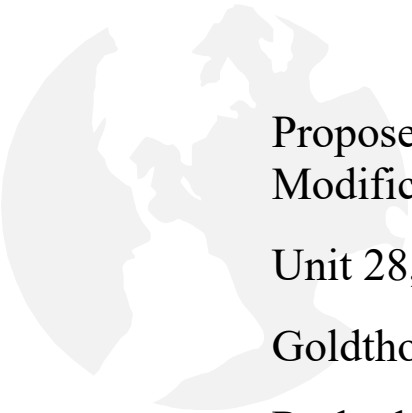


T. L. P. Ground Investigations.

Phase 2 – Intrusive Ground Investigation Report



Proposed New Factory Extensions &
Modifications,

Unit 28, Commercial Road,
Goldthorpe Industrial Estate,
Rotherham.

11th July 2019.

T. L. P. Ground Investigations.

Proposed New Factory Extensions & Modifications, Unit 28, Commercial Road, Goldthorpe Industrial Estate, Rotherham.

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T. L. P. Ground Investigations.

Phase 2 – Intrusive Ground Investigation Report

Site: Proposed New Factory Extensions & Modifications, Unit 28, Commercial Road, Goldthorpe Industrial Estate, Rotherham.

Client: Granville Oil & Chemicals Ltd.

Contact: GGP Consult.

Date: 11th July 2019.

Executive Summary

Introduction	TLP Ground Investigations Ltd. were instructed by GGP Consult acting on behalf of their client Granville Oil & Chemicals Ltd, to undertake a Phase I Desk Study and Phase II Intrusive Survey in connection with a Proposed New Factory Extensions & Modifications, Unit 28, Commercial Road, Goldthorpe Industrial Estate, Rotherham.
Previous Desk Study - 18 th June 2019	A Phase I Desk Study undertaken by TLP on 18 th June 2019 entitled 'Phase I Desk Study - Proposed New Factory Extensions & Modifications, Unit 28, Commercial Road, Goldthorpe Industrial Estate, Rotherham', identified pollution linkages at the site associated with its historical use and from potential contamination that may have migrated onto the site from off-site sources. Potential contamination perceived to be associated with these activities included metals, semi-metals, poly-aromatic hydrocarbons (PAH's), Total Petroleum Hydrocarbons (TPH), B-TEX, asbestos, harmful ground gasses and vapours.
Intrusive Survey	In accordance with the recommendations set out in the Desk Study, TLP carried out a Phase II Intrusive Investigation. The survey included the sinking of sampling boreholes and some hand dug trial pits followed up by chemical analysis of representative soil samples. The survey also included the installation and monitoring of land gas monitoring wells. A geotechnical investigation was also undertaken as part of the works. Landgas monitoring is currently ongoing and the monitoring period should be completed in late August 2019.
Contamination Summary	Soil The investigation has now revealed that within the near surface deposits of 'made ground' and natural soils underlying the site, concentrations of potential contaminants are well within current guideline values for a 'Commercial' end use scenario and in terms of soil contamination, the test results would suggest that no specific remedial measures are required in order for the proposed development to proceed as planned. Furthermore, in the samples obtained from within the earth embankment which extends along the southern site boundary (part of which is likely to be retained), concentrations of contaminants were found to be well within ATRISKSoil guideline values for a POS (Parks / non residential) end use scenario. Groundwater The only significant seepage encountered within the borings was located at the location of BH5 within the deposits of granular made ground. This 'perched' water seepage was considered to be from surface water which had accumulated in the near surface soils in a small localised area and was not considered to be representative of the water regime present beneath the site as a whole. As there were no other groundwater seepages at any of the other test locations, no groundwater samples were available for contamination analysis.

	<u>Controlled Waters</u> The investigation has now revealed that within the near surface deposits of ‘made ground’ and natural soils underlying the site, concentrations of potential contaminants are well within current guideline values for a ‘Commercial / POS parks’ end use scenario and in terms of soil contamination, the test results would suggest that no specific remedial measures are required in order for the proposed development to proceed as planned. Permeability trials attempted within the deposits of weathered sandstone have demonstrated that these deposits have a very low permeability and as such are providing an effective barrier to the vertical migration of potentially contaminated leachate. The site is not situated within 250m of a groundwater SPZ, no active abstraction points have been identified within 2000m of the site. The Emapsite indicates that the nearest surface water feature to the study site is an inland river not influenced by normal tidal action situated 122m north of the site. At such a distance, this receptor is unlikely to be considered at risk if any significant contamination is ultimately revealed on the site. No active surface water abstractions are identified within 2000m of the site. <u>Ground Gas Monitoring</u> Ground gas monitoring (to date) has not detected significant ground gas emissions (CO₂ & CH₄). If in future 4 No. rounds of monitoring, similar low concentrations of ground gasses are recorded, it may be possible to classify the site as Characteristic Situation 1 ‘Very low risk’ (Modified Wilson & Card Classification [CIRIA Report 659] or ‘Green’ in the ‘Traffic Lights’ Gas Risk Assessment used by the National House Building Council (NHBC) in ‘Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present – Report No. 04. March 2007’. Within this risk category, no specific special ground gas protective measures would be required for the proposed development. <u>Soil Waste Classification of Mounds on Site</u> Compliance testing of four soil samples obtained from within the earth embankment along the southern part of the site has been carried out in order to classify materials within the Waste Acceptance Criteria (WAC). The samples were obtained from along the length of the embankment which extends along the southern site boundary. It was considered likely that large parts of this embankment will need to be excavated and removed from site as part of the proposed redevelopment proposals. The results of the tests are presented on the enclosed Waste Acceptance Criteria Testing certificates 79560-4, 8, 9 and 10. For the 4 No. samples submitted for testing, the results of the WAC analysis indicate that the leached concentrations (10:1) of the various contaminants would classify these materials within the Inert Waste classification.
Geotechnical Comments	<u>Ground Conditions</u> The recent borings have revealed that on the lower, level part of the site, beneath any surface construction materials, the deposits of made / disturbed ground extend to depths of between 0.45m and 0.80m beneath the surface. The deposits of made up / disturbed ground were underlain by competent, weathered deposits of sandstone comprising generally ‘medium dense’, quickly becoming ‘dense’, silty, sandy and occasionally clayey soil containing weathered fragments and layers of light brown, rust brown, dark brown and grey, micaceous sandstone. At depths of between 0.70m and 1.25m beneath the surface, these deposits developed into less weathered deposits of ‘very dense’ light brown and rust brown, medium grained sandstone. Clearly, this weathered rock will provide a satisfactory foundation bearing stratum for conventional shallow spread foundations i.e. pads and strip footings. <u>Foundations</u> As a preliminary guide to design, pad or strip foundations constructed on deposits of ‘very dense’ weathered sandstone can anticipate a presumed bearing value of at least 600kN /m². No significant settlement is anticipated for foundations / floor slabs constructed on the very dense weathered

	sandstone . Foundations excavations which extend in the ‘very dense’ sandstone, may require specialist plant to facilitate penetration. Ground Slabs Ground bearing floor slabs would also be acceptable provided any unsuitable deposits of made up, disturbed or reworked ground is first removed and replaced with compacted granular fill of suitable grading. <u>Earth Embankment</u> From the single borehole located within the central part of the earth embankment it would appear that the material present behind the exposed face of the embankment generally comprises silty and sandy soil with inclusions of sandstone and mudstone. However, <u>further into the ‘body’ of the embankment more competent materials may be encountered which may required heavier excavation plant to facilitate excavation</u> . Natural deposits of weathered sandstone were encountered towards the base of the embankment and quickly became very dense. The datum level at which very dense deposits of weathered sandstone were encountered, towards the base of BH3 (undertaken on the higher ground), appeared to be generally consistent with the depth at which similar deposits were encountered in the borings taken on the lower lying areas of the site. This however may not be the case towards the more southern parts of the site where natural deposits may be encountered at higher datum level to match that of the Carr Field Lane highway to the rear of the site. The deposits encountered in the embankment borehole were found to be generally ‘dry’ in composition, no doubt due in part to dehydration by the roots of the numerous trees and dense vegetation covering the surface. This vegetation will need to be removed prior to any earthworks. If the earth works are undertaken during the drier weather, then the excavation face of the embankment should be temporarily stable at a modest slope angle. However, in wetter conditions any exposed materials may deteriorate in time which may compromise the stability of the cut face. The design and construction of the proposed retaining structure will depend to some extent on the quality of the material ultimately exposed in the cut face of the embankment which it is intended to support. However the material at foundation level is likely to comprise very dense Mexborough Rock with a presumed bearing value similar to that quoted above. <u>Building Near Trees</u> Atterberg Limit tests were attempted on representative samples of the residual deposits of highly weathered sandstone. In all cases the samples were found to be non-plastic and as such these soils would not be susceptible to the drying effects / desiccation by root action of trees. <u>Soakaway Potential</u> In two of the sampling boreholes (BH1 & BH6), ‘falling head’ (variable head) permeability tests were attempted in order to establish the relative permeability of the near surface stratum <i>in situ</i>. At the start of the test, the boreholes were quickly filled to appropriate level with water. The time taken for the water to dissipate from the test holes was then subsequently monitored. After approximately three hours of monitoring, no appreciable drop in the water level was observed in the test holes and it was therefore concluded that the near surface deposits of very dense, weathered sandstone were of low permeability and would not provide a suitable media for the dissipation of surface water from ‘soakaways’. <u>Open Excavations</u> Over the majority of the site, <u>shallow</u> excavations which are left open for short periods should be temporarily self supporting. Some minor instability may be experienced whilst excavating through layers of granular made ground (sub-base). As the majority of the borings remained dry, no significant groundwater infiltrations are anticipated whilst forming the excavation for the proposed new structure. Some slight ‘perched’ water infiltrations may be experienced if excavating in the vicinity of BH5 where a localised area of saturated granular sub base was encountered. However, infiltrations are unlikely to be significant and where encountered should be capable of being controlled with conventional dewatering plant.
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	<u>Design Sulphate Classification</u> Chemical tests performed on representative samples of the near surface soils and made up / disturbed ground as part of the environmental screening, recorded water-soluble sulphate concentrations between 13mg/l and 102mg/l (2:1 water / soil extract) with pH between 7.7 and 10.7. In accordance with the guidelines contained in Part 1 of the Digest and taking into account the geology and specific soil and groundwater conditions, the site can be assigned a design sulphate class of DS-1 and an ACEC (Aggressive Chemical Environment for Concrete) Class AC-1s. <u>Pavement Design</u> A California Bearing Ratio test (CBR) was performed on a large diameter, undisturbed core sample obtained from anticipated formation level within the proposed new concrete hard standing storage area (CBR 1). The sample was obtained from the near surface deposits which comprised made ground of silty, sandy soil containing occasional fine to medium fragments of weathered sandstone and brick. The results of the test indicate an approximate CBR value (to the nearest 1%) of 2%. On the assumption that similar made ground is likely to be present at formation beneath the area of the proposed new concrete hard standing then a CBR value of 2% would be an appropriate value to adopt for design purposes.
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1.0 **Brief**

Following the instructions of GGP Consult acting on behalf of their client Granville Oil & Chemicals Ltd, a geo-environmental assessment was carried out at land to the rear of Unit 28, Commercial Road, Goldthorpe Industrial Estate, Rotherham, where proposed extensions and modifications are proposed. The proposed new development will involve the construction of large portal frame extensions to the southern elevation of the existing structure. The extensions will extend eastwards and westwards. The development will also include the creation of new external yard areas which will be used for access, storage and parking. In order to make space for the proposed new extensions, large parts of an embankment will need to be excavated from the southern part of the site and supported with a new retaining structure.

The scope of this intrusive investigation was designed in accordance with the requirements of the recommendations of a Phase 1 Desk Study report prepared by TLP Ground Investigations Ltd., issued on 18th June 2019 entitled 'Phase 1 Desk Study - Proposed New Factory Extensions & Modifications, Unit 28, Commercial Road, Goldthorpe Industrial Estate, Rotherham.' the findings of which are summarised in Section 3.0 of this report.

The intrusive borehole investigation was carried out on 19th June 2019 and included the collection of undisturbed soil, groundwater and subsequent ground gas samples from borehole installations followed by chemical and geotechnical analysis of selected samples. This report presents the results and findings of this investigation and an assessment of the geotechnical and contamination restraints associated with the proposed new development.

2.0 **Site Description**

Unit 28, Commercial Road is situated at the southern end of Commercial Road in the southern outskirts of the Goldthorpe Industrial Estate near Goldthorpe, Rotherham. The proposed development area is approximately 0.3449 Ha and is centred at National Grid Reference 444914, 403232.

The site surrounds a portal frame commercial industrial unit which is centred towards the northern boundary of the site. The structure comprises a brick base with brick columns interspersed with panels of profiled, painted metal cladding. There is also a large glazed section to the northern elevation of the existing building with a small glazed porch. The structure is covered by a hipped roof structure which is also surfaced with profiled, painted metal cladding.

Historical kerbside photography indicates that the site was previously occupied by Duve (automotive products) and then subsequently Yorkshire Flooring Supplies Ltd.

To the east of the existing structure is a small rectangular parking area surfaced with tar macadam which has been used for the parking of commercial vehicles. At the time of the walkover survey there was also a large waste skip, a pallet of brick edging slips and a pallet of timber flooring thresholds in this area. To the west of the structure is a slightly smaller parking area used for staff vehicles surfaced with tar macadam and paving blocks. This area contained a number of timber pallets and waste timber flooring. To the southwest of this is a large concreted floor slab area, which has been amalgamated into the Granville Oil & Chemicals Ltd. site situated to the northwest. The area of concrete is currently being used for general storage purposes and at the time of the walkover survey contained a large number of empty IBC's., a small number of IBC's filled with 'rework' oil products, empty oil drums, oddments of timber, timber pallets, a waste skip. To the north of this area is a 'bundled' concrete area containing a large number of metal storage silos, some of which appeared to be in the process of being refurbished.

To the south of the existing structure is a densely wooded bank which rises by approximately 5m before sloping down slightly to Carr Field Lane, which is situated further to the south. The bank is populated by a variety of different tree species, many of which appear to have been self seeded. A post and wire fence has been erected within the densely wooded area. The area of proposed development is currently accessible via either of two gates set within a fence along the northern boundary to the compound. The general compound area is secured with a metal post and wire fence which extends through the densely wooded bank to the east of the site and runs straight along Carr Field Lane to the south of the site.

The site is situated at the southern edge of a medium sized commercial / industrial zone with Granville Oil and Chemicals Ltd. situated immediately to the northwest. A collection of commercial / industrial properties are located to the north along Commercial Road and to the northwest beyond Granville Oil and Chemicals Ltd. is a large Aldi Supermarket distribution centre.

At the time of the walkover inspection, no visual or olfactory evidence of significant contamination was identified. Any suspected residual potentially contaminative spillage from the storage silos was found to be contained within a good quality concrete bund and this area is not within the development area. IBC's stored within the concrete slab external storage yard did not appear to have caused any obvious staining or slicks on the surface. Any other stored materials on or near to the site are considered to be relatively inert.

3.0 Issues Arising from Phase 1 Assessment

- According to historical mapping, the site remained undeveloped amongst open fields until the mid nineteen nineties when the site was incorporated into a part of the newly establish Goldthorpe Industrial Estate. At this time construction of the main adjacent commercial / industrial structure of Unit 28 occurred together with a number of other similar commercial / industrial units along Commercial Road to the north. Since that time, unit 28 has been used for commercial industrial purposes and according to historical kerbside photograph was previously occupied by Duve auto-mobile components suppliers and more recently Yorkshire Flooring Supplies Ltd. Some of the north western areas of the proposed development area are currently covered with a concrete floor slab have more recently been used for the storage of either empty or part filled IBC's containing products used by the adjacent Granville Oil factory unit. It is likely that staff and commercial vehicles have been used in the external areas surrounding unit 28. It is also possible that some commercial / industrial activities have taken place within the main adjacent structure of unit 28. The majority of the proposed development area is elevated from the surrounding industrial estate and currently

comprises an overgrown embankment with steep access to the upper level. Other than occasional larger pieces of concrete identified in the exposed slope, the majority of the exposed near vertical cuttings, particularly close to the base of the cutting appear to comprise natural deposits of weathered silty sandstone.

- Historically, the areas surrounding the site also remained largely as open fields until the beginning of the 20th Century when the Wath Branch of the H.B. & W.R.J.R. railway line was constructed a short distance to the east of the site. The construction of this railway involved the construction of an embankment to the north of Carr Field Lane and a cutting to the south of it. Following the creation of the railway line, residential developments gradually occupied the areas to the east, southeast and south of the site. A brick works, 'works' and a quarry were also identified in the area approximately 500m to the south of the site. Following the development of a medium sized housing estate and school to the south of the site, the nearby railway cutting was in-filled becoming a public footpath. From the late nineteen eighties, the Goldthorpe Industrial Estate expanded into in the areas to the north of the site and extended southwards. The estate was completed around the mid nineteen nineties with extensions to a number of the units continuing into the turn of the 21st Century. A large supermarket distribution centre was also constructed approximately 150m to the northwest of the site in 2014.

Table 1

Table 1 - Summarises the potential contaminative land uses on and in the vicinity of the site showing potential sources with associated contaminants.

Sources							
Sources Description	Contaminants Associated with Source						
	Metals	PAH	TPH/BTEX	Asbestos	Faecal indicators	Landfill Gas	TPH Vapours
<u>On Site</u>							
Historical and ongoing commercial / industrial processes. Storage of materials and waste products. Use and parking of vehicles, HGV's and fork lift trucks. Construction of unit 28 directly adjacent to the site.	✓	✓	✓	✓			✓
The possible presence of deposits of made ground that may exist beneath parts of the site surface.	✓	✓	✓	✓		✓	✓
Burning processes that have taken place within the site boundaries or in adjacent areas.	✓	✓					
Residual contamination from natural weathering of geological strata.	✓						
<u>Off Site</u>							
The possible migration of contamination from the various commercial / industrial areas surrounding the site.	✓	✓	✓	✓			
The presence of harmful ground gasses such as methane and carbon dioxide from the former in-filled railway cutting to the south.						✓	

Table 1 - Summarises the potential contaminative land uses on and in the vicinity of the site showing potential sources with associated contaminants.

Key for Table 1

Metals

Includes - Metals and metalloids (Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc, Arsenic, Boron, Selenium and inorganic chemicals such as Cyanide)

PAH

Includes – EA16 – Acenaphthene, Acenaphthylene, Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenzo[a,h]anthracene, Fluoranthene, Fluorene, Indeno[1,2,3-cd]pyrene, Naphthalene, Phenanthrene, Pyrene.

Table 2

Details the potential pathways with receptors identified for any contaminants that may be present in the ground at the site during and following the proposed development.

<u>Pathways</u>		<u>Receptors</u>	
<u>Human Health</u>		<u>Human Health</u>	
Dermal Contact with soil	✓	End users and construction workers	✓
Ingestion of soil	✓	End users and construction workers	✓
Inhalation of Contaminated Dust and Harmful Gasses	✓	End users and construction workers	✓
Ingestion of site grown vegetables	⊗	End users	⊗
Ingestion of water from affected service pipes	✓	End users	✓
<u>Buildings</u>		<u>Buildings</u>	
Mobile water soluble sulphates	✓	Concrete foundations	✓
<u>Controlled Waters</u>		<u>Controlled Waters</u>	
Lateral and vertical migration	✓	Surface water receptors & shallow / deeper groundwater regime	✓
Infiltration	✓	Surface water receptors & shallow / deeper groundwater regime	✓

Table 2 - details the potential pathways with receptors identified for any contaminants that may be present in the ground at the site during and following the proposed development.

4.0 Intrusive Investigation

4.1 Sampling Strategy

In order to quantify the potential contamination risk, an intrusive investigation was undertaken in accordance with BS5930:1999+A2 2010 Code of Practice for Site Investigations, BS EN 1997-2:2007 'Eurocode 7 – Geotechnical Design – Part 2 – Ground Investigation and Testing' British Standards Institution and BS10175:2011 Code of practice for the Investigation of Potentially Contaminated Sites. The borehole investigation was completed on 19th June 2019. The sampling strategy was designed on the basis of the fundamental objectives of the Phase 1 Intrusive Investigation which were to:-

- Obtain representative samples of soil, groundwater and ground gas (monitoring ongoing) from strategic areas for subsequent analysis.
- Gather further information on contaminated land conditions and geotechnical data to assist in the design and construction of the proposed new buildings and infrastructure.
- Re-evaluate the preliminary conceptual site model and undertake a qualitative contamination risk assessment.
- Determine whether mitigation measures or remediation is required in areas where soil / groundwater / ground gas / vapours contamination may exist in order to render the site suitable for the proposed development.

The historical extracts indicate that the majority of the site has had no former commercial use and is essentially elevated from the surrounding industrial estate and currently comprises an overgrown embankment with steep access to the upper level. Some of the north western parts of the proposed

development site are used as external hard paved storage for Granville Oils & Chemicals Ltd. where empty and part filled IBC containers are being stored. The north eastern parts of the proposed development site comprise a staff car park to the adjacent unit 28 which has formerly been used as an automotive parts supplier and following that a flooring supplier.

As there was no specific sources of contamination identified within the Phase 1 Desk study, for analytical purposes, (with regards to metals, semi-metals, general contaminants, characterized total petroleum hydrocarbons, BTEX contaminants, speciated poly-aromatic hydrocarbons, asbestos and harmful ground gasses) the entire site has provisionally been considered as one 'averaging area'.

Due to the extremely steep and densely vegetated embankment situated across the southern boundary of the site, it was not possible to wholly access these areas with the available mechanical boring equipment. It was possible to locate one borehole (BH3) on a section of the embankment but the remainder of the borings were located on the lower lying parts of the site. In order to provide an indication of the composition of the near surface material forming the embankment, a number of hand dug excavations were taken and samples obtained for subsequent analysis.

The locations of the exploratory borings have been indicated on the enclosed site layout drawing / aerial photograph and details of the strata encountered have been provided on the enclosed borehole record sheets.

4.2 Fieldwork

The recent intrusive fieldwork included the following:-

- The sinking of 6 No. shallow sampling boreholes using windowless sampling equipment to depths of between 1.37m and 4.35m beneath the ground surface. At the individual borehole locations, soil and where possible groundwater samples were obtained. The soil samples were recovered as continuous cores reducing in size from 100mm to 63mm in diameter within rigid PVC core liner. Fragmental samples were obtained from the cores using appropriate tools (e.g. stainless steel trowel) and placed in appropriate containers, sealed, labelled and stored in cool boxes at low temperatures. The samples selected for analysis were subsequently transferred under chain of custody to an analytical laboratory.
- Converting three of the windowless sampling borings (BH1, BH4 & BH6) into ground gas monitoring stations by installing lengths of slotted standpipe surrounded by well screen gravel and sealed at the surface with bentonite pellets, an airtight gas valve and a lockable cover. These borings were distributed in order to provide an overview of the ground gas conditions in the area where the proposed new extensions will be placed. A period of ground gas monitoring was subsequently initiated in accordance with the recommendations of the Phase 1 Desk Study. *Guidance in Ciria Report C665 indicates that for a 'low' potential source of gas generation, i.e. made ground with limited degradable material / organic clays of limited thickness and a "low" sensitivity of end use i.e. commercial units, then the gas monitoring period should be 6 readings over a period of two months.*
- Obtaining 1 No. large diameter undisturbed samples of the near surface sub-grade for laboratory California Bearing Ratio testing in order to assist with the design of the proposed new paved areas of the site.
- Attempting) percolation tests in 2 No. of the completed shallow probe borings (BH1 and BH6) in order to assess the relative permeability of the natural near surface deposits *in situ*.
- Excavating 3 No. shallow hand dug trial pits at locations across the length of the embankment in order to obtain samples for environmental screening.

- Backfilling of the boreholes and reinstatement of the surface where appropriate.

4.3 Soil Sample Acquisition

A number of near surface samples were retained from each borehole and from these, a total of 10 No. soil samples were selected for analysis. The majority of the selected samples were obtained from the near surface soils as these were considered to represent the most likely soils to be contaminated and most likely to come into contact with construction workers and end users of the site. These near surface soils were also deemed to represent a possible source of contaminated leachate which could potentially enter any underlying sensitive groundwater regime.

One of the samples was obtained from slightly greater depth and submitted for analysis to assist in establishing the required level of protection for underground potable water supply pipes.

Samples obtained from the embankment were submitted for testing in order to establish the contamination status and waste classification for potential disposal purposes to assist in the exportation of the materials from the site.

The only significant seepage encountered within the borings was located at the location of BH5 within the deposits of granular made ground. This ‘perched’ water seepage was considered to be from surface water which had accumulated in the near surface soils in a small localised area and was not considered to be representative of the water regime present beneath the site as a whole. As such a sample was not selected for environmental screening.

Three of the boreholes (boreholes BH1, BH4 and BH6) were converted in ground gas monitoring stations and following the fieldwork, samples of the gas which had accumulated in the standpipes were drawn off for analysis (*monitoring is currently ongoing and the test period should be completed in late August 2019*).

5.0 Ground Conditions

5.1 Anticipated Geology

Maps published by British Geological Survey indicate that no superficial deposits are likely to be present beneath the study site. The underlying natural bedrock is represented by the Mexborough Rock (Sandstone), which is of Westphalian age. The maximum permeability of the solid geology is deemed to be ‘high’. A fault (inferred) is identified at a distance of 459m to the south of the site.

The Emapsite indicates the former railway cutting situated 77m to 167m south of the site as an area of historical ground workings. No other mining, extractions or natural cavities have been highlighted by the Emapsite Report within 500m of the study site. The Emapsite Report indicates that the site lies within the proximity of a Coal Mining Area as defined by the Coal Authority. Reference to the CON29M Coal Mining Report obtained for the site indicates that although the site is located within a surface area that could be affected by underground mining in 4 seams of coal at 230m to 640m depth (last worked in 1976), it is the professional opinion of Groundstability (under jurisdiction of The Law Society) that these features are unlikely to impact upon the stability of the enquiry boundary. Further information is provided within the CON29M Report 18th June 2019 appended to the Phase 1 Desk Study report.

Ground Conditions Encountered

Surface Construction

In order to preserve the integrity of the existing concrete slab in the western part of the site the borings in this area were positioned at the edge of the slab as close as possible to the foot of the steep embankment. The edge of the concrete slab measured approximately 200mm in thickness.

BH6 was located in the tar macadam yard / parking area to the east of the existing building. Here the tar macadam surface measured only 50mm in thickness and rested on a sub-base of medium, light greyish brown limestone chippings in a matrix of light grey, gritty, sandy fines. At the location of BH4, a surface covering of hard standing comprised medium, light brown limestone chippings in a matrix of light grey, gritty, sandy fines extending to 400mm beneath the surface.

Made Up / Disturbed Ground

Deposits of made up or disturbed ground were encountered in almost all of the sampling boreholes. Beneath any surface construction materials, this generally comprised reworked deposits of brown / rust brown or pinkish brown, silty, sandy clay containing assorted weathered fragments of brown, rust brown and light brown sandstone. At the location of BH5, a thin layer of sub rounded gravel was encountered towards the base of the made ground at a depth of 530mm beneath the surface.

On the flat, lower lying area of the site, the greatest thickness of made ground was encountered at the location of CBR1 in the far eastern part of the site. Here deposits of dark brown, silty, sandy and clayey soil containing occasional fine to medium fragments of weathered sandstone rested at 0.30m depth on deposits of mid brown, rust brown and light grey, silty, sandy soil containing fragments of light brown, rust brown and light grey weathered sandstone and occasional brick fragments. These deposits of 'made ground' extended to a depth of 0.80m beneath the surface and rested on natural deposits of weathered sandstone.

Embankment

BH3 was located within the embankment to the south of the existing commercial building at a height of approximately 3.50m above the level of the concrete yard. Here the deposits of made ground were seen to extend to a depth of 3.30m beneath the surface. At this location the embankment material initially comprised a covering of greyish brown, silty, sandy soil containing occasional fine to medium fragments of rust brown, brown and greyish brown sandstone. At 0.25m this rested on similar deposits of greyish brown and rust brown, silty, sandy soil containing fine to medium fragments of light brown, rust brown and dark brown sandstone and mudstone. At 1.20m beneath the surface the borehole penetrated medium dense, mid greyish brown, silty, sandy soil containing fine to medium fragments of weathered buff brown, dark brown and rust brown sandstone and mudstone which at 2.70m depth gave way to deposits which appeared to be reworked firm, light grey, mottled buff brown and rust brown, silty, sandy clay containing occasional coarse fragments of light brown, medium grained sandstone.

The three hand dug pits excavated along the crest of the embankment encountered similar deposits as those encountered at the surface in BH3.

Natural Deposits

At each of the borehole locations the natural deposits were initially represented by highly weathered deposits of the underlying Mexborough Rock (Sandstone). This initially comprised medium dense or dense, mid brown, rust brown, dark brown and light grey, weathered fragments of sandstone in a matrix of buff brown and rust brown, silty, sandy and occasionally clayey soil.

On the flat and level areas of the site these deposits very quickly graded into less weathered deposits of very dense weathered sandstone at depths of between 0.70m and 1.25m b.g.l. These ‘very dense’ deposits quickly resisted penetration with the available boring equipment and it was in this competent material at depths of between 1.00m and 1.45m b.g.l that the borings were subsequently terminated

In BH3 located on the embankment, ‘very dense’ weathered sandstone established at around 4.05m below the data level of the borehole which would equate to approximately 0.55m beneath the level of the adjacent concrete yard. This is similar to the depth at which it was encountered in the borings taken on the lower ground.

5.2 Groundwater

The only significant seepage encountered within the borings was located at the location of BH5 within the deposits of granular made ground. This ‘perched’ water seepage was considered to be from surface water which had accumulated in the near surface soils in a small localised area and was not considered to be representative of the water regime present beneath the site as a whole.

6.0 Geotechnical Testing

- In order to establish the relative compaction of the predominantly granular deposits *in situ*, Standard Penetration Tests (SPT’s) were performed as the borings were advanced. The results of the tests have been interpreted as ‘N’ values (blows for 300mm penetration) and these have been presented on the borehole record sheets. A tests performed within the highly weathered deposits of Mexborough Rock, recorded an ‘N’ value of around 29, indicating a ‘medium dense’ state of compaction for the deposit. Tests performed within the underlying less weathered Mexborough Rock (sandstone), recorded SPT blow counts between 54 and 113 blows, before the deposit became too compact to penetrate with the available boring equipment, clearly indicating a ‘very dense’ state of compaction. Tests performed within the deposits of made ground / sub-base, recorded SPT ‘N’ values between 8 and 50 indicating a wide range in compaction between ‘loose’ and ‘dense’.
- Atterberg Limit tests were attempted on representative samples of the residual deposits of highly weathered sandstone. In all cases, these were found to be **non-plastic** and as such these soils would not be considered to be susceptible to volume changes associated with fluctuations in soil moisture content.
- A California Bearing Ratio test (CBR) was performed on a large diameter, undisturbed core sample obtained from anticipated formation level within the proposed new concrete hard standing storage area i.e. from the near surface deposits present at the location of CBR1. The sample comprised deposits of silty, sandy soil containing occasional fine to medium fragments of weathered sandstone and brick. The results of the test indicate an approximate CBR value (to the nearest 1%) of 2%.
- In two of the sampling boreholes (BH1 and BH6), ‘falling head’ (variable head) permeability tests were attempted in order to assess the relative permeability of the near surface stratum *in situ*. At the start of the test, the boreholes were quickly filled to appropriate level with water. The time taken for the water to dissipate from the test holes was then subsequently monitored. After approximately three hours of monitoring, no appreciable drop in the water level was observed in the test holes and it was therefore concluded that the near surface deposits of very dense, weathered silty sandstone were largely impermeable and would not provide a suitable media for the dissipation of surface water from ‘soakaways’.
- Chemical tests performed on representative samples of the near surface soils and made up / disturbed ground as part of the environmental screening, recorded water-soluble sulphate

concentrations between 13mg/l and 102mg/l (2:1 water / soil extract) with pH between 7.7 and 10.7.

7.0 Contamination

7.1 Preliminary Conceptual Site Model

The preliminary Conceptual Site Model (PCSM) detailed in the Phase 1 Assessment Report provides information regarding the potential 'source-pathway- receptor' linkages that may be present at the site.

- From an examination of the sites history, the main sources of potential contamination at the site are derived from the commercial use of the site as an automobile components suppliers and storage yard. This would include potential contamination created as a direct result of manufacturing processes or subsidiary processes such as the use of vehicles, HGV's fork lift trucks, materials storage and waste management. Some of the north western areas of the proposed development area are currently being used by Granville Oil and Chemicals Ltd. for the storage of empty and part filled IBC's. It is also possible that some contamination may have been released during the construction of the adjacent commercial structure Unit No. 28 and the nearby structures located adjacent to the site boundary.

It should be noted that the majority of the proposed development area is on higher ground to that of all surrounding commercial sites and appears to have not been developed. Evidence of natural deposits of weathered silty sandstone are visible on the lower slope cuttings in the western parts of the site but some occasional larger deposits of rubble can be seen exposed in other areas of the slope suggesting the possible presence of some made ground across the site. Whilst the majority of the proposed development area is largely un-surfaced, the current and presumed historical topography does not lend itself to practical use in a commercial setting, therefore it is unlikely that significant commercial activities have been undertaken across the majority of the site in the recent historical past.

- The areas surrounding the site have been used for a variety of purposes including residential and commercial / industrial. Although small to medium sized commercial / industrial developments are situated in the areas surrounding the site, since no pollution incidents have been recorded, it is considered unlikely that any of these could represent more of a risk than the activities that have taken place at the site itself.
- The Emapsite report has identified that a former railway cutting has been in-filled in an area approximately 77m to the south of the site. If the backfill materials were biodegradable then it is possible that this area may represent a potential source of harmful ground gas generation such as methane and carbon dioxide. However, this is considered unlikely.
- Weathering of the natural geological stratum can occasionally cause enrichment of certain metals in the near surface strata, however, this is considered unlikely bearing in mind the information given in the 'Emapsite – Geosight' report which in 'Section 8' (Estimated Background Soil Chemistry) shows very low anticipated levels of Arsenic, Cadmium, Chromium, Nickel and Lead.

7.2 Contamination Testing and Assessment Strategy

In accordance with the recommendations of Phase 1 Desk Study, a programme of chemical analysis was adopted that would target certain contaminants present in the soil that might be associated with the past and current activities at the site and in the immediate surrounding area.

From the 6 No. boreholes, CBR location and 3 No. hand dug Trial Pits a total of 10 No. representative soil samples were selected and these were submitted for a range of tests which included metals, semi-metals, PAH compounds (speciated to EPA16), speciated and characterised TPH, B-TEX and asbestos. The majority of the samples were obtained from the near surface soils as these were deemed to represent the most likely to come into contact with construction workers and future site users and would represent the most likely potential source of contaminated leachate.

One sample was obtained from slightly greater depth (BH2 0.70-0.90m) and submitted for a suite of tests often requested by water companies in order to establish the material choice and level of protection required for underground potable water pipes. Four of the selected samples (obtained from the embankment in the southern / central part of the site) were submitted for analysis within the Waste Acceptance Criteria (WAC) in order to establish the most appropriate disposal route should it be necessary to export these materials 'off site' as part of the redevelopment works.

As no significant groundwater seepages were encountered within the deposits underlying the site, no groundwater samples were available for analysis. The only significant seepage encountered within the borings was located at the location of BH5 within the deposits of granular made ground. This 'perched' water seepage was considered to be from surface water which had accumulated in the near surface soils in a small localised area and was not considered to be representative of the water regime present beneath the site as a whole.

All soil samples were placed in approved containers and cool boxes and despatched under a chain of custody to an accredited laboratory (Chemtech Environmental Ltd.) for the range of tests outlined above. The results of the analyses have been provided on the enclosed laboratory certificates with contract numbers 79560 Granville Oil, Goldthorpe.

7.3 Assessment of Data

Where appropriate, for the assessment of human health, the dataset has been compared to Soil Screening Values (SSV's) developed by ATRISK^{SOIL}. Atkins soil screening values (SSV's) have been derived in line with the EA 2009 guidance (SR2, SR3, SR4, and SR7) using the CLEA v1.071 software. The modelling inputs were made compliant with the SR3 residential, commercial and other conceptual site models and follow the guidance provided within SR3 where possible. The SSV's currently available include values for a range of metals and semi metals, speciated PAH's, characterized TPH, BETX and other organic contaminants.

The C4SL project methodology released by DEFRA in December 2014 was a step-change in the approach to the assessment of land contamination in the UK. The C4SLs introduced a change to toxicological appraisal that defined 'low risk', updated exposure parameters for the standard SR3 land uses and, following a review of relevant literature and Atkins own SSV approach, introduced the Public Open Space (Residential) and Public Open Space (Parks) land uses. These changes in exposure and land use were formalised in an update to the CLEA software with the release of CLEA v1.071 in September 2015.

Atkins have updated the SSVs using CLEA v1.071 to incorporate the following changes:

- Updated exposure assumptions for the standard residential, commercial land uses as set out in the C4SL project methodology for 1% SOM sand and 6% SOM sandy loam soil types;

- Updated exposure assumptions for the standard allotments land use as set out in the C4SL project methodology for the 6% SOM sandy loam soil type;
- Derivation of the ‘top two’ produce for all contaminants for the residential and allotments land uses and inclusion of this method in the consumption of home grown produce pathway; and
- Inclusion of SSVs derived for the Public Open Space (residential) and Public Open Space (parks) land uses as set out in the C4SL project methodology at 1% SOM sand and 6% SOM sandy loam soil types.

As part of their routine updates they have updated the toxicological assessment of ten contaminants (based on minimal risks as set out in Environment Agency SR2 Guidance).

Further C4SLs based on ‘Low Levels of Toxicological Concern’ are to be derived by an industry led initiative in the future and Atkins is fully supportive of this effort.

Certain organic contaminants can be compared to the EIC/AGS/CL:AIRE Soil Generic Assessment Criteria for Human Health Risk Assessment 2010 for a residential or commercial end use. They provide an indication of the chemical concentration in soil below which the long-term human health risks for site occupants (for various generic land-use scenarios) are considered to be tolerable or minimal.

Once the development is completed, almost all parts of the site surface will be covered with either foundation concrete or areas of permanent hard surfacing such as access, parking and storage areas. The only remaining areas of soft landscaping will be the remaining areas of the embankment to the south, east and west of the proposed new extensions. These areas will however be separated from the main developed area by means of a retaining structure. In terms of human health risk, assessment the development has provisionally been considered as representing a ‘**Commercial**’ end use and the current contamination guideline values applicable to this end use has been adopted for the assessment of the contamination test data. The dataset has been compared to 1% soil organic matter (SOM) ‘Commercial’ values as the majority of the recorded OMC concentrations were below 3% so this approach was considered appropriate. These are also the most conservative site specific values (SSV’s).

BRE Digests Special Digest 1 can be referenced to assess the risk from sulphate and acid attack on buried concrete.

Guidance issued by UKWIR Publication 2010 ‘Guidance for the selection of water supply pipes to be used in Brownfield sites can be used to assess the risk to underground water supply pipes.

7.3.1 Statistical Analyses

Where appropriate, statistical analysis of the dataset has been carried out in accordance with the methodology outlined in ‘Guidance on Comparing Soil Contamination Data with a Critical Concentration’, CL: AIRE May 2008.

For a planning scenario, the developer should consider the following key question:

‘Is there sufficient evidence that the true mean concentration of any given contaminant is less than the Critical Concentration?’

In statistical terms, these types of question are handled through the use of formal hypotheses – the Null Hypothesis and the Alternative Hypothesis. Statistical tests are structured as to be able to show (with a defined level of confidence), which of the hypotheses is likely to be true

in any particular case. The outcome of the testing is always expressed in terms of whether the Null Hypothesis can be rejected or not.

Under the land use planning system, where the aim is to demonstrate ‘suitability of use’:

- The Null Hypothesis is that the level of contamination [in the land of interest] **is the same as or higher than**, the critical concentration; and
- The Alternative Hypothesis is that the level of contamination **is lower than** the critical concentration.

If the statistical test shows that the Null Hypothesis should be rejected, it concludes that the Alternative Hypothesis is more likely to be true, i.e. that contaminant concentrations are low relative to the critical concentration and that the land is suitable for use.

If the test shows that the Null Hypothesis should not be rejected, it should be concluded that contaminant concentrations may be the same as, or higher than the critical concentration and further remedial measures may be needed.

Where the recorded concentrations of the samples submitted for testing fall below the limit of analytical detection, these values have been replaced with small numbers of similar order.

‘Outliers’ have only been excluded from the dataset when they are obviously and demonstrably the result of an error that can be identified or explained, or where they clearly indicate that more than one soil population exists within the dataset.

The spreadsheets showing the statistical analysis of the contamination test results have been provided in the appendix.

7.4 Contamination Results

7.4.1 Soils

7.4.1.1 *Metals and Semi metals and General Contaminants*

9 No. of the 10 No. soil samples submitted for testing were analysed for a general metals and semi-metals suite that might be associated with contamination resulting from the past uses of the site and the surrounding area. The results indicate that none of the determinands included in the testing schedule were in concentrations above current Atrisk SSV’s for a ‘commercial’ end use scenario and a soil organic matter (SOM content of 1%).

As contamination from metals, semi-metals and general contaminants in the near surface soils across the site is low relative to their critical concentration then with respect to these potential contaminants the land can be considered suitable for the proposed ‘commercial’ end use without prior remediation. Also for those samples obtained from the earth embankment area along the southern site boundary (parts of which are likely to be retained), concentrations of metals, semi-metals and general contaminants were found to be well within current guideline vales for a Public Open Space (Parks / non residential) end use scenario.

7.4.1.2 *Polycyclic Aromatic Hydrocarbons*

5 No. of the 10 No. soil samples submitted for testing were analysed for speciated PAH’s (EPA16) and the results compared to current Atrisk SSV’s. On comparing the recorded values with current Atrisk SSV’s, all of the samples recorded PAH concentrations within current Atrisk SSV’s for a ‘commercial’ end use scenario (SOM 1%).

As contamination from PAH contaminants in the near surface soils across the site is low relative to their critical concentrations then with respect to these potential contaminants the land can be considered suitable for the proposed ‘commercial’ end use without prior remediation. Also for those samples obtained from the earth embankment area along the southern site boundary (parts of which are likely to be retained), concentrations of PAH’s were found to be well within current guideline values for a Public Open Space (Parks / non residential) end use scenario.

7.4.1.3 *Total Petroleum Hydrocarbons and BTEX (soil only)*

5 No. of the 10 No. soil samples submitted for testing were analysed for characterised TPH and B-TEX compounds and the results compared to current SSV’s. Whilst there were some very slight detectable concentrations of TPH fractions in some of the samples submitted for testing, on comparing the recorded values with current guideline values, none of the determinands included in the suite of tests were found to be in concentrations which exceed the current At-risk SSV’s for a ‘commercial’ end use scenario (SOM 1%). Indeed the vast majority of the determinands were found to be in concentrations which were below the limit of analytical detection and with respect to these contaminants, the site can be considered suitable for its proposed end use without the need for any specific remediation. **Also for those samples obtained from the earth embankment area along the southern site boundary (parts of which are likely to be retained), concentrations of TPH and BTEX contaminants were found to be well within current guideline values for a Public Open Space (Parks / non residential) end use scenario.**

The absence of any significantly elevated TPH or B-TEX fractions within the **soil** samples submitted for testing suggests that the risk of hydrocarbon vapours from soil entering the proposed new extensions is very low.

7.4.1.4 *Asbestos*

5 No. of the 10 No. soil samples were submitted for examination the presence of asbestos in soil using polarised light microscopy. No traces of asbestos were detected in any of the samples submitted for examination.

7.4.1.5 *Others*

Chemical tests performed on representative samples of the near surface soils and made up / disturbed ground as part of the environmental screening, recorded water-soluble sulphate concentrations between 13mg/l and 102mg/l (2:1 water / soil extract) with pH between 7.7 and 10.7. In accordance with the guidelines contained in Part 1 of the Digest and taking into account the geology and specific soil and groundwater conditions, the site can be assigned a design sulphate class of DS-1 and an ACEC (Aggressive Chemical Environment for Concrete) Class AC-1s.

7.4.1.6 *WIR Suite*

A single sample obtained from slightly greater depth (BH2 0.70-0.90m) was submitted for a suite of tests often requested by water companies in order to establish the material choice and level of protection required for underground potable water pipes. The results of the test would suggest that PE could be suitable for underground potable water supply pipes, however, this should be confirmed at an early stage with the local water company who may wish to consult the full complement of available contamination test data.

7.1.4.7 *Waste Acceptance Criteria (WAC)*

Compliance testing of four soil samples obtained from within the earth embankment along the southern part of the site has been carried out in order to classify materials within the Waste Acceptance Criteria (WAC). The samples were obtained from along the length of the embankment which extends along the southern site boundary. It was considered likely that large parts of this

embankment will need to be excavated and removed from site as part of the proposed redevelopment proposals. The results of the tests are presented on the enclosed Waste Acceptance Criteria Testing certificates 79560-4, 8, 9 and 10.

For the 4 No. samples submitted for testing, the results of the WAC analysis indicate that the leached concentrations (10:1) of the various contaminants would classify these materials within the Inert Waste classification.

7.4.3 Ground Gas / Vapours

The Phase I Desk Study revealed that a railway cutting has been in-filled with materials of unknown origin at a distance of 77m to the southeast of the site. Although highly unlikely, this feature could, nevertheless be considered a potential source of land gas generation that could potentially impact on the study site.

Guidance in Ciria Report C665 indicates that for a 'low' '*generation of potential source*' i.e. made ground with limited degradable material, organic clays of limited thickness and a "low" '*sensitivity of end use*' i.e. 'commercial', then the recommended gas monitoring period would be 6 readings over a period of 2 months.

7.4.3.1 Ground Gas Monitoring Installations

In order to quantify the risk from ground gas, 3 No. boreholes / soakaway holes (BH1, BH4 and BH6) were converted into ground gas monitoring wells. The installations were extended to depths of between 1.00m and 1.45m into the deposits of weathered sandstone. The approximate locations of the installations have been indicated on the enclosed Borehole Location Plan.

Analysis was carried out using a GA2000 portable gas analyser, which determines a quantitative analysis of methane and carbon dioxide by infrared absorption with internal electrochemical sensors to measure oxygen, hydrogen sulphide and carbon monoxide.

All works were performed in accordance with: -

- BS 5930 1999 +A2 2010, Code of Practice for Site Investigations.
- BS 10175: 2000, Investigation of Potentially Contaminated Sites.
- CIRIA Report C665, Assessing risks posed by hazardous gases to buildings (2007).

In keeping with the recommendations of the PH1 Desk Study, 6 No. land gas reading have been scheduled from the installations over a two month period i.e. from approximately mid June 2019 to mid August 2019. Guidance on the assessment of the hazards of landfill gas is presented in the following documents:

- Landfill Gas, Waste Management Paper Number 27.
- The Building Regulations 1991, Approved Document C, Section 2.
- Construction of new buildings on gas-contaminated land, BRE Report, 1991.
- CIRIA Report C665, Assessing risks posed by hazardous gases to buildings (2007).
- B.S. 8485 C.O P. (2015) for the design of protective measures for methane and carbon dioxide ground gas for new buildings.

The Building Regulations set action levels for both methane and carbon dioxide from which an initial assessment can be made. The action threshold for methane is 1.0% v/v. Specific design might be required if carbon dioxide concentrations exceed 5.0% v/v. If action thresholds are exceeded, then reference should be made to specific documentation to determine the nature and extent of the gas control measures.

7.4.3.2 Ground Gas Test Results

During the initial monitoring period (between 19th June and 2nd July 2019) 2 No. readings have been undertaken. The results indicate zero concentrations of methane with carbon dioxide concentrations ranging between 0.0% and 0.6% and oxygen varied between 19.9% v/v and 20.6% v/v. Zero concentrations of hydrogen sulphide and carbon monoxide were recorded. No positive flow rates were recorded.

If further rounds of monitoring (i.e. 4 No. rounds to go with a monitoring period extending to approximately late August 2019) reveal similar test results it would be possible to classify the site as Characteristic Situation 1 ‘Very low risk’ (Modified Wilson & Card Classification [CIRIA Report 659] or ‘Green’ in the ‘Traffic Lights’ Gas Risk Assessment used by the National House Building Council (NHBC) in ‘Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present – Report No. 04. March 2007’. Within this risk category, no specific special ground gas protective measures would be required for the proposed development.

Table 11.2: Typical Scope of Protective Measures Required for the Revised Wilson and Card Classification (CIRIA Report 659)

Characteristic Situation (from Table 11.1)	Residential building (Not low-rise traditional housing) ¹		Commercial/Industrial development	
	Number of levels of protection	Typical scope of protective measures	Number of levels of protection	Typical scope of protective measures
1	None	No special precautions	None	No special precautions
2	2	a) Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 120kg DPM and underfloor venting b) Beam and block or pre-cast concrete and 2000 g DPM reinforced gas membrane and underfloor venting All joints and penetrations sealed. 1 to 2	1 to 2	a) Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 120kg DPM b) Beam and block or pre-cast concrete slab and minimum 2000g DPM reinforced gas membrane c) Possibly underfloor venting or pressurisation in combination with a) and b) depending on use All joints and penetrations sealed.
3	2	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space.	1 to 2	All types of floor slab as above. All joints and penetrations sealed. Minimum 2000g reinforced gas proof membrane and passively ventilated underfloor sub-space or positively pressurised underfloor sub-space
4	3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated underfloor sub-space or positively pressurised underfloor sub-space, oversite capping or blinding and in ground venting layer.	2 to 3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space with monitoring facility.
5	4	Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space, oversite capping and in ground venting layer and in ground venting wells or barriers.	3 to 4	Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised underfloor sub-space with monitoring facility. In ground venting wells or barriers.

The absence of any significantly elevated TPH or B-TEX fractions within the **soil** samples submitted for testing suggests that the risk of hydrocarbon vapours from soil entering the proposed new buildings is very low.

8.0 Contamination Summary, Revised Conceptual Site Model & Risk Assessment

The Preliminary Conceptual Site Model and Risk assessment developed in the Phase 1 Desk Study identified possible pollutant linkages stemming from the historical land uses at the site itself and / or in the immediate environs. The principal potential contaminants of concern were considered to

be metals, semi-metals, PAH's, TPH, B-TEX, asbestos, harmful ground gasses and potential toxic vapours.

The principal receptors of potential contamination from soil and groundwater were identified as current and future end users of the site, ground workers, controlled surface and ground waters / Secondary A aquifer, structures and buried concrete. The risk classification afforded to these possible pollution linkages was perceived to be 'Moderate to Very Low'.

The investigation has now revealed that within the near surface deposits of 'made ground' and natural soils underlying the site, concentrations of potential contaminants are well within current guideline values for a 'Commercial' end use scenario and in terms of soil contamination, the test results would suggest that no specific remedial measures are required in order for the proposed development to proceed as planned. Furthermore, in the samples obtained from within the earth embankment which extends along the southern site boundary (part of which is likely to be retained), concentrations of contaminants were found to be well within ATRISKSoil guideline values for a POS (Parks / non residential) end use scenario.

Permeability trials attempted within the deposits of weathered sandstone have demonstrated that these deposits have a very low permeability and as such are providing an effective barrier to the vertical migration of potentially contaminated leachate. The site is not situated within 250m of a groundwater SPZ, no active abstraction points have been identified within 2000m of the site.

Ground gas monitoring (to date) has not detected significant ground gas emissions.

On the basis of the information which has now become available in the Phase 2 Investigation, a revised conceptual site model and risk assessment has been developed which is outlined in the matrix below.

Revised Conceptual Site Model Based on Information Gathered in Phase 2 Intrusive Investigation

Source	Pathway	Receptor	Any significant contamination present Y/N	Previous Risk Class Phase 1 Desk study	New Risk Class Based on Phase 2 Investigation
Historical and ongoing commercial / industrial processes. Storage of materials and waste products. Use and parking of vehicles, HGV's and fork lift trucks. Construction of structures that occupy parts of the site. The possible presence of deposits of made ground that may exist beneath parts of the site surface. Burning processes that have taken place within the site boundaries or in adjacent areas. Residual contamination from natural weathering of geological strata. The presence of harmful ground gasses such as methane and carbon dioxide from the former in-filled railway cutting to the south.	Ingestion, Inhalation (dust) and / or Dermal Contact and Migration of Potentially Contaminated Leachate	Construction / Maintenance Workers / General Public during Excavations	No	Moderate / Low	Low – The investigation has now revealed that within the near surface deposits of 'made ground' and natural soils underlying the site, concentrations of potential contaminants are well within current guideline values for a 'Commercial' end use scenario. Furthermore, in the samples obtained from the earth embankment, which extends along the southern boundary (parts of which are likely to be retained), concentrations of contaminants were found to be well within ATRISKSoil guideline values for a POS (Parks / non residential) end use scenario. Nevertheless, in order to mitigate the risk of temporary exposure to any potential slight contamination which has not been identified in this survey, site / ground workers should be equipped with appropriate PPE (overalls, gloves, dust masks, eye protection) during any earth works operations. Adequate welfare facilities should also be provided. If earthworks are carried out during very dry and windy conditions, dust suppression measures should be put in place. If excavated soils are exported from site this should be in covered vehicles to limit the release of airborne particulates.
		Future Site Users	No	Moderate / Low	Low – The investigation has now revealed that within the near surface

The possible migration of contamination from the various commercial / industrial areas surrounding the site. Potential Contaminants Include – PAH, TPH, B-TEX, metals, semi-metals and asbestos. Gasses include methane, carbon dioxide and TPH vapours.					deposits of 'made ground' and natural soils underlying the site, concentrations of potential contaminants are well within current guideline values for a 'Commercial' end use scenario and in terms of soil contamination, the test results would suggest that no specific remedial measures are required in order for the proposed development to proceed as planned. Furthermore, in the samples obtained from the earth embankment, which extends along the southern boundary (parts of which are likely to be retained), concentrations of contaminants were found to be well within ATRISKSoil guideline values for a POS (Parks / non residential) end use scenario. The current layout would suggest that, once the development is complete the vast majority of the site will be covered with foundation concrete / floor slabs or areas of permanent hard surfacing. The risk posed to future users of the site is therefore considered to be 'low'.
		Landscaping Plants	No	Very Low	Very Low – Environmental screening of the soil samples submitted for testing did not detect any elevated concentrations of contaminants above acceptable guideline limits for a 'commercial' or 'public open space – parks / non residential' end use. Trees and plants growing along the southern boundary do not appear to be exhibiting any significant signs of distress.
		Water supply Pipes	No	Low	Low – A sample obtained from slightly greater depth (BH2 0.70-0.90m) was submitted for a suite of tests often requested by water companies in order to establish the material choice and level of protection required for underground potable water pipes (WIR Test). The results of the test would suggest that PE could be suitable for underground potable water supply pipes, however, this should be confirmed at an early stage with the local water company who may wish to consult the full complement of available contamination test data.
		Underground Structures	No	Low	Low – Chemical tests performed on representative samples of the near surface soils and made up / disturbed ground as part of the environmental screening, recorded water-soluble sulphate concentrations between 13mg/l and 102mg/l (2:1 water / soil extract) with pH between 7.7 and 10.7. In accordance with the guidelines contained in Part 1 of the Digest and taking into account the geology and specific soil and groundwater conditions, the site can be assigned a design sulphate class of DS-1 and an ACEC (Aggressive Chemical Environment for Concrete) Class AC-1s.
		Controlled waters (Surface / Groundwater / Off site drains)	No	Moderate & Moderate / Low	Low - The investigation has now revealed that within the near surface deposits of 'made ground' and natural soils underlying the site, concentrations of potential contaminants are well within current guideline values for a 'Commercial / POS parks' end use scenario and in terms of soil contamination, the test results would suggest that no specific remedial measures are required in order for the proposed development to proceed as

					planned. Permeability trials attempted within the deposits of weathered sandstone have demonstrated that these deposits have a very low permeability and as such are providing an effective barrier to the vertical migration of potentially contaminated leachate. The site is not situated within 250m of a groundwater SPZ, no <u>active</u> abstraction points have been identified within 2000m of the site. The Emaphsite indicates that the nearest surface water feature to the study site is an inland river not influenced by normal tidal action situated 122m north of the site. At such a distance, this receptor is unlikely to be considered at risk if any significant contamination is ultimately revealed on the site. No <u>active</u> surface water abstractions are identified within 2000m of the site.
	Migration of harmful ground gasses / vapours through permeable made ground and natural strata and accumulation in confined spaces.	Construction / Maintenance Workers	To be completed	Moderate / Low	Low (provisional) - A narrow railway cutting once extended approximately 77m to the southeast of the site which has subsequently been in-filled with unknown materials. This area could be considered a <u>potential</u> source of land gas generation that could possibly impact on the study site. Guidance in Ciria Report C665 would suggest that a 'low' '<i>generation of potential source</i>' i.e. made ground with limited degradable material, organic clays of limited thickness and a "low" "<i>sensitivity of end use</i>" i.e. commercial, then the recommended gas monitoring period would be 6 readings over a period of 2 months. The 2 No. ground gas monitoring tests undertaken (to date) has not detected any significant ground gas emissions (CO₂ & CH₄). Current information would suggest that construction workers would not at significant risk from ground gas accumulations in deep excavations or enclosed spaces. The absence of any significantly elevated TPH or B-TEX fractions within the soil samples submitted for testing suggests that the risk of hydrocarbon vapours from soil entering any open excavations or enclosed spaces during construction is very low.
		Current and Future Site Users	To be completed	Moderate / Low	Low (provisional) - A narrow railway cutting once extended approximately 77m to the southeast of the site which has subsequently been in-filled with unknown materials. This area could be considered a potential source of land gas generation that could potentially impact on the study site. Guidance in Ciria Report C665 would suggest that a 'low' '<i>generation of potential source</i>' i.e. made ground with limited degradable material, organic clays of limited thickness and a "low" "<i>sensitivity of end use</i>" i.e. commercial, then the recommended gas monitoring period would be 6 readings over a period of 2 months. The 2 No. ground gas monitoring tests undertaken (to date) has not detected any

					significant ground gas emissions (CO₂ & CH₄). If in future 4 No. rounds of monitoring, similar low concentrations of ground gasses are recorded, it may be possible to classify the site as Characteristic Situation 1 'Very low risk' (Modified Wilson & Card Classification [CIRIA Report 659] or 'Green' in the 'Traffic Lights' Gas Risk Assessment used by the National House Building Council (NHBC) in 'Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present – Report No. 04. March 2007'. Within this risk category, no specific special ground gas protective measures would be required for the proposed development. The absence of any significantly elevated TPH or B-TEX fractions within the soil samples submitted for testing suggests that the risk of hydrocarbon vapours from soil entering the proposed new buildings is very low.
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9.0 Precautionary Measures

Some precautionary measures are recommended and these are listed:-

- Ground workers involved in the development should be provided with appropriate personal protective equipment in order to mitigate the risk of temporary exposure to any contamination not identified in this survey.
- If materials suspected of being significantly contaminated are revealed during site preparation, then it will be necessary to take representative samples and carry out additional analysis. All such occurrences should be photographed, carefully logged and the extent shown on a copy of the site plan. Remediation work should not take place until this potential 'new' contamination has been fully identified and a remediation strategy approved by the local authority. Any soils suspected of being contaminated, which are stockpiled, should be placed on sheeted areas and representative samples submitted for analysis. Upon receipt of the results, these materials will be either available for re-use or exported to an authorized landfill.
- If it is necessary to export excavated soil from the site, this should be to an appropriate receiving facility. Any documentation relating to the export of soils from site should be retained for possible future inspection by the local authority Environmental Protection Unit. Changes in legislation concerning hazardous waste may have an effect on the disposal costs of any materials from the site. Compliance testing of four soil samples has been carried out in order to classify materials within the Waste Acceptance Criteria (WAC) obtained from the earth embankment which is located along the southern boundary of the site. It was considered likely that these areas would need to be excavated and the soils removed from site as part of the proposed redevelopment. The results of the tests are presented on the enclosed Waste Acceptance Criteria Testing certificates 79560-4, 8, 9 and 10. For the 4 No. samples submitted for testing, the results of the WAC analysis indicate that the leached concentrations (10:1) of the various contaminants would classify these materials within the Inert Waste classification.
- The risk to site users, neighbouring occupants, and 'general' public and to construction workers from airborne pollution is considered to be generally 'low'. However, basic dust suppression measures should be adopted for the duration of any earth works as a precaution particularly if undertaken in dry and dusty conditions.

Haulage vehicles removing any excavated soils from site should be provided with a cover sheet to reduce the possibility of release of potentially contaminated airborne particulates during transportation.

- If potable water supply pipes are to be placed within the surface soils, these are likely to necessitate protection. A soil sample was submitted for a UKWIR suite of tests that are commonly used to assist in the materials selection for potable water supply pipes. The results of the test would suggest that PE would be suitable for underground potable water supply pipes, however, this should be confirmed at an early stage with the local water company bearing in mind some elevated concentrations of sulphate, boron and TPH fractions have been recorded in the near surface perched water sample.

Provided the measures detailed above are implemented, then the long term risk to human health and other environmental receptors is considered to be generally Low.

10.0 Engineering Comments Geotechnical

The recent borings have revealed that on the lower, level part of the site, beneath any surface construction materials, the deposits of made / disturbed ground extend to depths of between 0.45m and 0.80m beneath the surface. The deposits of made up / disturbed ground were underlain by competent, weathered deposits of sandstone comprising generally 'medium dense', quickly becoming 'dense', silty, sandy and occasionally clayey soil containing weathered fragments and layers of light brown, rust brown, dark brown and grey, micaceous sandstone. At depths of between 0.70m and 1.25m beneath the surface, these deposits developed into less weathered deposits of 'very dense' light brown and rust brown, medium grained sandstone. Clearly, this weathered rock will provide a satisfactory foundation bearing stratum for conventional shallow spread foundations i.e. pads and strip footings.

Foundations

As a preliminary guide to design, pad or strip foundations constructed on deposits of 'very dense' weathered sandstone can anticipate a presumed bearing value of at least 600kN /m². No significant settlement is anticipated for foundations / floor slabs constructed on the very dense weathered sandstone. Foundations excavations which extend in the 'very dense' sandstone, may require specialist plant to facilitate penetration.

Ground Slabs

Ground bearing floor slabs would also be acceptable provided any unsuitable deposits of made up, disturbed or reworked ground is first removed and replaced with compacted granular fill of suitable grading.

Earth Embankment

From the single borehole located within the central part of the earth embankment it would appear that the material present behind the exposed face of the embankment generally comprises silty and sandy soil with inclusions of sandstone and mudstone. However, further into the 'body' of the embankment more competent materials may be encountered which may required heavier excavation plant to facilitate excavation. Natural deposits of weathered sandstone were encountered towards the base of the embankment and quickly became very dense. The datum level at which very dense deposits of weathered sandstone were encountered, towards the base of BH3 undertaken on the higher ground, appeared to be generally consistent with the depth at which similar deposits were encountered in the borings taken on the lower lying areas of the site. This

however may not be the case towards the more southern parts of the site where natural deposits may be encountered at higher datum.

The deposits encountered in the embankment borehole were found to be generally 'dry' in composition, no doubt due in part to dehydration by the roots of the numerous trees and dense vegetation covering the surface. This vegetation will need to be removed prior to any earthworks. If the earth works are undertaken during the drier weather, then the excavation face of the embankment should be temporarily stable at a modest slope angle. However, in wetter conditions any exposed materials may deteriorate in time which may compromise the stability of the cut face. The design and construction of the proposed retaining structure will depend to some extent on the quality of the material ultimately exposed in the cut face of the embankment which it is intended to support. However the material at foundation level is likely to comprise very dense Mexborough Rock with a presumed bearing value similar to that quoted above.

Building Near Trees

Atterberg Limit tests were attempted on representative samples of the residual deposits of highly weathered sandstone. In all cases the samples were found to be non-plastic and as such these soils would not be susceptible to the drying effects / desiccation by root action of trees.

Soakaway Potential

In two of the sampling boreholes (BH1 & BH6), 'falling head' (variable head) permeability tests were attempted in order to establish the relative permeability of the near surface stratum *in situ*. At the start of the test, the boreholes were quickly filled to appropriate level with water. The time taken for the water to dissipate from the test holes was then subsequently monitored. After approximately three hours of monitoring, no appreciable drop in the water level was observed in the test holes and it was therefore concluded that the near surface deposits of very dense, weathered sandstone were of low permeability and would not provide a suitable media for the dissipation of surface water from 'soakaways'.

Open Excavations

Over the majority of the site, shallow excavations which are left open for short periods should be temporarily self supporting. Some minor instability may be experienced whilst excavating through layers of granular made ground (sub-base). As the majority of the borings remained dry, no significant groundwater infiltrations are anticipated whilst forming the excavation for the proposed new structure. Some slight 'perched' water infiltrations may be experienced if excavating in the vicinity of BH5 where a localised area of saturated granular sub base was encountered. However, infiltrations are unlikely to be significant and where encountered should be capable of being controlled with conventional dewatering plant.

Design Sulphate Classification

Chemical tests performed on representative samples of the near surface soils and made up / disturbed ground as part of the environmental screening, recorded water-soluble sulphate concentrations between 13mg/l and 102mg/l (2:1 water / soil extract) with pH between 7.7 and 10.7. In accordance with the guidelines contained in Part 1 of the Digest and taking into account the geology and specific soil and groundwater conditions, the site can be assigned a design sulphate class of DS-1 and an ACEC (Aggressive Chemical Environment for Concrete) Class AC-1s.

Pavement Design

A California Bearing Ratio test (CBR) was performed on a large diameter, undisturbed core sample obtained from anticipated formation level within the proposed new concrete hard standing storage area (CBR 1). The sample was obtained from the near surface deposits which comprised

made ground of silty, sandy soil containing occasional fine to medium fragments of weathered sandstone and brick. The results of the test indicate an approximate CBR value (to the nearest 1%) of 2%. On the assumption that similar made ground is likely be present at formation beneath the area of the proposed new concrete hard standing then a CBR value of 2% would be an appropriate value to adopt of design purposes.

The opinions expressed in this Report are consistent with guideline standards available at the time of its preparation and assume that the ground conditions do not vary significantly beyond the range revealed within the agreed scope and budget for the investigation. There may, however, be conditions at the site, which have not been identified by the investigation and therefore will not have been considered in the report. Accordingly a careful watch should be maintained during any future ground works at the site and the report and its conclusions reviewed and / or modified accordingly within the context of the nature any development intended at the site.

Prepared by:

.....**R. L. Trattles** (Director)

Reviewed by:

.....**S. P. Trattles** (Director)

TLP Ground Investigation Ltd.

RT/GO&CL/U28CRG/GGPC/07/19

Site Location Plan

Unit 28, Commercial Road, Goldthorpe Industrial Estate, Goldthorpe, Rotherham



Site Location Plan

Unit 28, Commercial Road, Goldthorpe Industrial Estate, Goldthorpe, Rotherham



Site Location Plan

Unit 28, Commercial Road, Goldthorpe Industrial Estate, Goldthorpe, Rotherham



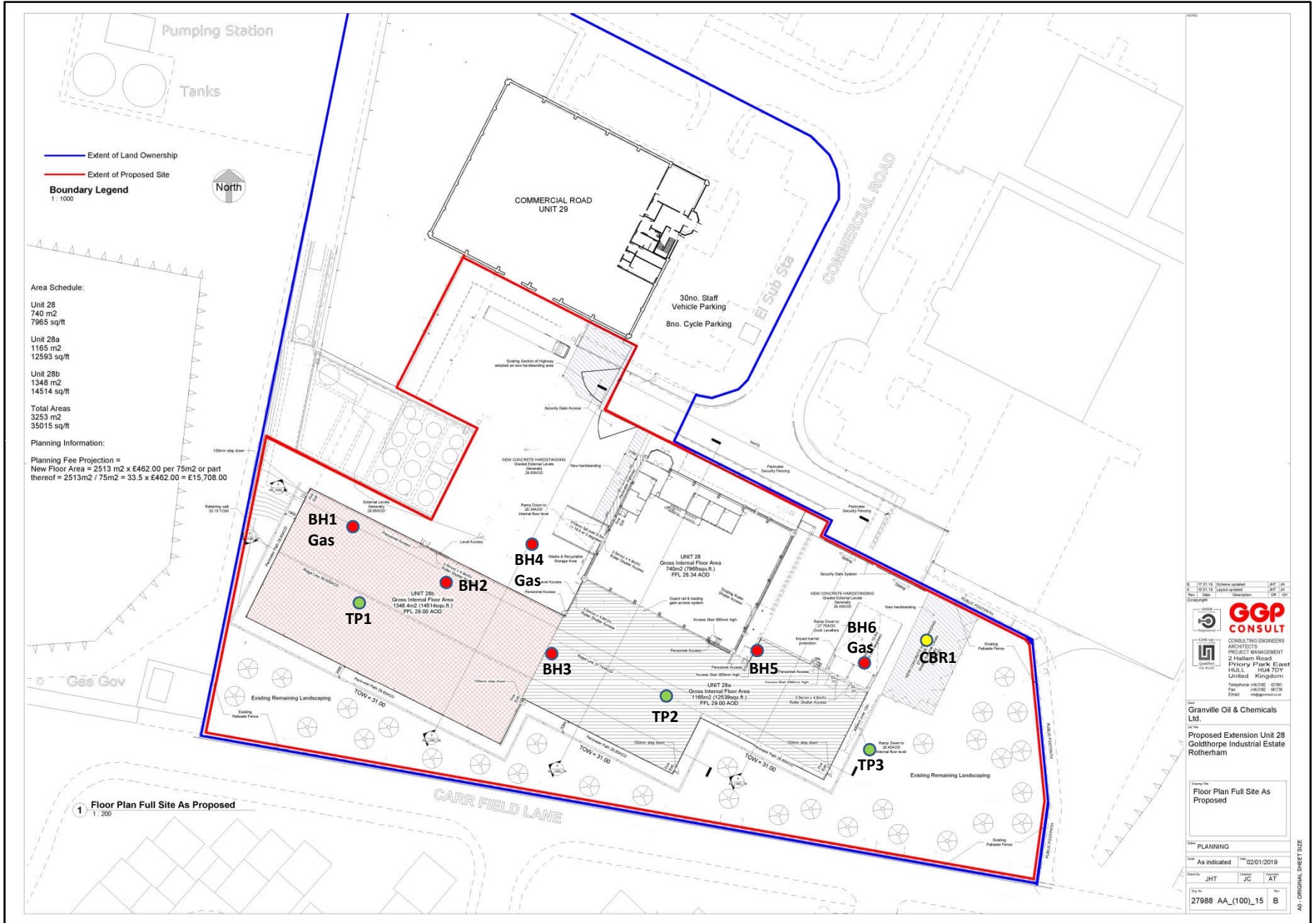
Site Location Plan

Unit 28, Commercial Road, Goldthorpe Industrial Estate, Goldthorpe, Rotherham



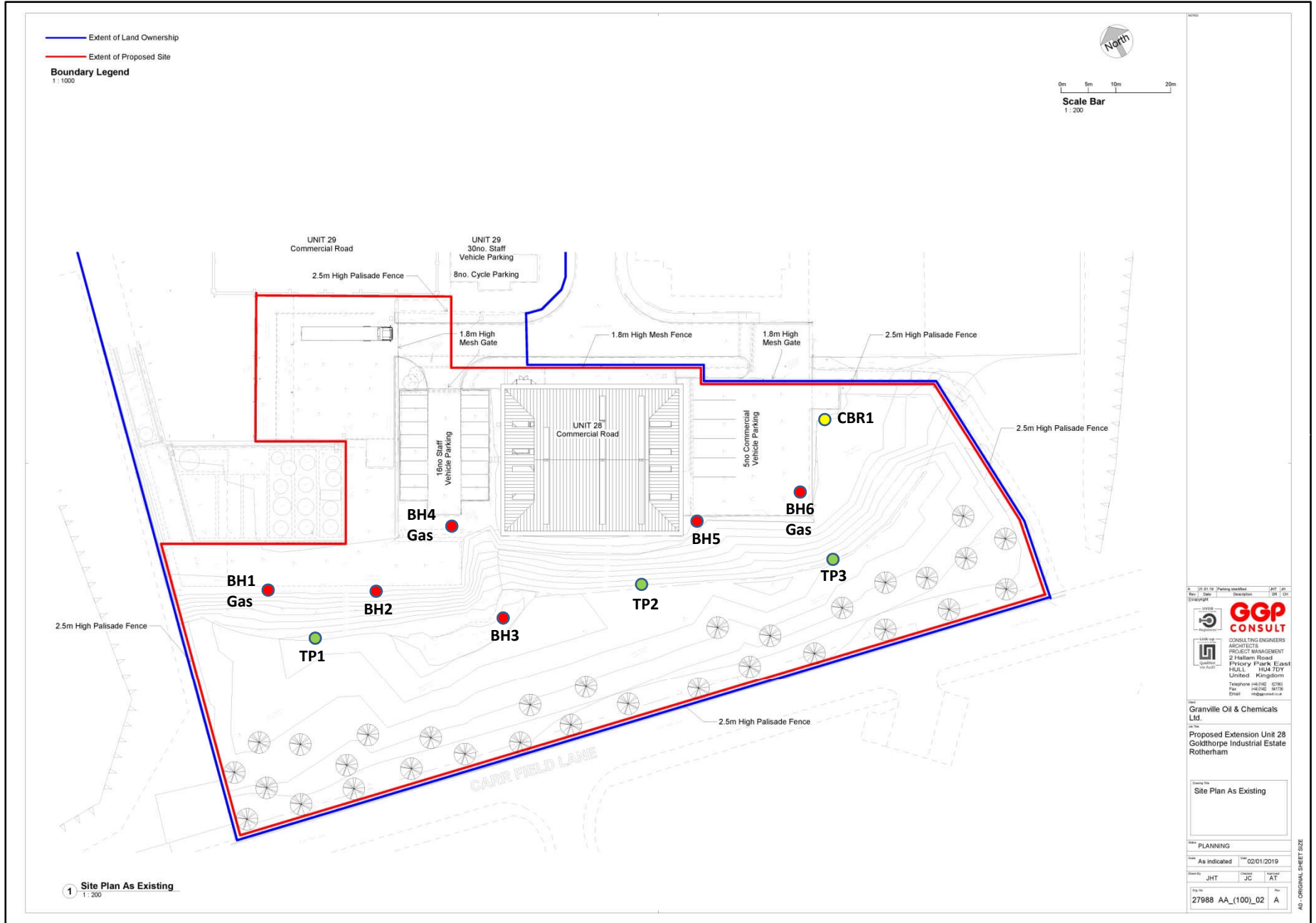
Borehole Location Plan

Unit 28, Commercial Road, Goldthorpe Industrial Estate, Goldthorpe, Rotherham



Borehole Location Plan

Unit 28, Commercial Road, Goldthorpe Industrial Estate, Goldthorpe, Rotherham



T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Factory Extension, Granville Oil & Chemicals, Unit 28, Goldthorpe Ind. Est., Goldthorpe.		Borehole No. BH1.		
Carried out For Granville Oil & Chemicals Ltd. C/o. GGP		Ground Level		Co-ordinates		Date : 19.06.19.		
Description		Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
					Depth	samples		
Type	No.							
Concrete slab (edge only). Made Ground Fine, medium and coarse fragments of light brown and buff brown weathered sandstone in a matrix of pinkish brown, silty, sandy and clayey soil (reworked).				(0.20) 0.20 (0.28) 0.48	0.00 - 0.85	U	1	
Mid brown, mottled rust brown and dark brown and light grey fragments of weathered, micaceous Sandstone in a matrix of buff brown, silty, sandy clay. Very dense, rust brown, medium grained Sandstone . Mexborough Rock			 	(0.37) 0.85 1.00	0.85	D	1	S 113 for 150mm penetration then refusal
End of Borehole 								
Observations No groundwater seepages were encountered within the depth penetrated and on completion the borehole remained dry. On completion a 'falling head' (variable head) permeability test was performed in the completed borehole in order to establish the relative permeability of the near surface soils in situ. After several hours, no appreciable drop in water level was observed within the borings and it was therefore assumed that the near surface deposits were of low permeability.		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks			Logged by S. P. T. / J. T.	
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.					Scale 1 : 25			
					Fig.			

T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Factory Extension, Granville Oil & Chemicals, Unit 28, Goldthorpe Ind. Est., Goldthorpe.				Borehole No. BH2.			
Carried out For Granville Oil & Chemicals Ltd. C/o. GGP				Ground Level		Co-ordinates		Date : 19.06.19.			
Description				Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records	
							Depth	samples			Test
Type	No.										
Concrete slab (edge only). Made Ground						(0.20)	0.00 - 0.95	U	1	S N29	S 159 for 420mm penetration then refusal
						0.20	0.20	D	1		
Medium dense, mid brown, mottled rust brown and dark brown and light grey fragments of weathered, micaceous Sandstone in a matrix of buff brown, silty, sandy clay.						(0.30)					
Dense, rust brown and dark brown and light brown weathered, micaceous Sandstone in a matrix of buff brown, silty, sand.						0.50					
Very dense, rust brown, medium grained Sandstone .						(0.20)					
Mexborough Rock						0.70					
							0.95	D	2		
											
											
											
											
											
											
											
											
											
											
											
											
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T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Factory Extension, Granville Oil & Chemicals, Unit 28, Goldthorpe Ind. Est., Goldthorpe.				Borehole No. BH3.	
Carried out For Granville Oil & Chemicals Ltd. C/o. GGP		Ground Level		Co-ordinates				Date : 19.06.19.	
Description *Approximately 3.50m above level of concrete yard.		Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records	
					Depth	samples			Test
Type	No.								
Greyish brown, silty, sandy soil containing occasional fine to medium fragments of rust brown, brown and greyish brown sandstone. Made Ground Greyish brown and rust brown, silty, sandy soil containing fine to medium fragments of light brown, rust brown and dark brown sandstone and mudstone. Medium dense, mid greyish brown, silty, sandy soil containing fine to medium fragments of weathered buff brown, dark brown and rust brown, sandstone and mudstone.				(0.25)	0.00 - 1.10	U	1	S N13	
					0.25				
					(0.95)				
					1.10 - 2.10	U	2		
					1.20				
Firm, light grey, mottled buff brown and rust brown, silty and sandy Clay containing occasional coarse fragments of light brown, medium grained sandstone.				(1.50)	2.10 - 2.85	U	3	S N15	
					2.70				
					2.85 - 4.00	U	4		
					(0.60)				
					3.30				
Medium dense, mid brown, mottled rust brown and dark brown and light grey fragments of weathered, micaceous Sandstone in a matrix of buff brown, silty, sandy clay. Mexborough Rock Very dense, rust brown, medium grained Sandstone .				(0.75)	4.05			S 54 for 300mm penetration then refusal	
					4.05				
					4.35				
					End of Borehole				
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value)		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks				Logged by S. P. T. / J. T.	
Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.								Scale 1 : 25	
								Fig.	

T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Factory Extension, Granville Oil & Chemicals, Unit 28, Goldthorpe Ind. Est., Goldthorpe.				Borehole No. BH4.		
Carried out For Granville Oil & Chemicals Ltd. C/o. GGP				Ground Level		Co-ordinates		Date : 19.06.19.		
Description				Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
							Depth	samples		
Type	No.									
Medium, light brown limestone chippings in a matrix of light grey, gritty, sandy fines. Made Ground Mixed, dark brown silty, sandy and clayey soil containing fragments of brown and rust brown, weathered sandstone.						(0.40) 0.40 0.53 (0.13)	0.00 - 1.10	U	1	
Medium dense, mid brown, mottled rust brown and dark brown and light grey fragments of weathered, micaceous Sandstone in a matrix of buff brown, silty, sandy clay. Mexborough Rock Very dense, rust brown, medium grained Sandstone.						(0.72) 1.10 1.25 1.45 End of Borehole	1.10	D	1	S 71 for 350mm penetration then refusal
<u>Observations</u> No groundwater seepages were encountered within the depth penetrated and on completion the borehole remained dry.										
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value)				Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test			Remarks			Logged by S. P. T. / J. T.
Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.										Scale 1 : 25
										Fig.

T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Factory Extension, Granville Oil & Chemicals, Unit 28, Goldthorpe Ind. Est., Goldthorpe.		Borehole No. BH5.		
Carried out For Granville Oil & Chemicals Ltd. C/o. GGP		Ground Level		Co-ordinates		Date : 19.06.19.		
Description		Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
					Depth	samples		
Type	No.							
Mixed brown, silty, slightly clayey soil containing occasional fine to medium fragments of light brown sandstone. Made Ground Medium fragments of crushed concrete in a matrix of brown, gritty, sandy fines. Mixed brown and rust brown, silty, sandy and clayey soil containing occasional fragments of light brown, rust brown and dark grey weathered sandstone. Medium, rounded gravel.				0.00 - 1.10 0.23 (0.22) 0.45 (0.08) 0.53 (0.06) 0.59 (0.24) 0.83 1.13	1.10	U 1 D 1	S 71 for 350mm penetration then refusal	
Medium dense, mid brown, mottled rust brown and dark brown and light grey layers of weathered, micaceous Sandstone in a matrix of buff brown, silty, sandy clay. Mexborough Rock Very dense, rust brown, medium grained Sandstone. End of Borehole								
Observations Perched water seepages were encountered within the deposits of made ground. On completion water rose to within 0.60m of the surface.								
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks			Logged by S. P. T. / J. T. Scale 1 : 25 Fig.	

T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Factory Extension, Granville Oil & Chemicals, Unit 28, Goldthorpe Ind. Est., Goldthorpe.		Borehole No. BH6.	
Carried out For Granville Oil & Chemicals Ltd. C/o. GGP		Ground Level		Co-ordinates		Date : 19.06.19.	
Description		Reduced Level	Legend	Depth & Thickness (0.05)	Samples/Tests Depth samples Type No. Test		Field Records
Tar macadam. Made Ground Dense, medium, light greyish brown limestone chippings in a matrix of light grey, gritty, sandy fines. Light brown and rust brown, silty, sandy soil containing fragments of light brown, light grey and rust brown, weathered sandstone.				0.05 (0.30) 0.35 0.45 (0.10) (0.45) 0.90 1.00 1.37 End of Borehole	0.00 - 1.00 1.00 	U 1 S N32 D 1 S 100 for 300mm penetration then refusal	
Dense, rust brown and dark brown and light brown weathered, micaceous Sandstone in a matrix of buff brown, silty, sand. Very dense, rust brown, medium grained Sandstone . Mexborough Rock							
Observations No groundwater seepages were encountered within the depth penetrated and on completion the borehole remained dry. On completion a 'falling head' (variable head) permeability test was performed in the completed borehole in order to establish the relative permeability of the near surface soils in situ. After several hours, no appreciable drop in water level was observed within the borings and it was therefore assumed that the near surface deposits were of low permeability.							
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks			Logged by S. P. T. / J. T.
							Scale 1 : 25
							Fig.

T.L.P. Ground Investigations Ltd.		Borehole Record Hand digging		Location : Proposed Factory Extension, Granville Oil & Chemicals, Unit 28, Goldthorpe Ind. Est., Goldthorpe.		Borehole No. TP1.	
Carried out For Granville Oil & Chemicals Ltd. C/o. GGP		Ground Level		Co-ordinates		Date : 19.06.19.	
Description *Approximately 3.50m above level of concrete yard.		Reduced Level	Legend	Depth & Thickness	Samples/Tests		Field Records
					Depth	samples Type No.	Test
Greyish brown, silty, sandy soil containing occasional fine to medium fragments of rust brown, brown and greyish brown sandstone. Made Ground Greyish brown and rust brown, silty, sandy soil containing fine to medium fragments of light brown, rust brown and dark brown sandstone and mudstone. Observations No seepages were encountered within the depth penetrated and on completion the excavation remained dry.				(0.30) 0.30 0.60 End of Excavation	0.30 - 0.50	D 1	
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks			Logged by S. P. T. / J. T.
							Scale 1 : 25
							Fig.

T.L.P. Ground Investigations Ltd.		Borehole Record Hand digging		Location : Proposed Factory Extension, Granville Oil & Chemicals, Unit 28, Goldthorpe Ind. Est., Goldthorpe.			Borehole No. TP2.	
Carried out For Granville Oil & Chemicals Ltd. C/o. GGP		Ground Level		Co-ordinates			Date : 19.06.19.	
Description *Approximately 3.50m above level of concrete yard.		Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
					Depth	samples Type	No.	Test
Dark greyish brown and rust brown, silty, sandy soil containing fine to medium fragments of light brown, rust brown and dark brown sandstone and mudstone.				0.20 - 0.40 0.60 End of Excavation	D	1		
Made Ground								
Observations No seepages were encountered within the depth penetrated and on completion the excavation remained dry.								
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test			Remarks			Logged by S. P. T. / J. T.
								Scale 1 : 25
								Fig.

T.L.P. Ground Investigations Ltd.		Borehole Record Hand digging		Location : Proposed Factory Extension, Granville Oil & Chemicals, Unit 28, Goldthorpe Ind. Est., Goldthorpe.				Borehole No. TP3.	
Carried out For Granville Oil & Chemicals Ltd. C/o. GGP		Ground Level		Co-ordinates				Date : 19.06.19.	
Description *Approximately 3.50m above level of concrete yard.		Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records	
					Depth	samples			Test
						Type	No.		
Mid brown and buff brown, silty, sandy soil containing fine to medium fragments of light brown, rust brown and dark brown sandstone and mudstone. Made Ground				0.20 - 0.40	D	1			
Observations No seepages were encountered within the depth penetrated and on completion the excavation remained dry.				0.60 End of Excavation					
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value)		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test			Remarks			Logged by S. P. T. / J. T.	
Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.								Scale 1 : 25	
								Fig.	

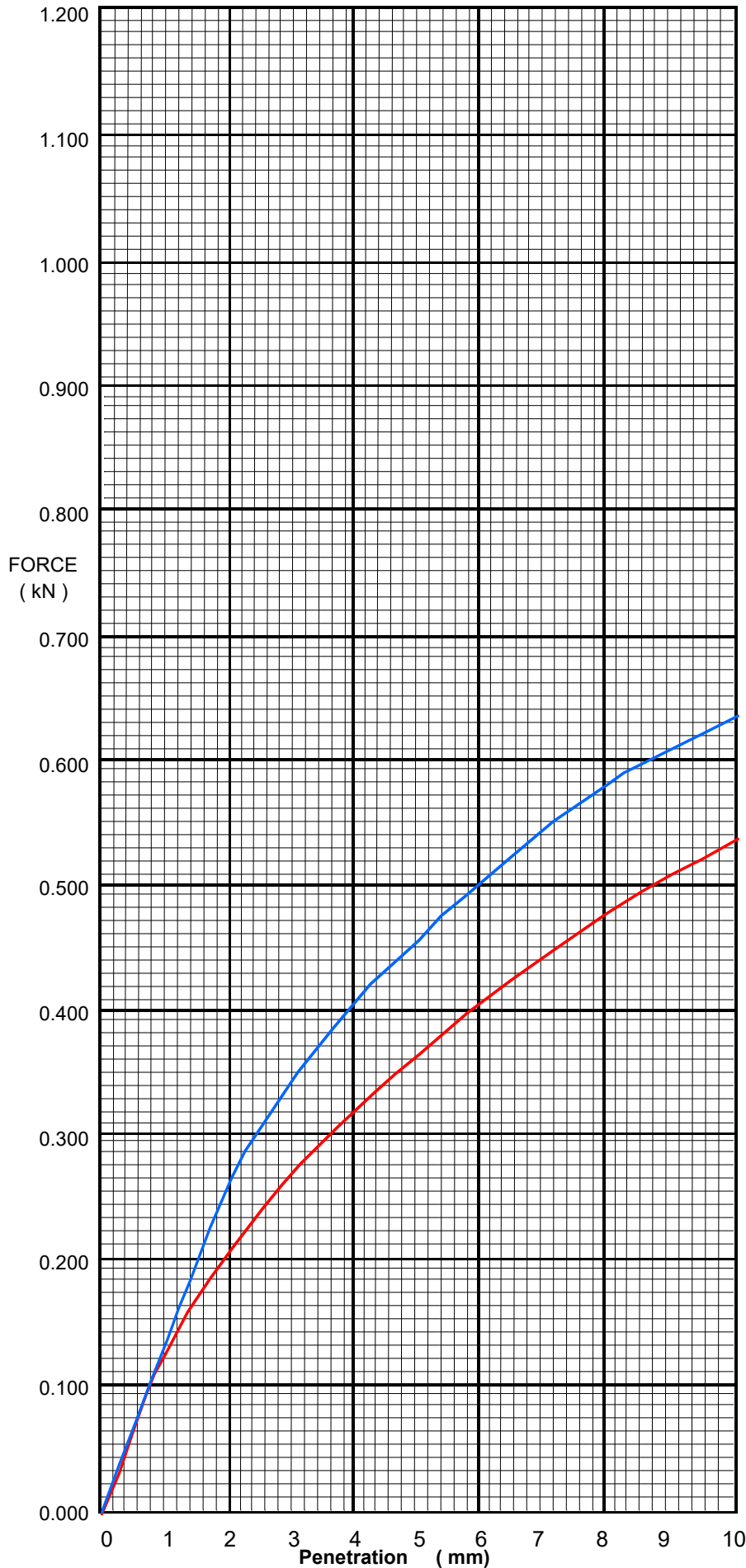
T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Factory Extension, Granville Oil & Chemicals, Unit 28, Goldthorpe Ind. Est., Goldthorpe.				Borehole No. CBR1.	
Carried out For Granville Oil & Chemicals Ltd. C/o. GGP		Ground Level		Co-ordinates				Date : 19.06.19.	
Description		Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records	
					Depth	samples			Test
Type	No.								
Loose, dark brown, silty, sandy and clayey soil containing occasional fine to medium fragments of light brown, weathered sandstone. Made Ground Mid brown, rust brown and light grey, silty, sandy soil containing fragments of light brown, light grey and rust brown, weathered sandstone and fine brick.				(0.30) 0.30 (0.50) 0.80 0.90	0.00 - 0.45	D	1	S	Note SPT's undertaken directly adjacent to CBR
Dense, rust brown and dark brown and light brown weathered, micaceous Sandstone in a matrix of buff brown, silty, sand. Mexborough Rock Observations No groundwater seepages were encountered within the depth penetrated and on completion the borehole remained dry.					0.30 - 0.50	U	1	CBR1	
					0.45	D	2	S	N50

California Bearing Ratio.

(BS1377 : Part 4 : 1990 : Test 7)

Client Granville Oil & Chemicals Ltd.
Location Unit 28, Commercial Road, Goldthorpe.

Sample CBR1
(0.30m).



SAMPLE DETAILS.

Dimensions 152mm. dia.
127mm. high.

Preparation

Undisturbed

Bulk Density 1.873 t/m³

Moisture Content 16.9 %

Dry Density 1.602 t/m³

Surcharge weight = 13kg.

AFTER CBR TEST.

Moisture Content below plunger.

Top 16.7 %

Base 17.1 %

CBR Results.

Pene - tration. mm.	Load. kN.	Standard Load. kN.	CBR %
Top			
2.5	0.24	13.2	1.8
5.0	0.36	20.0	1.8
Base			
2.5	0.30	13.2	2.3
5.0	0.45	20.0	2.3

Fig. 1

TLP Ground Investigations

Gas Data Sheet

Granville Oil, Goldthorpe

Site	Granville Oil, Goldthorpe				Weather	slight cloud		
Date	19-06-19				Ground	dry / damp		
Model	GA2000				Temp	18 Deg C		
Calibration Due	04-10-19				Baromtric Trend	- steady		
Borehole	Background	BH1	BH4	BH6				
Average Flow Rate Litres/hr	N/a	0.0	0.0	0.0				
Relative (Borehole) Pressure (mbar)	N/a	0.00	0.00	0.00				
Barometric Pressure (mbar)	1012	1012	1012	1012				
Methane (peak) - CH4 %	0.0	0.0	0.0	0.0				
Carbon Dioxide (peak) - CO2 %	0.0	0.2	0.5	0.0				
Oxygen (minimum) - O2 %	20.9	20.4	20.1	20.6				
Balance Gasses (minimum) %	79.1	79.4	79.4	79.4				
Carbon Monoxide (peak) - CO (ppm)	0	0	0	0				
Hydrogen Sulphide (peak) - H2S (ppm)	0	0	0	0				
Water Level BGL (m)	N/a	-	-	-				

Site	Granville Oil, Goldthorpe				Weather	slight cloud		
Date	02-07-19				Ground	dry		
Model	GA2000				Temp	15 Deg C		
Calibration Due	04-10-19				Baromtric Trend	- slightly rising		
Borehole	Background	BH1	BH4	BH6				
Average Flow Rate Litres/hr	N/a	0.0	0.0	0.0				
Relative (Borehole) Pressure (mbar)	N/a	0.00	0.00	0.00				
Barometric Pressure (mbar)	1022	1022	1022	1022				
Methane (peak) - CH4 %	0.0	0.0	0.0	0.0				
Carbon Dioxide (peak) - CO2 %	0.0	0.4	0.6	0.2				
Oxygen (minimum) - O2 %	20.9	20.3	19.9	20.5				
Balance Gasses (minimum) %	79.1	79.3	79.5	79.3				
Carbon Monoxide (peak) - CO (ppm)	0	0	0	0				
Hydrogen Sulphide (peak) - H2S (ppm)	0	0	0	0				
Water Level BGL (m)	N/a	-	-	-				

Site	Granville Oil, Goldthorpe				Weather			
Date					Ground			
Model	GA2000				Temp	Deg C		
Calibration Due	04-10-19				Baromtric Trend			
Borehole	Background	BH1	BH4	BH6				
Average Flow Rate Litres/hr	N/a	0.0	0.0	0.0				
Relative (Borehole) Pressure (mbar)	N/a	0.00	0.00	0.00				
Barometric Pressure (mbar)		0	0	0				
Methane (peak) - CH4 %	0.0	0.0	0.0	0.0				
Carbon Dioxide (peak) - CO2 %	0.0	0.0	0.0	0.0				
Oxygen (minimum) - O2 %	20.9							
Balance Gasses (minimum) %	79.1	100.0	100.0	100.0				
Carbon Monoxide (peak) - CO (ppm)	0	0	0	0				
Hydrogen Sulphide (peak) - H2S (ppm)	0	0	0	0				
Water Level BGL (m)	N/a	-	-	-				



ANALYTICAL TEST REPORT

Contract no: 79560
Contract name: Granville Oil, Goldthorpe
Client reference: 21062019
Clients name: TLP Ground Investigations
Clients address: 64 Wentworth Road
South Park Industrial Estate
Scunthorpe
DN17 2AZ

Samples received: 24 June 2019

Analysis started: 24 June 2019

Analysis completed: 01 July 2019

Report issued: 01 July 2019

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.
BTEX compounds are identified by retention time only and may include interference from co-eluting compounds.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by:

Dave Bowerbank
Customer Support Hero

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
79560-1	BH1	0.20-0.40	Sandy Clay with Gravel	-	-	10.0
79560-2	BH2	0.20-0.40	Clayey Sand with Gravel	-	-	9.6
79560-3	BH2	0.70-0.90	Sand with Gravel	-	-	7.4
79560-4	BH3	1.00	Sandy Clay with Gravel	-	-	11.3
79560-5	BH5	0.45-0.53	Sandy Clay with Gravel	-	-	14.4
79560-6	BH6	0.35-0.50	Sand with Gravel	-	-	8.4
79560-7	CBR1	0.20-0.30	Sandy Clay with Gravel	-	-	13.7
79560-8	TP1	0.30-0.50	Clayey Sand with Gravel	-	-	15.4
79560-9	TP2	0.20-0.40	Sand with Gravel	-	-	9.6
79560-10	TP3	0.20-0.40	Clayey Sand with Gravel & Roots	-	-	10.7

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SOILS

Lab number Sample id Depth (m) Date sampled			79560-1 BH1 0.20-0.40 21/06/2019	79560-2 BH2 0.20-0.40 21/06/2019	79560-4 BH3 1.00 21/06/2019	79560-5 BH5 0.45-0.53 21/06/2019	79560-6 BH6 0.35-0.50 21/06/2019	79560-7 CBR1 0.20-0.30 21/06/2019
Test	Method	Units						
Antimony (total)	CE127 ^U	mg/kg Sb	-	-	0.9	-	-	-
Arsenic (total)	CE127 ^M	mg/kg As	1.5	2.7	12	4.0	4.0	8.8
Barium (total)	CE127 ^M	mg/kg Ba	-	-	161	-	-	-
Boron (water soluble)	CE063 ^M	mg/kg B	<0.5	<0.5	-	<0.5	<0.5	0.8
Cadmium (total)	CE127 ^M	mg/kg Cd	0.3	0.3	0.2	0.4	<0.2	0.2
Chromium (total)	CE127 ^M	mg/kg Cr	27	30	38	28	46	35
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	-	<1	<1	<1
Copper (total)	CE127 ^M	mg/kg Cu	12	8.4	22	11	8.9	16
Lead (total)	CE127 ^M	mg/kg Pb	10	20	31	25	22	31
Mercury (total)	CE127 ^M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (total)	CE127 ^M	mg/kg Mo	-	-	2.1	-	-	-
Nickel (total)	CE127 ^M	mg/kg Ni	18	19	15	10	14	13
Selenium (total)	CE127 ^M	mg/kg Se	0.4	0.6	0.8	0.4	0.5	0.7
Zinc (total)	CE127 ^M	mg/kg Zn	38	69	75	48	53	58
pH	CE004 ^M	units	8.3	8.2	7.7	10.7	8.6	8.3
Sulphate (2:1 water soluble)	CE061 ^M	mg/l SO ₄	24	17	-	102	15	13
Sulphate (total)	CE062 ^M	mg/kg SO ₄	210	102	-	545	<100	309
Sulphide	CE079	mg/kg S ₂ -	<10	<10	-	<10	<10	<10
Cyanide (free)	CE077	mg/kg CN	<1	<1	-	<1	<1	<1
Cyanide (total)	CE077	mg/kg CN	<1	<1	-	<1	<1	<1
Thiocyanate	CE145 ^M	mg/kg SCN	1.2	<1	-	1.0	<1	<1
Phenols (total)	CE078	mg/kg PhOH	<0.5	3.2	-	<0.5	<0.5	<0.5
Total Organic Carbon (TOC)	CE072 ^M	% w/w C	0.1	0.2	-	0.6	0.2	1.1
Estimate of OMC (calculated from TOC)	CE072 ^M	% w/w	0.2	0.3	-	1.0	0.4	1.9
Loss On Ignition at 440°C	CE006 ^U	% w/w	1.5	1.8	-	2.1	1.1	4.0
PAH								
Naphthalene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Acenaphthylene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Acenaphthene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Fluorene	CE087 ^U	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Phenanthrene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	0.03
Anthracene	CE087 ^U	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Fluoranthene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	0.09
Pyrene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	0.08
Benzo(a)anthracene	CE087 ^U	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Chrysene	CE087 ^M	mg/kg	<0.03	<0.03	-	<0.03	<0.03	<0.03
Benzo(b)fluoranthene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Benzo(k)fluoranthene	CE087 ^M	mg/kg	<0.03	<0.03	-	<0.03	<0.03	<0.03
Benzo(a)pyrene	CE087 ^U	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Indeno(123cd)pyrene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Dibenz(ah)anthracene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02

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SOILS

Lab number Sample id Depth (m) Date sampled			79560-1 BH1 0.20-0.40 21/06/2019	79560-2 BH2 0.20-0.40 21/06/2019	79560-4 BH3 1.00 21/06/2019	79560-5 BH5 0.45-0.53 21/06/2019	79560-6 BH6 0.35-0.50 21/06/2019	79560-7 CBR1 0.20-0.30 21/06/2019
Test	Method	Units						
Benzo(ghi)perylene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
PAH (total of USEPA 16)	CE087	mg/kg	<0.34	<0.34	-	<0.34	<0.34	<0.34
PAH								
Naphthalene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Acenaphthylene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Acenaphthene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Fluorene	CE087 ^U	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Phenanthrene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	0.03
Anthracene	CE087 ^U	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Fluoranthene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	0.09
Pyrene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	0.08
Benzo(a)anthracene	CE087 ^U	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Chrysene	CE087 ^M	mg/kg	<0.03	<0.03	-	<0.03	<0.03	<0.03
Benzo(b)fluoranthene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Benzo(k)fluoranthene	CE087 ^M	mg/kg	<0.03	<0.03	-	<0.03	<0.03	<0.03
Benzo(a)pyrene	CE087 ^U	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Indeno(123cd)pyrene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Dibenz(ah)anthracene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Benzo(ghi)perylene	CE087 ^M	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
PAH (total of USEPA 16)	CE087	mg/kg	<0.34	<0.34	-	<0.34	<0.34	<0.34
BTEX & TPH								
MTBE	CE057 ^U	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
Benzene	CE057 ^U	mg/kg	<0.01	<0.01	-	<0.01	<0.01	<0.01
Toluene	CE057 ^U	mg/kg	<0.01	<0.01	-	<0.01	<0.01	<0.01
Ethylbenzene	CE057 ^U	mg/kg	<0.01	<0.01	-	<0.01	<0.01	<0.01
m & p-Xylene	CE057 ^U	mg/kg	<0.02	<0.02	-	<0.02	<0.02	<0.02
o-Xylene	CE057 ^U	mg/kg	<0.01	<0.01	-	<0.01	<0.01	<0.01
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	-	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	-	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	-	<0.01	<0.01	<0.01
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	-	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	-	<1	<1	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	<1	<1	-	<1	1	<1
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	<1	1	-	<1	1	<1
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	<1	-	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	-	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	-	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	-	<0.1	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	<4	-	<4	<4	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4	<4	-	<4	<4	<4
EPH Aliphatic (>C16-C35)	CE068	mg/kg	<4	23	-	<4	35	34

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SOILS

Lab number			79560-1	79560-2	79560-4	79560-5	79560-6	79560-7
Sample id			BH1	BH2	BH3	BH5	BH6	CBR1
Depth (m)			0.20-0.40	0.20-0.40	1.00	0.45-0.53	0.35-0.50	0.20-0.30
Date sampled			21/06/2019	21/06/2019	21/06/2019	21/06/2019	21/06/2019	21/06/2019
Test	Method	Units						
EPH Aliphatic (>C35-C44)	CE068	mg/kg	<10	14	-	<10	37	17
Subcontracted analysis								
Asbestos (qualitative)	\$	-	NAD	NAD	-		NAD	NAD

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SOILS

Lab number Sample id Depth (m) Date sampled			79560-8 TP1 0.30-0.50 21/06/2019	79560-9 TP2 0.20-0.40 21/06/2019	79560-10 TP3 0.20-0.40 21/06/2019
Test	Method	Units			
Antimony (total)	CE127 ^U	mg/kg Sb	0.8	1.1	0.9
Arsenic (total)	CE127 ^M	mg/kg As	12	13	11
Barium (total)	CE127 ^M	mg/kg Ba	191	134	171
Boron (water soluble)	CE063 ^M	mg/kg B	-	-	-
Cadmium (total)	CE127 ^M	mg/kg Cd	0.2	0.2	<0.2
Chromium (total)	CE127 ^M	mg/kg Cr	36	41	41
Chromium (VI)	CE146	mg/kg CrVI	-	-	-
Copper (total)	CE127 ^M	mg/kg Cu	20	22	17
Lead (total)	CE127 ^M	mg/kg Pb	40	44	39
Mercury (total)	CE127 ^M	mg/kg Hg	<0.5	<0.5	<0.5
Molybdenum (total)	CE127 ^M	mg/kg Mo	2.1	2.9	2.4
Nickel (total)	CE127 ^M	mg/kg Ni	15	15	15
Selenium (total)	CE127 ^M	mg/kg Se	0.8	0.9	0.8
Zinc (total)	CE127 ^M	mg/kg Zn	75	78	77
pH	CE004 ^M	units	8.0	7.5	7.2
Sulphate (2:1 water soluble)	CE061 ^M	mg/l SO ₄	-	-	-
Sulphate (total)	CE062 ^M	mg/kg SO ₄	-	-	-
Sulphide	CE079	mg/kg S ₂ -	-	-	-
Cyanide (free)	CE077	mg/kg CN	-	-	-
Cyanide (total)	CE077	mg/kg CN	-	-	-
Thiocyanate	CE145 ^M	mg/kg SCN	-	-	-
Phenols (total)	CE078	mg/kg PhOH	-	-	-
Total Organic Carbon (TOC)	CE072 ^M	% w/w C	-	-	-
Estimate of OMC (calculated from TOC)	CE072 ^M	% w/w	-	-	-
Loss On Ignition at 440°C	CE006 ^U	% w/w	-	-	-
PAH					
Naphthalene	CE087 ^M	mg/kg	-	-	-
Acenaphthylene	CE087 ^M	mg/kg	-	-	-
Acenaphthene	CE087 ^M	mg/kg	-	-	-
Fluorene	CE087 ^U	mg/kg	-	-	-
Phenanthrene	CE087 ^M	mg/kg	-	-	-
Anthracene	CE087 ^U	mg/kg	-	-	-
Fluoranthene	CE087 ^M	mg/kg	-	-	-
Pyrene	CE087 ^M	mg/kg	-	-	-
Benzo(a)anthracene	CE087 ^U	mg/kg	-	-	-
Chrysene	CE087 ^M	mg/kg	-	-	-
Benzo(b)fluoranthene	CE087 ^M	mg/kg	-	-	-
Benzo(k)fluoranthene	CE087 ^M	mg/kg	-	-	-
Benzo(a)pyrene	CE087 ^U	mg/kg	-	-	-
Indeno(123cd)pyrene	CE087 ^M	mg/kg	-	-	-
Dibenz(ah)anthracene	CE087 ^M	mg/kg	-	-	-

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SOILS

Lab number Sample id Depth (m) Date sampled			79560-8 TP1 0.30-0.50 21/06/2019	79560-9 TP2 0.20-0.40 21/06/2019	79560-10 TP3 0.20-0.40 21/06/2019
Test	Method	Units			
Benzo(ghi)perylene	CE087 ^M	mg/kg	-	-	-
PAH (total of USEPA 16)	CE087	mg/kg	-	-	-
PAH					
Naphthalene	CE087 ^M	mg/kg	-	-	-
Acenaphthylene	CE087 ^M	mg/kg	-	-	-
Acenaphthene	CE087 ^M	mg/kg	-	-	-
Fluorene	CE087 ^U	mg/kg	-	-	-
Phenanthrene	CE087 ^M	mg/kg	-	-	-
Anthracene	CE087 ^U	mg/kg	-	-	-
Fluoranthene	CE087 ^M	mg/kg	-	-	-
Pyrene	CE087 ^M	mg/kg	-	-	-
Benzo(a)anthracene	CE087 ^U	mg/kg	-	-	-
Chrysene	CE087 ^M	mg/kg	-	-	-
Benzo(b)fluoranthene	CE087 ^M	mg/kg	-	-	-
Benzo(k)fluoranthene	CE087 ^M	mg/kg	-	-	-
Benzo(a)pyrene	CE087 ^U	mg/kg	-	-	-
Indeno(123cd)pyrene	CE087 ^M	mg/kg	-	-	-
Dibenz(ah)anthracene	CE087 ^M	mg/kg	-	-	-
Benzo(ghi)perylene	CE087 ^M	mg/kg	-	-	-
PAH (total of USEPA 16)	CE087	mg/kg	-	-	-
BTEX & TPH					
MTBE	CE057 ^U	mg/kg	-	-	-
Benzene	CE057 ^U	mg/kg	-	-	-
Toluene	CE057 ^U	mg/kg	-	-	-
Ethylbenzene	CE057 ^U	mg/kg	-	-	-
m & p-Xylene	CE057 ^U	mg/kg	-	-	-
o-Xylene	CE057 ^U	mg/kg	-	-	-
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	-	-	-
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	-	-	-
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	-	-	-
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	-	-	-
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	-	-	-
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	-	-	-
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	-	-	-
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	-	-	-
VPH Aliphatic (>C5-C6)	CE067	mg/kg	-	-	-
VPH Aliphatic (>C6-C8)	CE067	mg/kg	-	-	-
VPH Aliphatic (>C8-C10)	CE067	mg/kg	-	-	-
EPH Aliphatic (>C10-C12)	CE068	mg/kg	-	-	-
EPH Aliphatic (>C12-C16)	CE068	mg/kg	-	-	-
EPH Aliphatic (>C16-C35)	CE068	mg/kg	-	-	-

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SOILS

Lab number			79560-8	79560-9	79560-10
Sample id			TP1	TP2	TP3
Depth (m)			0.30-0.50	0.20-0.40	0.20-0.40
Date sampled			21/06/2019	21/06/2019	21/06/2019
Test	Method	Units			
EPH Aliphatic (>C35-C44)	CE068	mg/kg	-	-	-
Subcontracted analysis					
Asbestos (qualitative)	\$	-	NAD	-	-

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SOILS

Lab number			79560-3
Sample id			BH2
Depth (m)			0.70-0.90
Date sampled			21/06/2019
Test	Method	Units	
VPH (>C5-C10)	CE067	mg/kg	<0.1
EPH (>C10-C16)	CE033 ^M	mg/kg	<7
EPH (>C16-C40)	CE033 ^M	mg/kg	19
VOC (total) inc TICs	CE174 ^{1,2}	mg/kg	<0.01
BTEX & MTBE (total)	CE057 ²	mg/kg	<0.02
SVOC (total) inc TICs	CE189 ^{2,3}	mg/kg	<0.1
Phenols (total)	CE189 ²	mg/kg	<0.1
Cresols & chlorinated phenols (total)	CE189 ²	mg/kg	<0.01
Ethers*	CE189 ²	mg/kg	<0.1
Nitrobenzene*	CE189 ²	mg/kg	<0.1
Ketones*	CE189 ²	mg/kg	<0.01
Aldehydes*	CE189 ²	mg/kg	<0.01
Amines*	CE189 ²	mg/kg	<0.1
pH	CE004 ^M	units	8.3
Electrical conductivity	CE007 ^U	µS/cm	60
Redox potential	CE082	mV	71

Notes

1: Total VOCs (excluding BTEX & MTBE)

2: LOD applies to each compound

3: Total SVOCs (excluding PAHs and those substances marked with an *)

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Antimony (total)	Aqua regia digest, ICP-MS	Dry	U	0.2	mg/kg Sb
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Barium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ba
CE063	Boron (water soluble)	Hot water extract, ICP-OES	Dry	M	0.5	mg/kg B
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE146	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Molybdenum (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Mo
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO ₄
CE062	Sulphate (total)	Acid extraction, ICP-OES	Dry	M	100	mg/kg SO ₄
CE079	Sulphide	Extraction, Continuous Flow Colorimetry	As received		10	mg/kg S ²⁻
CE077	Cyanide (free)	Extraction, Continuous Flow Colorimetry	As received		1	mg/kg CN
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	As received		1	mg/kg CN
CE145	Thiocyanate	Weak acid extraction, Colorimetry	Dry	M	1	mg/kg SCN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	As received		0.5	mg/kg PhOH
CE072	Total Organic Carbon (TOC)	Removal of IC by acidification, Carbon Analyser	Dry	M	0.1	% w/w C
CE072	Estimate of OMC (calculated from TOC)	Calculation from Total Organic Carbon	Dry	M	0.1	% w/w
CE006	Loss On Ignition at 440°C	Based on BS 1377, Gravimetry	Dry	U	0.1	% w/w
CE087	Naphthalene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	As received		0.34	mg/kg
CE057	MTBE	Headspace GC-FID	As received	U	0.02	mg/kg
CE057	Benzene	Headspace GC-FID	As received	U	0.01	mg/kg

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE057	Toluene	Headspace GC-FID	As received	U	0.01	mg/kg
CE057	Ethylbenzene	Headspace GC-FID	As received	U	0.01	mg/kg
CE057	m & p-Xylene	Headspace GC-FID	As received	U	0.02	mg/kg
CE057	o-Xylene	Headspace GC-FID	As received	U	0.01	mg/kg
CE057	BTEX & MTBE (total)	Headspace GC-FID	As received		0.02	mg/kg
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	As received		0.01	mg/kg
CE068	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID	As received		1	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	As received		0.1	mg/kg
CE068	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	As received		10	mg/kg
CE067	VPH (>C5-C10)	Headspace GC-FID	As received		0.1	mg/kg
CE033	EPH (>C10-C16)	Solvent extraction, GC-FID	As received	M	10	mg/kg
CE033	EPH (>C16-C40)	Solvent extraction, GC-FID	As received	M	10	mg/kg
CE033	EPH (>C10-C40)	Solvent extraction, GC-FID	As received	M	10	mg/kg
CE174	Volatile Organic Compounds	Headspace GC-MS	As received		0.01	mg/kg
CE174	VOC Tentatively Identified Compounds	Headspace GC-MS	As received		-	-
CE189	Semi-volatile Organic Compounds	Solvent extraction, GC-MS	As received		0.01-0.1	mg/kg
CE189	SVOC Tentatively Identified Compounds	Solvent extraction, GC-MS	As received		-	-
CE007	Electrical conductivity	Conductivity Meter	As received	U	10	µS/cm
CE082	Redox potential	ORP meter	As received		±1	mV
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

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DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
79560-1	BH1	0.20-0.40	N	
79560-2	BH2	0.20-0.40	N	
79560-3	BH2	0.70-0.90	N	
79560-4	BH3	1.00	N	
79560-5	BH5	0.45-0.53	N	
79560-6	BH6	0.35-0.50	N	
79560-7	CBR1	0.20-0.30	N	
79560-8	TP1	0.30-0.50	N	
79560-9	TP2	0.20-0.40	N	
79560-10	TP3	0.20-0.40	N	

Waste Acceptance Criteria Testing BS EN 12457-Part 3, 2 Stage Process



Sample Details

Contract Name Granville Oil, Goldthorpe
Lab Number 79560-4
Sample ID BH3 1.00m
Date Sampled 21 June 2019
Date Received 24 June 2019
Particle Size (<4mm) -
Method of size reduction N/A
Non-crushable matter N/A

Test Values

Mass of Raw Test Portion (MW) kg 0.197
Mass of Dried Test Portion (MD) kg 0.175
Moisture Content Ratio (MC) % 12.76
Dry Matter Content Ratio (DR) % 88.68
Leachant Volume (1) (L2) Litre 0.328
Leachant Volume (2) (L8) Litre 1.400
Eluate Volume (1) (VE1) Litre 0.230
Eluate Volume (2) (VE2) Litre 1.305

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	6.3	6.8
Temperature (°C)	20	20
Conductivity (µS/cm)	492	108
Antimony (µg/l Sb)	0.9	<0.1
Arsenic (µg/l As)	0.39	0.34
Barium (µg/l Ba)	31.3	18.7
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	<0.2	<0.2
Copper (µg/l Cu)	3.1	1.2
Lead (µg/l Pb)	<0.2	<0.2
Mercury (µg/l Hg)	0.064	0.031
Molybdenum (µg/l Mo)	<0.3	<0.3
Nickel (µg/l Ni)	0.7	<0.5
Selenium (µg/l Se)	0.15	0.07
Zinc (µg/l Zn)	2	<1
Chloride (mg/l Cl)	17	2.6
Fluoride (mg/l F)	0.3	0.4
Sulphate (mg/l SO ₄)	94	18
Total Dissolved Solids (mg/l TDS)	375	80
Phenol Index (µg/l PhOH)	<10	<10
Dissolved Organic Carbon (mg/l C)	7.3	<5

Amount Leached		BS EN 12457-3 Limit Values mg/kg at L:S 10:1		
2:1 mg/kg	10:1 mg/kg	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
0.002	<0.003	0.06	0.7	5
0.001	0.003	0.5	2	25
0.063	0.204	20	100	300
<0.0002	<0.0007	0.04	1	5
<0.0004	<0.002	0.5	10	70
0.006	0.014	2	50	100
<0.0004	<0.002	0.5	10	50
0.00013	0.00035	0.01	0.2	2
<0.0006	<0.003	0.5	10	30
0.001	<0.006	0.4	10	40
0.000	0.001	0.1	0.5	7
0.004	<0.012	4	50	200
34	45	800	15000	25000
0.6	3.9	10	150	500
189	280	1000	20000	50000
750	1188	4000	60000	100000
<0.02	<0.1	1		
15	<53	500	800	1000

Waste Analysis	Units	Result			
Total Organic Carbon	% w/w	1.1	3%	5%	6%
Loss on Ignition	% w/w	4.4			10%
BTEX	mg/kg	<0.06	6		
PCBs (7 congeners)	mg/kg	<0.045	1		
TPH (C10 - C40)	mg/kg	60	500		
PAH (total)	mg/kg	<0.36	100		
pH	pH units	7.7		>6	
Acid Neutralisation Capacity (pH4)	mol/kg	0.15		To be evaluated	
Acid Neutralisation Capacity (pH7)	mol/kg	0.03		To be evaluated	

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Waste Acceptance Criteria testing is outside the scope of the laboratory's UKAS accreditation.

Comments

Authorised by:

J. Campbell

Name:

John Campbell

Report date:

1 July 2019

Position:

Director

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Tel 01207 528578 Email customerservices@chemtech-env.co.uk
Vat Reg No. 772 5703 18 Registered in England number 4284013

Waste Acceptance Criteria Testing BS EN 12457-Part 3, 2 Stage Process



Sample Details

Contract Name Granville Oil, Goldthorpe
Lab Number 79560-8
Sample ID TP1 0.30-0.50m
Date Sampled 21 June 2019
Date Received 24 June 2019
Particle Size (<4mm) -
Method of size reduction N/A
Non-crushable matter N/A

Test Values

Mass of Raw Test Portion (MW) kg 0.207
Mass of Dried Test Portion (MD) kg 0.175
Moisture Content Ratio (MC) % 18.24
Dry Matter Content Ratio (DR) % 84.58
Leachant Volume (1) (L2) Litre 0.318
Leachant Volume (2) (L8) Litre 1.400
Eluate Volume (1) (VE1) Litre 0.250
Eluate Volume (2) (VE2) Litre 1.310

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	7.0	7.1
Temperature (°C)	20	20
Conductivity (µS/cm)	79	30
Antimony (µg/l Sb)	2.1	0.1
Arsenic (µg/l As)	2.74	0.96
Barium (µg/l Ba)	14.1	6.3
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	0.8	0.2
Copper (µg/l Cu)	11.7	2.6
Lead (µg/l Pb)	5.4	2.0
Mercury (µg/l Hg)	0.077	0.037
Molybdenum (µg/l Mo)	0.6	0.3
Nickel (µg/l Ni)	1.1	<0.5
Selenium (µg/l Se)	0.32	0.13
Zinc (µg/l Zn)	5	<1
Chloride (mg/l Cl)	1.2	<1
Fluoride (mg/l F)	1.2	0.7
Sulphate (mg/l SO ₄)	<10	<10
Total Dissolved Solids (mg/l TDS)	60	25
Phenol Index (µg/l PhOH)	<10	<10
Dissolved Organic Carbon (mg/l C)	6.0	<5

Amount Leached		BS EN 12457-3 Limit Values mg/kg at L:S 10:1		
2:1 mg/kg	10:1 mg/kg	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
0.004	0.004	0.06	0.7	5
0.005	0.012	0.5	2	25
0.028	0.074	20	100	300
<0.0002	<0.0007	0.04	1	5
0.002	0.003	0.5	10	70
0.023	0.039	2	50	100
0.011	0.025	0.5	10	50
0.00015	0.00042	0.01	0.2	2
0.001	0.004	0.5	10	30
0.002	<0.006	0.4	10	40
0.001	0.002	0.1	0.5	7
0.009	<0.016	4	50	200
2.5	<11	800	15000	25000
2.3	7.4	10	150	500
<20	<100	1000	20000	50000
120	300	4000	60000	100000
<0.02	<0.1	1		
12	<52	500	800	1000

Waste Analysis	Units	Result			
Total Organic Carbon	% w/w	2.2	3%	5%	6%
Loss on Ignition	% w/w	6.4			10%
BTEX	mg/kg	<0.06	6		
PCBs (7 congeners)	mg/kg	<0.045	1		
TPH (C10 - C40)	mg/kg	81	500		
PAH (total)	mg/kg	<0.36	100		
pH	pH units	8.0		>6	
Acid Neutralisation Capacity (pH4)	mol/kg	0.16		To be evaluated	
Acid Neutralisation Capacity (pH7)	mol/kg	0.04		To be evaluated	

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Report date:

1 July 2019

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Waste Acceptance Criteria Testing BS EN 12457-Part 3, 2 Stage Process



Sample Details

Contract Name Granville Oil, Goldthorpe
Lab Number 79560-9
Sample ID TP2 0.20-0.40m
Date Sampled 21 June 2019
Date Received 24 June 2019
Particle Size (<4mm) -
Method of size reduction N/A
Non-crushable matter N/A

Test Values

Mass of Raw Test Portion (MW) kg 0.194
Mass of Dried Test Portion (MD) kg 0.175
Moisture Content Ratio (MC) % 10.59
Dry Matter Content Ratio (DR) % 90.43
Leachant Volume (1) (L2) Litre 0.331
Leachant Volume (2) (L8) Litre 1.400
Eluate Volume (1) (VE1) Litre 0.275
Eluate Volume (2) (VE2) Litre 1.325

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	7.0	6.9
Temperature (°C)	20	20
Conductivity (µS/cm)	105	30
Antimony (µg/l Sb)	1.9	0.2
Arsenic (µg/l As)	2.33	1.38
Barium (µg/l Ba)	21.2	6.5
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	0.7	0.2
Copper (µg/l Cu)	8.3	3.9
Lead (µg/l Pb)	5.9	3.1
Mercury (µg/l Hg)	0.098	0.054
Molybdenum (µg/l Mo)	0.4	<0.3
Nickel (µg/l Ni)	1.2	<0.5
Selenium (µg/l Se)	0.22	0.13
Zinc (µg/l Zn)	7	2
Chloride (mg/l Cl)	2.4	1.3
Fluoride (mg/l F)	0.6	0.6
Sulphate (mg/l SO ₄)	<10	<10
Total Dissolved Solids (mg/l TDS)	80	25
Phenol Index (µg/l PhOH)	<10	<10
Dissolved Organic Carbon (mg/l C)	7.9	6.1

Amount Leached		BS EN 12457-3 Limit Values mg/kg at L:S 10:1		
2:1 mg/kg	10:1 mg/kg	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
0.004	0.005	0.06	0.7	5
0.005	0.015	0.5	2	25
0.042	0.088	20	100	300
<0.0002	<0.0007	0.04	1	5
0.001	0.003	0.5	10	70
0.017	0.046	2	50	100
0.012	0.036	0.5	10	50
0.00020	0.00061	0.01	0.2	2
0.001	<0.004	0.5	10	30
0.002	<0.007	0.4	10	40
0.000	0.001	0.1	0.5	7
0.014	0.027	4	50	200
4.8	15	800	15000	25000
1.1	5.6	10	150	500
<20	<100	1000	20000	50000
160	336	4000	60000	100000
<0.02	<0.1	1		
16	63	500	800	1000

Waste Analysis	Units	Result			
Total Organic Carbon	% w/w	1.6	3%	5%	6%
Loss on Ignition	% w/w	4.9			10%
BTEX	mg/kg	<0.06	6		
PCBs (7 congeners)	mg/kg	<0.045	1		
TPH (C10 - C40)	mg/kg	55	500		
PAH (total)	mg/kg	1.03	100		
pH	pH units	7.5		>6	
Acid Neutralisation Capacity (pH4)	mol/kg	0.14		To be evaluated	
Acid Neutralisation Capacity (pH7)	mol/kg	0.02		To be evaluated	

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Waste Acceptance Criteria Testing

BS EN 12457-Part 3, 2 Stage Process



Sample Details

Contract Name Granville Oil, Goldthorpe
 Lab Number 79560-10
 Sample ID TP3 0.20-0.40m
 Date Sampled 21 June 2019
 Date Received 24 June 2019
 Particle Size (<4mm) -
 Method of size reduction N/A
 Non-crushable matter N/A

Test Values

Mass of Raw Test Portion (MW) kg 0.196
 Mass of Dried Test Portion (MD) kg 0.175
 Moisture Content Ratio (MC) % 11.98
 Dry Matter Content Ratio (DR) % 89.30
 Leachant Volume (1) (L2) Litre 0.329
 Leachant Volume (2) (L8) Litre 1.400
 Eluate Volume (1) (VE1) Litre 0.260
 Eluate Volume (2) (VE2) Litre 1.315

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	6.6	6.5
Temperature (°C)	20	20
Conductivity (µS/cm)	75	23
Antimony (µg/l Sb)	3.8	<0.1
Arsenic (µg/l As)	3.08	0.75
Barium (µg/l Ba)	20.8	5.6
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	1.7	0.2
Copper (µg/l Cu)	14.4	4.8
Lead (µg/l Pb)	5.4	1.6
Mercury (µg/l Hg)	0.076	0.032
Molybdenum (µg/l Mo)	<0.3	<0.3
Nickel (µg/l Ni)	3.1	0.7
Selenium (µg/l Se)	0.22	0.11
Zinc (µg/l Zn)	12	2
Chloride (mg/l Cl)	4.2	<1
Fluoride (mg/l F)	0.2	0.2
Sulphate (mg/l SO ₄)	14	<10
Total Dissolved Solids (mg/l TDS)	55	15
Phenol Index (µg/l PhOH)	<10	<10
Dissolved Organic Carbon (mg/l C)	8.0	7.1

Amount Leached		BS EN 12457-3 Limit Values		
		mg/kg at L:S 10:1		
2:1	10:1	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
mg/kg	mg/kg			
0.008	<0.007	0.06	0.7	5
0.006	0.011	0.5	2	25
0.042	0.079	20	100	300
<0.0002	<0.0007	0.04	1	5
0.003	0.005	0.5	10	70
0.029	0.062	2	50	100
0.011	0.022	0.5	10	50
0.00015	0.00038	0.01	0.2	2
<0.0006	<0.003	0.5	10	30
0.006	0.010	0.4	10	40
0.000	0.001	0.1	0.5	7
0.024	0.036	4	50	200
8.4	<15	800	15000	25000
0.3	2.2	10	150	500
29	<107	1000	20000	50000
110	209	4000	60000	100000
<0.02	<0.1	1		
16	73	500	800	1000

Waste Analysis	Units	Result			
Total Organic Carbon	% w/w	1.3	3%	5%	6%
Loss on Ignition	% w/w	5.1			10%
BTEX	mg/kg	<0.06	6		
PCBs (7 congeners)	mg/kg	<0.045	1		
TPH (C10 - C40)	mg/kg	73	500		
PAH (total)	mg/kg	0.88	100		
pH	pH units	7.2		>6	
Acid Neutralisation Capacity (pH4)	mol/kg	0.13		To be evaluated	
Acid Neutralisation Capacity (pH7)	mol/kg	0.01		To be evaluated	

Disclaimer : The Landfill Waste Acceptance Criteria limits in this report are provided for guidance only.
 Chemtech Environmental Ltd does not take responsibility for any errors or omissions. Data is correct as of 01/09/2005.
 Samples will be disposed of 6 weeks from initial receipt unless written instructions are received and further storage is agreed.
 Waste Acceptance Criteria testing is outside the scope of the laboratory's UKAS accreditation.

Comments

Authorised by:

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Name:

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Report date:

1 July 2019

Position:

Director

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