg/kg	3.9	4	4	S4UL
Benzo(k)fluoranthene	mg/kg	110	110	110.0	S4UL
Benzo(g,h,i)perylene	mg/kg	360	360	360	S4UL
Benzo(a)Pyrene	mg/kg	3.20	3.2	3.2	S4UL
Chrysene	mg/kg	30	31	32.0	S4UL
Di-benzo(a,h)anthracene	mg/kg	0.31	0.32	0.32	S4UL
Fluoranthene	mg/kg	1500	1600	1600	S4UL
Fluorene	mg/kg	2800	3800	4500	S4UL
Indeno(1,2,3-cd)pyrene	mg/kg	45.0	46	46.0	S4UL
Naphthalene	mg/kg	2.3	5.6	13.0	S4UL
Phenanthrene	mg/kg	1300	1500	1500	S4UL
Pyrene	mg/kg	3700	3800	3800	S4UL
Total PAHs	mg/kg	No Sum	No Sum	No Sum	
Phenolics					
Phenol	mg/kg	750	1300	2300	S4UL
TPH					
TPH Aliphatic >C5-6	mg/kg	42	78	160	S4UL
TPH Aliphatic >C6-8	mg/kg	100	230	530	S4UL
TPH Aliphatic >C8-10	mg/kg	27	65	150	S4UL
TPH Aliphatic >C10-12	mg/kg	130	330	770	S4UL
TPH Aliphatic >C12-16	mg/kg	1100	2,400	4,400	S4UL
TPH Aliphatic >C16-35	mg/kg	65,000	92,000	110,000	S4UL
TPH Aliphatic >C35-44	mg/kg	65,000	92,000	110,000	S4UL
TPH Aromatic >EC5-7 (Benzene)	mg/kg	370.000	690.00	1400	S4UL
TPH Aromatic >EC7-8	mg/kg	860	1,800	3,900	S4UL
TPH Aromatic >EC8-10	mg/kg	47	110	270	S4UL
TPH Aromatic >EC10-12	mg/kg	250	590	1,200	S4UL
TPH Aromatic >EC12-16	mg/kg	1800	2,300	2,500	S4UL
TPH Aromatic >EC16-21	mg/kg	1900	1,900	1,900	S4UL
TPH Aromatic >EC21-35	mg/kg	1900	1,900	1,900	S4UL
TPH Aromatic >EC35-44	mg/kg	1900	1,900	1,900	S4UL
TPH Aliphatic & Aromatic >EC44-70	mg/kg	1,900	1,900	1,900	S4UL
Total TPH	mg/kg	No Sum	No Sum	No Sum	
BTEx					
Benzene	mg/kg	0.380	0.70	1.4	S4UL
Toluene	mg/kg	880 ^{mp} (869)	1,900	3900	S4UL
Ethylbenzene	mg/kg	83	190	440	S4UL
m-Xylene	mg/kg	88	210	480	S4UL
o-Xylene	mg/kg	82	190	450	S4UL
p-Xylene	mg/kg	79	180	430	S4UL

APPENDIX 3: DISCOVERY STRATEGY

Attn: Ground Works Contractors

Belmont Castle – Discovery Strategy

Background

This document presents a brief summary of the actions to be taken if suspected contamination of the soil or groundwater is encountered during the development of the site and follows on from the GCC Ground Condition Assessment Report and Remediation Strategy.

Evidence of contamination

Any evidence of contamination is likely to be in the following form, although other indicators may be observed.

- Dark staining of the soil
- Ash in soil
- Oily sheen on soil or water
- Tanks and pipework
- Smell of oil/diesel/petrol
- Asbestos containing material fragments
- Large deposits of made ground (e.g. waste deposits)
- Broken glass on and in the ground

Actions following identification of evidence of contamination

Contractors encountering evidence of contamination are to report the discovery to the site office.

- Further development of the potentially contaminated area should cease and Site Engineer should contact the Client's Environmental Consultant to attend site and assess the implications of the discovered impact.
- The Environmental Consultant will in turn inform the Local Authority and/or the Environment Agency as appropriate.
- Potentially contaminated material is to be left in situ where possible, or stockpiled in bunded areas where it is not possible to leave in situ, until an assessment is complete and appropriate action is agreed with the relevant regulator. Bunds are to be lined with plastic sheeting to prevent leaching of contaminants to the underlying soil and to allow a clear distinction between the suspected contaminated soil and the material used to form the bund.
- Potentially contaminated material to be disposed of off site may require further chemical testing.