Ground and Environmental Services Limited

Unit 2 Montpelier Business Park
Dencora Way
Ashford
Kent
TN23 4FG
01233 646237

Batchelors Farm, Keymer Road, Burgess Hill, West Sussex RH15 0BQ

Phase 2 Geo-Environmental Investigation

On Behalf of SDP Developers

Document Reference: 12531 **January 2021**

Site: Batchelors Farm, Keymer Road, Burgess Hill, RH15 0BQ

Document Reference No: 12531

Quality Management

Prepared by:	**JM/PAD**
Reviewed by:	**CSS**
Authorised by:	**KM**
Date	**January 2021**
Revision	**1 – Minor ammendments**

Table of Contents

Figures

Appendices

1 INTRODUCTION

Ground and Environmental Services Ltd (GES) was commissioned by SDP Developers (The Client) to undertake an intrusive Geo-Environmental Investigation on a proposed development site at Batchelors Farm, Keymer Road, RH15 0BQ.

We understand that the proposed scheme consisted of the construction of 2 detached houses with detached garages and associated new driveways, soft landscaping and private garden areas.

Based on a review of the Phase 1 Environmental Risk Assessment prepared by Groundsure, the objective of the Phase 2 Geo-Environmental Investigation was to ascertain the significance of the various potential contaminant sources identified in the Phase 1 report and thereby prepare an appropriate remedial strategy for the site.

In addition, the ground investigation was extended to provide outline recommendations for foundation, floor slab, pavement and soakage design.

2 SITE LOCATION AND LAYOUT

The site is located in Burgess Hill approximately 1.2km South East of Burgess Hill train station and is centred on approximate ordnance survey grid reference centre: TQ 31796 17653.

The site in its entirety, a defined by the red and blue lines in Figure 1 is C-shaped roughly square in shape with the majority of site given over to rough grassland and overgrown vegetation. The C shape site surrounds an existing detached residential property which is located to the east. The proposed development areas are located to the north and south of the existing property.

In the southern section of the site was an area of hardstanding with one large disused steel framed barn structure and two detached smaller storage buildings of breeze block and wood construction. Also within the southern section of the site were a number of stockpiles of waste materials of varying composition. The waste materials comprised a mix of concrete, wood and metal fragments with subordinate waste construction materials and general rubbish. Also amongst the waste materials were piles of corrugated sheeting which may potentially contain asbestos.

Access to the southern section was gained via a hardcore covered track which runs from Keymer Road which was located to the east. At the south western corner of the site evidence of bonfire residue was observed.

Trees and hedges form the site boundaries. The site is mostly flat with the northern part of the site sloping gently downwards to towards the north west.

The following features surround the site:

- To the North, the site is bound by an East to West trending foot path/private track, beyond which lies open grass/farmland.
- To the East, the site is bound by the North to South trending Keymer Road, beyond which lie residential housing.
- To the South and West, the site is bound by open grass/farmland.

3 SITE HISTORY

The site was noted to have been used for agricultural purposes since the earliest mapping in the c.1874. Since that time, various structures were erected in the south, though the majority of these have now been cleared. A pond was also noted to have been potentially infilled in the south east by c.1954.

4 GEOLOGICAL SETTING

4.1 GEOLOGY

Reference to the British Geological Survey 1:50,000 scale geological map of the area indicates a solid geology of the Weald Clay Formation, deposited during the Epoch specifically Hauterivian to Barremian (132.9ma to 125ma).

The geological memoir for the area described these strata as follows:

Weald Clay Formation – Dark grey thinly-bedded mudstones (shales) and mudstones with subordinate siltstones, fine to medium fine grained sandstones, including calcareous sandstone.

Upper Boundary – The top is unconformable and sharp at the contact between the drab, ochre-brown mudstones of the upper part of the Weald Clay.

Lower Boundary – The lower boundary is generally poorly defined and gradational in complete successions, from the siltstones and silty fine grained sandstones of the underlying Tunbridge Wells Sand Formation up into the mudstones of the Weald Clay Formation.

4.2 GROUNDWATER

Reference to the British Geological Survey 1:50,000 scale Aquifer Designation Dataset, shows the site to be predominantly set upon Unproductive Strata, although small parts of the site may be set upon a Secondary A aquifer.

Unproductive Strata are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Secondary A aquifers are permeable layers capable of supporting water supplies on a local rather than strategic scale and in some cases forming an important source of base flow to rivers.

The site is not situated within an Environment Agency-designated Groundwater Source Protection Zone.

4.3 RADON

Reference to Public Health England and the British Geological Survey's "Radon Atlas of England and Wales" indicated that less than one percent (<1%) of houses within the 5 km square which includes the site have radon concentrations above the action level of 200 Bq/m³.

The site is therefore not located within a "Radon Affected Area" and therefore no special measures need be incorporated into buildings.

5 INTRUSIVE INVESTIGATION

5.1 FIELDWORK

The site works were carried out between the 03rd December 2020 and the 7th January 2021 and comprised the following:

- Window Sampling;
- DG365 Soakage Testing;
- Dynamic Cone Penetrometer Testing;.
- Soil Gas and Groundwater Level Monitoring.

The positions of the above works on the site are indicated on Figure 1, Exploratory Hole Location Plan.

Window Sample Holes

Eleven window sample holes (WS1 to WS11) were excavated using a Premier 110 window sampling rig to depths ranging between 3.0mbgl and 4.0mbgl.

The soils and materials encountered in the holes were logged and representative samples recovered for laboratory analysis. Standard Penetration tests were also carried out at regular intervals using the solid cone attachment.

Upon completion, window sample locations WS1, WS3, WS4, WS8 and WS11 were installed with 35mm gas and groundwater level monitoring standpipes with the remainder being backfilled with arisings.

Window sample hole logs and installation details are presented in Appendix 1.

Soakage Testing

DG365 Soakage Testing Infiltration testing was carried out in trial pits SP1 and SP2. The test was carried out in accordance with the methodology given in BRE 365 'Soakaway design' and comprised discharging water into a 2.45mbgl (SP1) and 2.5mbgl (SP2) deep excavations up to approximately 1.0mbgl and monitoring the fall in water level against time. Indicative soil infiltration rates have been calculated based on the results obtained. The results have been presented in Appendix 2 and are discussed in Section 7.4 below.

Dynamic Cone Penetrometer Testing

Seventeen dynamic cone penetrometer (DCP) tests were undertaken in the areas proposed for hardstanding. The dynamic cone penetrometer (DCP) uses an 8 kg hammer dropping through a height of 575 mm and a 60° cone having a maximum diameter of 20 mm. Penetration depth is recorded after every blow. The DCP is a Penetrometer device used to provide a measure of in situ CBR. Blow count readings were converted to an equivalent CBR, which is displayed in the results tables presented in Appendix 3.

The TRRL equation was used to calculate the equivalent CBR value from the DCP results.

Soil Gas and Groundwater Level Monitoring

Groundwater level/Soil Gas Monitoring Soil gas monitoring was undertaken on the site and comprised the monitoring of the atmosphere within the standpipes installed in window sample holes WS1, WS3, WS4, WS8 and WS11 were installed. Portable gas monitoring equipment (GA5000) was used to monitor the standpipes for concentrations of carbon dioxide (CO2), methane (CH4) and oxygen (O2).

The groundwater level / gas monitoring results are presented in Appendix 4.

5.2 GROUNDWATER

Groundwater was not positively identified during drilling of the window sample holes. Post fieldwork monitoring records are presented below. encountered during the intrusive investigation:

Hole ID	Depth	Groundwater Observation
WS1	3.25	Possible Groundwater
WS3	3.7 – 3.4	Possible rainwater
WS4	3.8 – 3.85	Possible rainwater
WS8	3.45 – 3.5	Possible Groundwater
WS11	3.7 – 3.8	Possible rainwater

Groundwater levels may vary due to seasonal fluctuations in rainfall, but in the shorter term, can be affected by antecedent weather conditions or other causes.

6 LABORATORY TESTING

6.1 GEOTECHNCIAL TESTING

The following range of laboratory tests were scheduled and the results are presented in Appendix 5.

i. Moisture Content Determination (12 No.).
ii. Atterberg Limit Determination (12 No.).
iii. Determination of pH (16 No.). See Appendix 6.
iv. Determination of water-soluble sulphate (16 No.). See Appendix 6.

6.2 ANALYTICAL TESTING

Eleven samples were selected and scheduled for chemical analysis which was undertaken by DETS Ltd. All soil samples were analysed for a general screening suite of contaminants considered appropriate to the current usage and past history of the site and surrounding area.

Toxic Metals	Phytotoxic Metals	Inorganic Compounds	Organic Compounds
Arsenic Barium Beryllium Cadmium Chromium Lead Mercury Nickel Selenium Vanadium	Water Soluble Boron Copper Nickel Zinc	Water Soluble Sulphate pH Asbestos	Total Polyaromatic Hydrocarbons (PAH) Soil Organic Matter Total Petroleum Hydrocarbons (TPH) Mineral Oils

In addition, two composite samples were selected for Waste Acceptance Criteria (WAC) testing.

Ten samples designated S1 to S10 taken from near surface and stockpiled material located in the Eastern portion of the site (See Figure 1) were submitted for an asbestos screen due to the suspected presence of potential asbestos containing material.

Soil samples were stored in appropriate containers as specified within BS10175. The containers comprised of 1 kg capacity plastic containers with fitted lids. Where organic compounds were to be determined, inert containers, which prevent loss by absorption, or volatilization, i.e. wide-mouthed amber glass containers, were used.

Samples were stored in appropriately cooled cool boxes and were transported to the laboratory as quickly as possible in order to minimize any potential for chemical and biological changes to take place.

The results of the analytical testing are presented in Appendix 6.

7 GROUND CONDITIONS AND ENGINEERING PROPERTIES

7.1 GROUND PROFILE

The anticipated geology, as described in Section 3 above, was found during this ground Investigation. Beneath the Topsoil/Made Ground the soil sequence comprised the Weald Clay

Topsoil/Made Ground

The uppermost layer was slightly variable in thickness and composition across the site with depths ranging from 0.3mbgl to 0.95mbgl.

The surface layer which was encountered in all locations except WS6 and WS7 comprised dark brown silty clayey topsoil with frequent fine roots. Made Ground materials were encountered in WS6 and WS7 with depths ranging from 0.6mbgl to 0.95mbgl and comprised of red brick, asphalt and concrete with mottled grey clay fill encountered from 0.6mbgl to 0.95mbgl in WS6.

Weald Clay Formation

Underlying the Topsoil/Made Ground materials were soils typical of the Weald Clay Formation. The Weald Clay comprised an upper horizon of orange brown, mottled light grey slightly silty Clay which was found to depths ranging between 0.3mbgl and 4.0mbgl and found to the base on WS4, WS5, WS6, WS7. Beneath the upper horizon soils in WS3, WS8, WS9, WS10 and WS11 was a lower horizon generally comprising of light orange brown with dark grey silt/ very weak siltstone. This lower horizon was found between depths ranging from 1mbgl to 3.4mbgl and was proven to the base of the window sample holes.

Standard penetration testing recorded N values in the range 4 to 37 (Soft to very stiff) with N values ranging between 4 and 9 (soft to firm) recorded at 1m depth. N values increased with depth as is typical of over consolidated clay soils. See Figure 2 for plot of SPT N v Depth. Figure 3 provides a plot of corrected N60 values against depth. The N60 value taking into account an energy ratio (Er) of 77% for the test equipment used. Tactile observations on the cohesive upper horizon indicated firm to stiff soils.

Classification testing recorded clay soils of intermediate, high and very high plasticity with plasticity indices in the range 21% to 52%. The test results indicated that the soils would have a medium to high shrink/swell potential.

7.2 ENGINEERING PROPERTIES

The engineering properties of the principal strata, as tabulated above, can be assessed based upon a combination of the in situ and laboratory test results. A summary of the engineering properties is given below:

For preliminary foundation design purposes the following parameters may be used for consideration of shallow foundations within the Weald Clay Formation:

Undrained shear strength = 40kN/m^2 (Firm) – lower bound at 1.2m depth
= 60kN/m^2 (Firm) at 2m depth

Coefficient of compressibility = 0.25m^2/MN (typical value)

Shrink/Swell Potential = High

8 ENGINEERING DESIGN

8.1 OUTLINE FOUNDATION DESIGN

At the time of reporting, applied structural loads from the proposed development were unknown. However, it is known that the proposed development consists of the construction of 2 detached houses with associated garages, both of which would have access to private garden areas. For preliminary foundation design purposes a line load of 60kN/m run has been adopted.

In deliberation of suitable foundation options consideration was given to the geotechnical hazards and risks as presented below:

Geotechnical Hazard	Qualitative Risk & Consequences	Possible Risk Reduction Measures
Variations in stiffness of ground below foundation depth that could give rise to unacceptable total and differential settlement.	Low Large span buildings would be particularly sensitive to differential settlement. Would result in cracking of superstructure if conventional brickwork or brick cladding is used.	Calculate likely magnitude of settlement and determine if within acceptable tolerances. Make foundations act as reinforced beams. Consider ground treatment to improve ground conditions or adopt deep foundation.
Existing underground structures such as footings to neighbouring structures, service runs and old footings from previous development on the site.	Low – northern and western parts of the site Medium to high – southern part Implication for foundation depth and economic feasibility of shallow foundations.	New foundations to be constructed in undisturbed ground or alternatively disturbed ground to be removed and replaced with suitable engineering fill.
Groundwater	Very low Implications on temporary works.	None required.
Shrinkage/swelling of foundation soils due to action of tree roots.	Medium Foundation movement and cracking of brickwork.	Follow guidance for high shrink/swell potential soils

Shallow Foundations

For preliminary design purposes shallow foundations founded within the Weald Clay Formation will provide a suitable foundation solution for the proposed new two storey structures on the site.

Given the ground conditions encountered near surface it is recommended that a minimum foundation depth of 1.2m is adopted.

Foundation depths should also comply with the minimum foundations depths as governed by the NHBC guidance on building near trees. Recommendations for high shrinkage potential soils are recommended. In addition, it is recommended that foundations extend 0.3m below the level of any live roots found.

Based on field observations, in situ testing and laboratory test results, a maximum allowable bearing pressure of 100 kN/m^2 is recommended for foundations placed at a minimum depth of 1.2m. Adopting a line load of 60 kN/m run a minimum foundation width of 0.6m is therefore recommended. For foundations at a depth of 2m a maximum allowable bearing pressure of 150kN/m^2 could be utilised resulting in a minimum foundation width of 0.45m.

Preliminary settlement calculations indicated total settlements would be less than 25mm. Immediate settlement would be approximately half of the total settlement, the remainder being long term consolidation settlement.

8.2 GROUND FLOORS

The NHBC guidance advises that suspended ground floors should be adopted when the plasticity index (PI) of the founding soils is greater than 10%.

Based upon the findings of this ground investigation it is recommended that ground floor slabs are suspended.

8.3 TEMPORARY WORKS

Excavations in excess of 1.2 m depth are unlikely to be required in connection with the proposed development on this site. If there is a requirement for personnel to enter into excavations, then the need for trench side support should be considered for any depth of excavation and, therefore, appropriate equipment should be available on site prior to excavation proceeding. A site specific risk assessment should be carried out where man entry into excavations is required.

8.4 SOAKAWAYS

The results of the soakage testing undertaken in SP1 and SP2 indicated negligible soakage potential with water levels not dropping in the trial pits over a period of 3 hours.

Based on the results obtained the use of shallow chamber type soakaways for the disposal of surface water is not considered feasible.

8.5 ROADS/HARDSTANDING

The results of in situ DCP tests indicated CBR values in the range 2 to <100% although were generally in the range 4 to 10 below a typical formation level of 0.45m.

For preliminary design purposes a CBR value of 4% may be adopted in the areas of hardstanding. The soils encountered during this ground investigation are considered frost susceptible therefore road construction should have a minimum of thickness of 450 mm.

8.6 CHEMICAL ATTACK ON BURIED CONCRETE

The results of the chemical testing indicated a concentration of water-soluble sulphate in ranging from 13 to 1750 (mg/l as SO_4). pH values in soil samples were generally slightly alkaline and ranged between 5.6 and 9.8 pH units.

In accordance with BRE Special Digest 1 (SD1:2005 Third Edition) entitled 'Concrete in Aggressive Ground', a design sulphate class for the site of DS-1 is recommended. Using SD1:2005 an ACEC (Aggressive Chemical Environment for Concrete) class of AC-1 is recommended.

9 GROUND CONTAMINATION ASSESSMENT

The current guidelines used for this contamination assessment are presented in full at Appendix 7.

In summary, the contaminant concentrations encountered as part of this intrusive investigation were compared against Land Quality Management Generic Assessment Criteria (LQM GAC) for a residential development, or where available against newly published Category 4 Screening Levels (C4SLs) for a Residential (with plant uptake) end use and the suitable for use levels (S4ULs). Where neither guidelines have limit values, Contaminated Land Exposure Assessment (CLEA) framework guideline limit values have been assessed.

Category 4 Screening Levels (C4SLs) have currently been published for six substances as per the table below.

Substance	Residential (with home-grown produce)	Residential (without home-grown produce)	Allotments	Commercial	Public Open Space 1	Public Open Space 2
Arsenic	37	40	49	640	79	170
Benzene	0.87	3.3	0.18	98	140	230
Benzo(a)Pyrene	5.0	5.3	5.7	77	10	21
Cadmium	22	150	3.9	410	220	880
Chromium VI	21	21	170	49	21	250
Lead	200	310	80	2300	630	1300

All concentrations expressed in mg/kg
This table should be read in conjunction with the Final C4SL R&D Report

9.1 SOIL QUALITY

9.1.1 Toxic Metals

Concentrations of toxic metals arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium and zinc were found to be below their respective soil guidance values under the C4SL/S4USL and CLEA/LQM GAC guideline levels, for a residential with home-grown produce, in all samples tested.

9.1.2 Phytotoxic Metals

Concentrations of phytotoxic metals copper, zinc and nickel were compared against the maximum permissible concentration in the Sewage Sludge (Use in Agriculture) Regulations 1989.

Concentrations of copper and nickel were found to be below the maximum permissible concentration for use on soils for the relevant pH level in all of the analysed soil samples.

Isolated slightly elevated zinc concentrations in excess of the guideline limit value of 450 mg/kg were encountered within the near surface soil samples from WS7 (0.3m) and the WAC Composite (0.2-0.3m) which contained concentrations of 913 and 503 mg/kg respectively.

9.1.3 Organic Compounds

Polycyclic Aromatic Hydrocarbons (PAH)

Concentrations of PAH were generally low and were found to be below the analytical detection limit of 1.6 mg/kg and therefore the inert waste acceptance criteria of 100 mg/kg as detailed in the EC Landfill Directive 1999/31/EC as applied under the Environmental Permitting (England and Wales) (Amendment) (EU Exit) Regulations 2019 (*SI 2019/39*) and as defined by the council decision establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC(2003/33/EC), in all of the samples tested, with the exception of the sample retrieved from WS6 (0.3m) which contained a Total PAH concentration of 115 mg/kg.

Benzo(a)Pyrene (B(a)P)

B(a)P concentrations were generally below the C4SL guideline limit value of 5.0 mg/kg for a residential (with home-grown produce) end use with the exception of the soil sample retrieved from WS6 (0.3m) which contained a BaP concentration of 6.75 mg/kg.

Speciated PAH Compounds

The following species of PAH exceed the LQM CIEH generic assessment criteria values for soil samples retrieved from the following soil samples as shown below.

PAH Compound	Residential limit value mg/kg	WS6 (0.3m) mg/kg
Benzo(b)fluoranthene	3.3	8.22
Dibenz(ah)anthracene	0.28	0.73

All other speciated PAH compounds, within all of the analysed soil samples, were below their relevant guideline values.

Total Petroleum Hydrocarbons (TPH)

Concentrations of TPH were generally low and were below the inert waste acceptance criteria of 500 mg/kg as detailed within the EC Landfill Directive 1999/31/EC as applied under the Environmental Permitting (England and Wales) (Amendment) (EU Exit) Regulations 2019 (*SI 2019/39*) and as defined by the council decision establishing

criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC(2003/33/EC), and also within the UK Water Industry Research (UKWIR) in all soil samples tested.

Generic Assessment Criteria (GAC) for total petroleum hydrocarbons according to both their molecular weight and chemical structure and also for a range of soil organic matter (SOM) content values have been derived using CLEA software. The LQM CIEH GACs are presented according to their soil organic matter content and proposed end use of the land.

Comparison of the measured TPH data with the worst-case scenario constituent compounds and their GAC limit values was made to provide a conservative assessment of the organic contamination.

TPH concentrations within all samples across the site were below the relevant GAC limit for their respective ranges and would therefore not be considered to pose a significant risk of significant harm to human health.

9.1.4 Inorganic Compounds

Concentrations of water-soluble sulphate ranged from 12 mg/l to 1750 mg/l (as SO_4). The pH values were slightly acidic to neutral and ranged from 5.6 to 9.8 units.

9.1.5 Asbestos

Screening undertaken on all eleven soil samples and the additional ten soil samples did not test positive for asbestos containing soils (ACS) therefore asbestos fibres within the soil were not detected, neither was any asbestos containing material (ACM) identified within the tested samples.

9.2 WASTE ACCEPTANCE CRITERIA (WAC)

Two composite WAC samples were compiled from samples recovered from depths of between 0.2-0.3m (WAC Composite A) and from soils at 0.7m (WAC Composite B)

Based on the findings of these tests, no leachable content in excess of the inert waste limits were found.

9.3 SOIL GAS

Three gas monitoring visits were undertaken between the 11th December 2020 and the 7th January 2021.

On each of the visits, a soil vapour survey was undertaken across the site and comprised the monitoring of the atmosphere within the installed Window Sample Hole

standpipes. Portable gas monitoring equipment (GA5000) was used to monitor the standpipes for concentrations of carbon dioxide (CO_2), methane (CH_4) and oxygen (O_2)

For determining the gas protection measures which may be required in low rise buildings with a beam and block floor there is published guidance from the NHBC for use on residential developments which utilises a traffic light system of classification. For larger buildings the guidance in CIRIA 665 and BS8485 is used.

Reference has also been made to the British Standard Code of Practice BS8485:2015, *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings* and regard has been given to the recommendations presented therein. The processes set out in BS8485 represent good practice and is based on the CIRIA C665 document.

In addition CIRIA document C735, *Good practice on the testing and verification of protection systems for buildings against hazardous ground gases* has also been referenced.

The results obtained from the short-term soil gas monitoring undertaken indicated that significantly elevated concentrations of soil gas are not present in the soils underlying the site. The soil gas results are attached at Appendix 4.

The results obtained from the soil gas survey undertaken indicated that elevated methane and carbon dioxide concentrations were not recorded within the voids tested during the monitoring period and were therefore below the action level of 1% and 5% respectively.

Measurement of both borehole pressure and gas emission rates indicates that no significant gas flows are present. The maximum gas flow rate measured on site was <0.1 l/hr.

9.4 WATCHING BRIEF AND DISCOVERY STRATEGY

Whilst significantly elevated contaminant concentrations were generally not encountered as part of this site investigation, given the potential sources of contamination identified on-site, should discreet hotspots be encountered, which were not previously detected, during the site groundworks, these should be dealt with accordingly, by informing all parties involved with the site and drafting new contamination proposals if necessary. A number of options are available for handling any such material, which include:

- The removal from site and disposal to a suitably licensed landfill of all material suspected of being contaminated.
- Short-term storage of the suspected material while undertaking verification testing for suspected contamination. The storage area should be a contained area to ensure that contamination does not migrate and affect other areas of the

site. Depending upon the amounts of material under consideration, this could be either a skip or a lined area.

- Treatment of the identified contamination as discussed above.
- Having a suitably experienced Environmental Engineer either on-call or with a watching brief for the visual and olfactory assessment of the material, and sampling for verification purposes.

Should a new source of contamination be suspected or identified then the relevant local authorities would be informed. A report indicating the nature of contamination and how this is to be dealt with would be submitted to their department and for their agreement. Any necessary remediation would then be detailed and verified in a supplementary remediation statement.

GES can confirm that such a watching brief should exist on this site during any enabling works and should any contamination or potentially contaminative sources be discovered during the proposed enabling works all site works would cease and suitably competent consultants/engineers will attend site.

10 CONTAMINATION RISK ASSESSMENT

This risk assessment has been undertaken with due regard to the advice relating to groundwater as provided in the Environment Agency's "Methodology for the Derivation of Remedial Targets for Soil and Groundwater to Protect Water Resources", the advice provided in the Contaminated Land (England) Regulations 2000, and the associated statutory guidance. The guidance defines contaminated land as any land that is in such a condition that by reason of substances in, on or under the land:

- significant harm is being caused or there is a significant possibility of such harm being caused; or

- pollution of controlled water is being, or is likely to be caused.

This definition is based on the principles of risk assessment defined as a combination of the probability (or frequency) of occurrence of a defined hazard and the magnitude (including the seriousness) of the consequences. Central to the risk assessment process is the concept of pollutant linkage, that is a linkage between a contaminant and a receptor by means of a pathway.

Statutory definitions relating to pollution linkage.	
Contaminant	"a substance which is in, on or under the land and which has the potential to cause harm or to cause pollution of controlled waters."
Receptor	"a living organism, a group of living organisms, and ecological system or a piece of property" which meets given criteria. "controlled waters which are, or could be, polluted by a contaminant".
Pathway	"one or more routes or means by, or through, which a receptor: • is being exposed to, or affected by, a contaminant, or • could be so exposed or affected".

The relationship between these components is discussed below in order to identify the existence of any source-pathway-receptor linkage on the site, and hence the potential risks associated with any contamination.

This risk assessment is based on the proposed redevelopment of the site for the construction of 2 detached houses with detached garages and associated driveways, soft landscaping and private garden areas.

The significance of the risks to the receptors/targets identified is based on an evaluation of the potential pathways between the contaminant source and receptors based on residential with home grown produce end use.

Potential receptors/targets at the site and in the area in which the site is located include:

- future occupants and the general public;
- construction/maintenance workers;
- groundwater resources;
- underground services in and around the site;
- plants in proposed garden and landscaped areas.

10.1 CONTAMINANT SOURCES

From the historical maps there are generally no clear signs of significant on-site sources of contamination. The site walkover did not identify any potential sources of significant contamination on site with the exception of the potential of asbestos containing material to be present within the waste stockpiles located across parts of the site.

In summary, the following potential contaminant sources have been identified at the site and in the surrounding area:

Potential Source	Source Description	Principal Contaminants of Concern
Current and Historic Site Use	Near surface in-fill/ reworked material of unknown origin used to level areas beneath current buildings and hardstanding. Demolition waste and waste stockpiles.	PAH, Metals, ACM
	Former agricultural use of the site.	Metals, PAH, TPH
	Hazardous materials used within existing on-site buildings	ACM
Current and Historic Surrounding Land Use	Potential Landfill operations.	Ground Gases (Methane and Carbon Dioxide)

10.2 RISK TO HUMAN HEALTH

Toxic Metals

Concentrations of toxic metals arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, vanadium and zinc were all below their respective soil guidance values for a residential with home grown produce end use in all samples tested, therefore the risks posed to human health from these contaminants is considered to be low.

Organic Compounds

Whilst, in general, organic hydrocarbon concentrations were not significantly elevated, certain slightly elevated PAH compounds, including Benzo(a)Pyrene and an elevated Total PAH concentration was encountered within a single near surface soil sample retrieved from WS6 (0.3m) which may be considered to pose a significant risk of significant harm to human health should any viable pathway exist.

This means that if any contaminant source to receptor pathways are to remain present on site, then the soils above could be considered to pose a potential risk of harm to human health in the context of Part 2A.

The PAH ratios of anthracene (A), chrysene (C), fluoranthene (F), and pyrene (P) can be used as source apportionment tools to determine the likely source of the significantly elevated PAH concentration encountered within the near surface made ground soil samples retrieved from WS6 (0.3m). By calculating the ratios of A:C versus F:P and plotting the results, the resultant ratios indicate that the likely source of the elevated PAH concentration encountered in the Made Ground sample from WS6 is tarmac. As confirmed within the soil logs, it is likely therefore that some tarmac has been incorporated into the sample tested at the laboratory. A copy of the PAH source indicator ratios is attached to this report as Appendix 8.

On this basis and given that the near surface Made Ground soils are likely to be removed from site anyhow as part of the site preparatory works, the risks to human health from these contaminants are considered to be low.

Asbestos

Asbestos was not detected in any near surface made ground soils from across the site or within any of the waste stockpiles located across parts of the site, therefore the risks from asbestos would not be considered to pose a significant risk to human health.

In the event that ACM is encountered during the site enabling works then the extent of such will be delineated under the supervision of a suitably competent consultant/engineer and the material will be removed from site in accordance with the hazardous waste regulations.

If asbestos-containing material is found on site, then all the documentation regarding its remediation including duty of care and waste transfer notes would be forwarded to the appropriate authorities.

Furthermore, given the age of the existing buildings on site, there is the potential for asbestos containing material (ACM) to be present within the building fabric. The storage of asbestos sheeting has also been identified on site. The Control of Asbestos Regulations 2012 require an Asbestos Management Plan to be maintained for all commercial property constructed prior to 2000, i.e. where asbestos may be contained within the building fabric. It is therefore recommended that an appropriate asbestos survey of the existing buildings is undertaken by a competent contractor prior to any demolition works.

On the balance of the toxicological risks posed by the ground contamination encountered as part of this current intrusive investigation undertaken by GES, it is considered that the potential risks to site workers and future occupants could be adequately controlled as follows:

Site Workers

- Provision of appropriate personal protective equipment and hygiene facilities.
- Good working practice in line with current legislation when safely handling and disposing of any asbestos material.
- Provision of appropriate dust suppression, to minimise the generation of potentially contaminated suspended particulates during site works.

Future Occupants

Elevated levels of contaminants which could potentially pose a health risk to future occupants of the site were generally not identified during either the desk study research of the site or the intrusive investigation, therefore no further remedial works, in terms of contaminated soils, is required upon the site as part of the proposed development.

Therefore the site would not be considered to pose a potential risk of significant harm to human health in the context of Part 2A.

With regard to the areas on site which may be set to garden areas in the proposed development it will likely that any existing topsoil and subsoil will be suitable for reuse, however additional clean topsoil may be required to be imported and placed into proposed private garden and soft landscaped areas where required.

10.3 RISKS TO WATER RESOURCES

The geology underlying the site is the Weald Clay Formation which is generally designated as Unproductive Strata and is not located within a groundwater source protection zone. Similarly, there are no potable groundwater or surface water abstractions within 2.0 km of the site.

Furthermore, significant levels of potentially soluble and therefore mobile organic contaminant sources were not measured on site within the samples tested. In the absence of any significant potential contaminative source it is therefore considered risks to groundwater resources are considered to be classed as low.

10.4 RISKS TO PLANTS

The concentrations of potentially phytotoxic metals copper, zinc and nickel were generally all below their respective maximum permissible concentrations used in the Sewage Sludge (Use in Agriculture) Regulations 1989 for their relevant soil pH with the exception of an elevated zinc concentration within the soil sample retrieved from WS7 (0.3m). Given that zinc concentrations within all of the other samples retrieved from across the site were significantly lower and well below the guideline limit value, this isolated elevated concentration would be considered to be an isolated 'hotspot' and not reflective of zinc concentrations across the site.

Furthermore, the area around WS7 currently comprises of Made Ground material consisting of aggregate, asphalt, and bricks which would not be considered suitable growth media and as such, suitable growth media would need to be imported here anyhow.

Therefore, the risk to plants is considered low and the current topsoil, where present, across the site is considered to be a suitable and healthy growth media in terms of the proposed development. Additional clean topsoil may need to be imported and placed within certain parts of the site where required.

10.5 RISKS TO BUILDINGS & SERVICES

Elevated levels of organic contaminants were not detected across the site. The risks to services from contamination degrading pipes is therefore considered low.

It is therefore not considered necessary to protect services, notably potable water, on this site, however it is advisable to seek service provider confirmation of this.

10.6 GAS RISK ASSESSMENT

The levels of soil gas underlying the site have been monitored as part of a short-term soil gas monitoring programme carried out across the site during December 2020 and January 2021. The results obtained from the soil gas survey indicate that elevated levels of soil gas, which may require gas protection measures to be incorporated into the development, are not present on site. No elevated gas flow rates were recorded during the monitoring which included periods of low and falling atmospheric pressure. Furthermore significant biodegradable material was not encountered in any of the holes excavated at the site.

The highest carbon dioxide concentration encountered on site during this current investigation was measured in WS11 at 3.4% which does not exceed the relevant guideline limits of 5%. Similarly no elevated methane concentrations were recorded across the site.

Measurement of both borehole pressure and gas emission rates indicates that no significant gas flows are present. The maximum gas flow rate measured on site was below 0.1 l/hr which was measured using the GA5000 built-in flow meter. In order to allow for a worst-case scenario, a gas flow rate across the site of 1.5 l/h has been applied in the following calculations.

Based on BS 8485:2015, we have assessed the site based on the gas monitoring undertaken as part of the site investigation in order to calculate a Characteristic Gas Situation (CS).

Based on the worst case gas characteristic situation, the worst case implied CS derived by combining the maximum observed concentrations from different gas monitoring standpipes during any monitoring event and a worst case flow rate of 1.5 l/h are as follows.

Flow Rate (l/h)	CH4 (%)	CO2 (%)	GSV – CH4 (l/h)	GSV – CO2 (l/h)	Implied CH4 CS	Implied CO2 CS
1.5	0.0	3.4	0.000	0.051	1	1

On the basis of the measurements in the table above, the GSV is taken to be 0.051 l/h, which is the worst case for methane and carbon dioxide. A GSV of 0.051 l/h lies within the GSV values for **CS1** (<0.07 l/h) which has a very low hazard potential.

BS 8485:2015 enables the minimum level gas protection (score) for the site or zones to be determined based on the determined CS and the type of proposed building. Given the proposed end use of the site, a High risk Type A building has been used for calculating the appropriate gas protection score.

Given that the site has an implied CS1, the minimum gas protection score required for a Type A building is 0, which means that no gas protection measures would be required as part of the proposed development based on current gas concentrations.

10.7 WASTE DISPOSAL

Should an excess volume of soil be required to be disposed of off-site then a waste classification may be required.

For a waste classification to be undertaken, materials may need to be subjected to leachate testing which would give an indication to the soluble component of contaminants and, therefore those most toxic to the environment in the waste. The classification will then allow the appropriate disposal pathway to a suitably licensed disposal facility to be determined.

Waste acceptance criteria (WAC) leachate testing was carried out on composite soil samples from the site. The results are attached at Appendix 6 and show that no leachable content in excess of the inert limit values was noted.

As a preliminary waste assessment and based on the results of materials tested to date, it is considered that the majority of any surplus soils requiring off-site disposal would be classified as EWC 17 05 04 non-hazardous and acceptable at a waste facility licenced to accept inert material.

11 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is a system diagram identifying contaminant sources, routes of exposure (pathways), and which receptors are affected by contaminants moving along those pathways.

The model is produced to identify the zones of the site with different potential contaminations characteristics (e.g. whether contaminants in the soil are likely to be on the surface or at depth, distributed over an entire area or in localised ‘hot spots’).

The conceptual site model presented in the table below is based on the findings of the site investigation undertaken.

Source	Pollutant		Pathway	Hazard		Receptor	Observations/ Recommendations	Assessed Risk
Contaminated ground	Metals, organic (hydrocarbons) could be present	➔	Direct contact, ingestion, inhalation.	Health risks including skin irritation.	➔	Humans: site workers	Normal health and safety precautions. No significantly elevated contaminant concentrations encountered.	Low
			Surface run off.	Lateral movement to surface watercourses.	➔	Aquatic resources, ecology and subsequent users including humans.	Significant contamination not encountered on site and there are no surface water courses in immediate vicinity of the site.	Low
			Leaching/ Dispersion.	Downward migration to groundwater.	➔	Aquatic resources – Groundwater, abstraction wells) / surface waters.	Significant mobile contamination not present in soils.	Low
			Uptake by plants.	Phytotoxic effects.	➔	Soft landscaped areas / plants.	Significant contamination generally not present in soils. The importation of certified clean topsoil may be required across certain parts of the site.	Low
			Direct contact	Aggressive chemical attack	➔	Building structures and services	It is considered that protection of services is unlikely to be required on this site, however it is advisable to seek service provider confirmation of this.	Low

Source	Pollutant		Pathway	Hazard		Receptor	Observations/ Recommendations	Assessed Risk
Liquid contaminant sources	Diesel, Petrol and Oils.	➔	Direct contact; ingestion, inhalation.	Health risks including skin irritation. Lateral and vertical migration of contaminants.	➔	Humans: site workers. Groundwater and surface water.	The intrusive ground investigation proved no significant contamination and no liquid contamination sources were identified on site.	Low
Asbestos	Asbestos fibres within made ground and waste on site	➔	Inhalation.	Health risks including asbestosis, mesothelioma, and lung cancer.	➔	Humans: site workers and future occupants.	Asbestos has not been identified within soil samples retrieved on site however is likely to be contained within the existing on-site buildings. Appropriate PPE should be worn when working with asbestos and an asbestos survey should be undertaken within existing buildings prior to any demolition works.	Low
Landfill, madeground,	Ground Gases (CO_2, CH_4)		Inhalation and ingress into buildings	Asphyxiation and explosions		Buildings/humans/ future site users	Significantly elevated ground gases have not been noted on site. Gas protection measures are not recommended in new development.	Low
Redundant Waste, Demolition Waste			Dermal Contact/ingestion. Potential for migration via surface water run-off	Health Risks		Humans: Site workers	Any unwanted waste on site is to be removed from site during site preparatory works and disposed of in accordance with current legislation. Normal health and safety precautions.	Low

12 CONCLUSIONS AND RECOMMENDATIONS

Based on the intrusive works and subsequent data assessment, the following conclusions and recommendations have been drawn up in respect of the site at Bachelors Farm, Keymer Road, Burgess Hill, RH15 0BQ.

Geotechnical

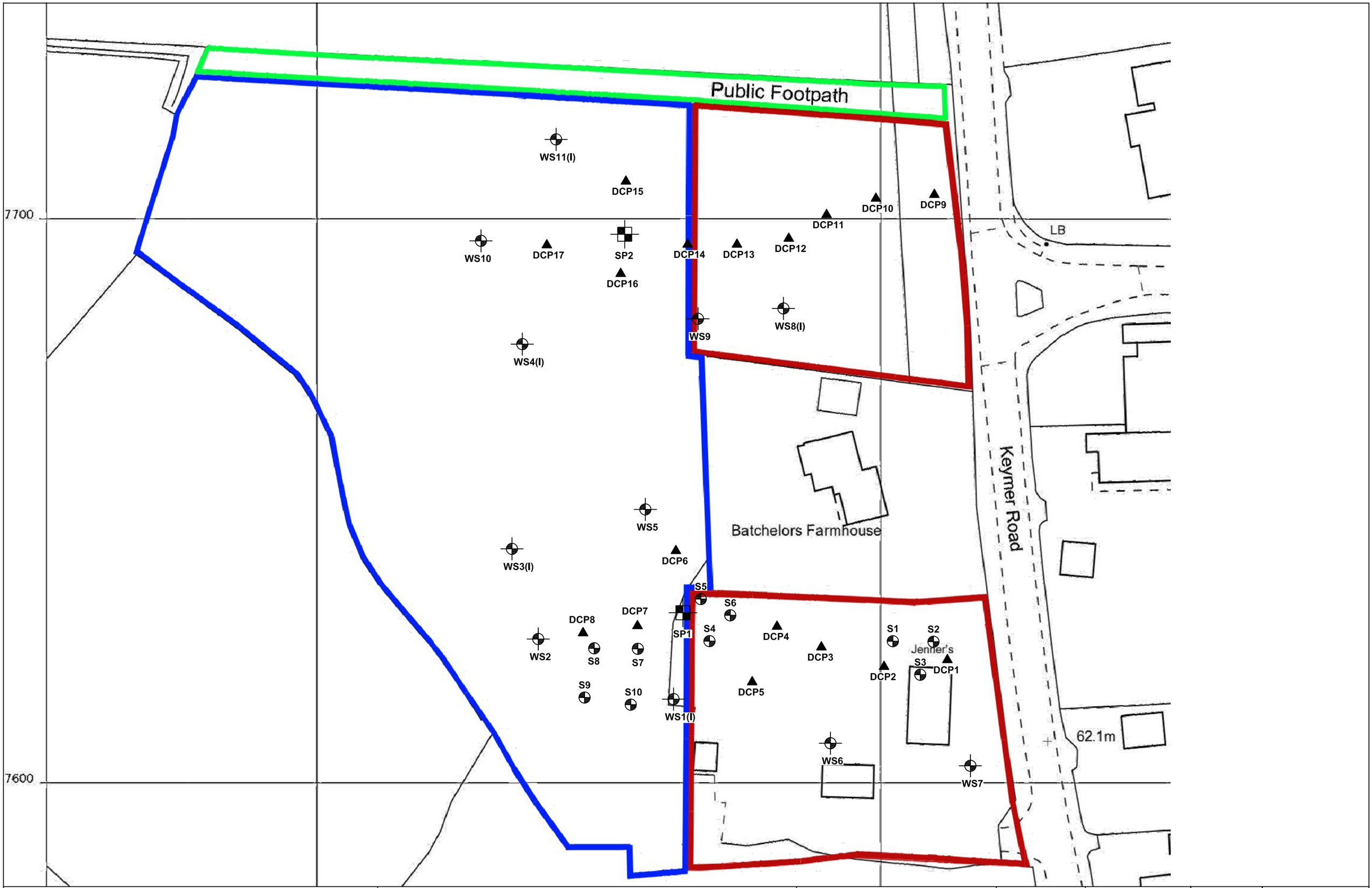
- The exploratory holes proved the anticipated geology with soils typical of the Weald Clay Formation - Mudstone found beneath a surface layer of Topsoil. Made Ground soils were found locally in the southern part of the site.
- The proposed development comprises the construction of two storey detached properties. For preliminary foundation design purposes, a line load of 60kN/m run has been adopted.
- Based on field observations an allowable bearing pressure of 100kN/m² is recommended for foundations placed within the Weald Clay Formation at a minimum depth of 1.2m. An allowable bearing pressure of 150kN/m^2 could be utilised for foundations placed at a depth of 2m.
- It is therefore recommended that a minimum foundation width of 0.6m is adopted for footings at 1.2m depth and 0.45m at a depth of 2.0m.
- The results of the settlement calculations predicted total settlements would be less than 25mm.
- Suspended ground floor slabs were recommended.
- For preliminary design purposes it is recommended that a CBR value of 4% should be adopted.
- The use of shallow chamber type soakaways would not be viable due to the negligible infiltration achieved.
- In accordance with BRE Special Digest 1 (SD1) a design sulphate class for the site of DS-1 and a class of AC-1 is recommended.

Environmental

- From the historical maps there are generally no clear signs of significant on-site sources of contamination. The site walkover did not identify any potential sources of significant contamination on site with the exception of the potential of asbestos containing material to be present within the waste stockpiles located across parts of the site.
- The site is generally underlain by unproductive strata in the bedrock strata. The site is not located within an Environment Agency defined groundwater source protection zone.
- Concentrations of toxic metals were below their respective soil guideline values and are therefore not considered to pose a significant risk of significant harm to human health.

- Similarly, organic hydrocarbon concentrations were generally not significantly elevated, based on the development proposal, and are therefore not considered to pose a significant risk of significant harm to human health. Whilst certain isolated PAH compound concentrations were encountered within the near surface soil sample retrieved from WS6, this was attributed to the presence of tarmac within the sample and would not be considered to pose a risk to human health.
- The risk to flora on site is considered to be low given the absence of phytotoxic contamination and the health and vigour of the plants currently on site.
- Where present, the existing on-site topsoil/subsoil is suitable to remain on site and to be re-used within proposed garden and soft landscaping areas, however a quantity of certified clean topsoil may need to be imported for certain areas of the site.
- No Asbestos Containing Material (ACM) was identified in soils recovered on site therefore the risks associated with these materials are considered to be low.
- There is however a possibility of the presence of Asbestos Containing Material (ACM) within the fabric of the existing site buildings. It is therefore recommended that a formal asbestos survey of existing buildings on site be undertaken pre-demolition by a competent contractor. Good working practice should be adhered to, along with appropriate PPE, in line with current legislation when safely handling and disposing of asbestos material.
- The risks posed to workers involved in the redevelopment of the site are not considered significant providing standard health and hygiene practices are adopted.
- Based on low concentrations of organic contaminants found across the site, it is unlikely that any new services, in particular potable water, will require protection, however it is advisable to seek service provider confirmation of this.
- Based on gas monitoring results, the site has been given a classification of CS1 which has a very low hazard potential and therefore no protection measures are required as part of the proposed development.
- The risks to groundwater in the underlying aquifer is considered to be low due to the lack of any significant mobile organic contamination.
- The majority of any surplus soil material to be removed off site is likely to be classified as non-hazardous and likely to be acceptable at a facility licensed to accept inert waste.
- It is recommended that a watching brief be implemented on this site during enabling works and should any suspected contamination or potentially contaminative sources be discovered during the proposed enabling works all site works would cease and suitably competent consultants/engineers will attend site to agree a formal remediation strategy.

Based on the principles and definitions outlined under section 57 of the Environment Act 1995, the site would not be considered to be “Contaminated Land” based on its proposed residential redevelopment.



WS - Window Sample	DP - Dynamic Probe
BH - Borehole	GM - Gas Monitoring Standpipe
TP - Trial Pit	SP - Soakage Pit
HDTP - Hand Dug Trial Pit	PT - Percolation Test
DCP - Dynamic Cone Penetration Test	S - Sample Location
HA - Hand Auger	

Site: Batchelors Farm, Keymer Road, Burgess Hill, West Sussex, RH15 0BQ	Client: SDP Developers	Drawn: PJ	Rev.:
Title: Figure 1 Exploratory Hole Location Plan	Project: 12531	Date: 12/2020	Scale:

Unit 2 Montpelier Business Park, Dencora Way, Ashford, Kent TN23 4FG
Tel: 01233 646 237

Figure 2: Batchelors Farm, Keymer Road, Burgess Hill RH15 0QB
SPT N-Depth Profile

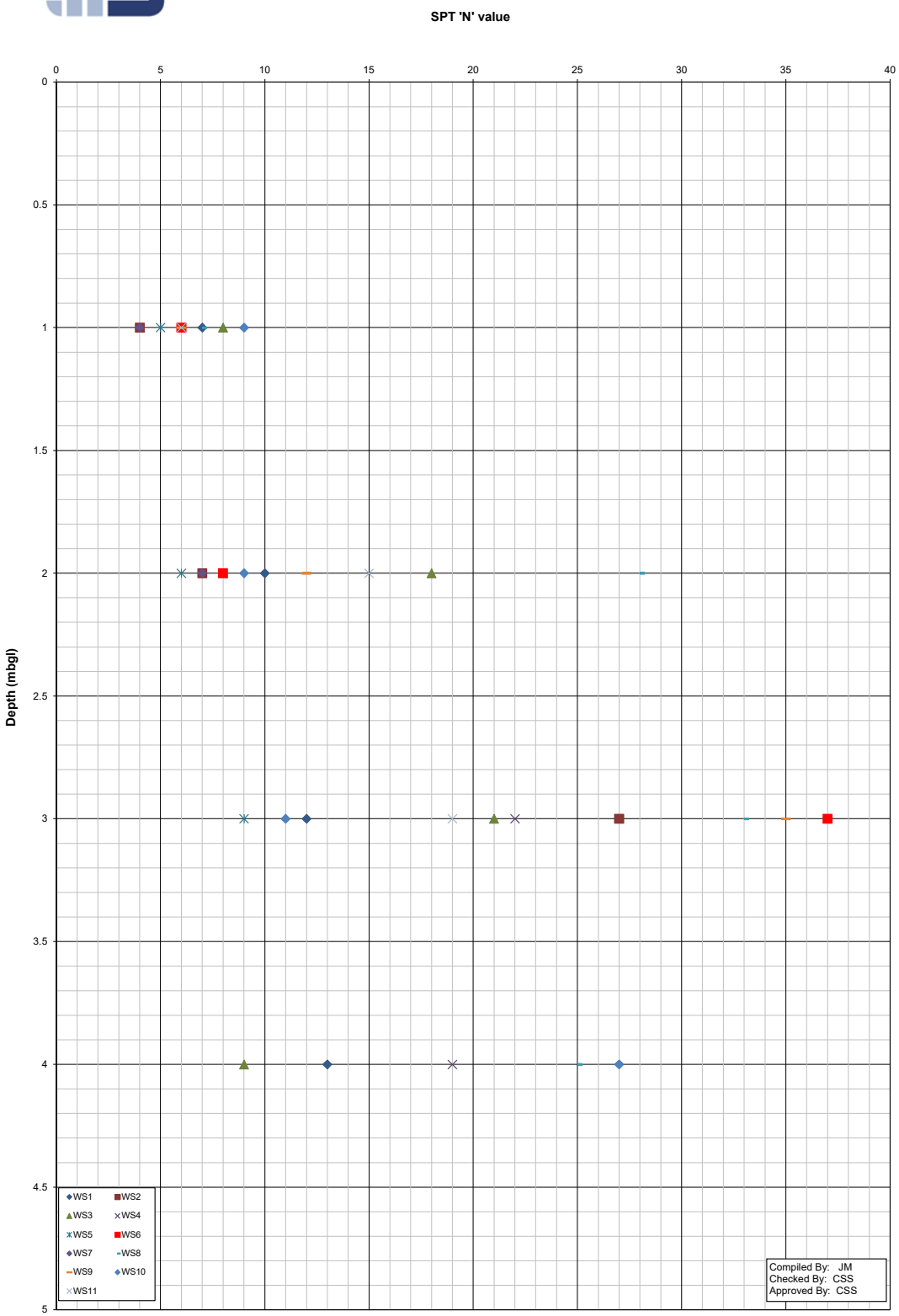
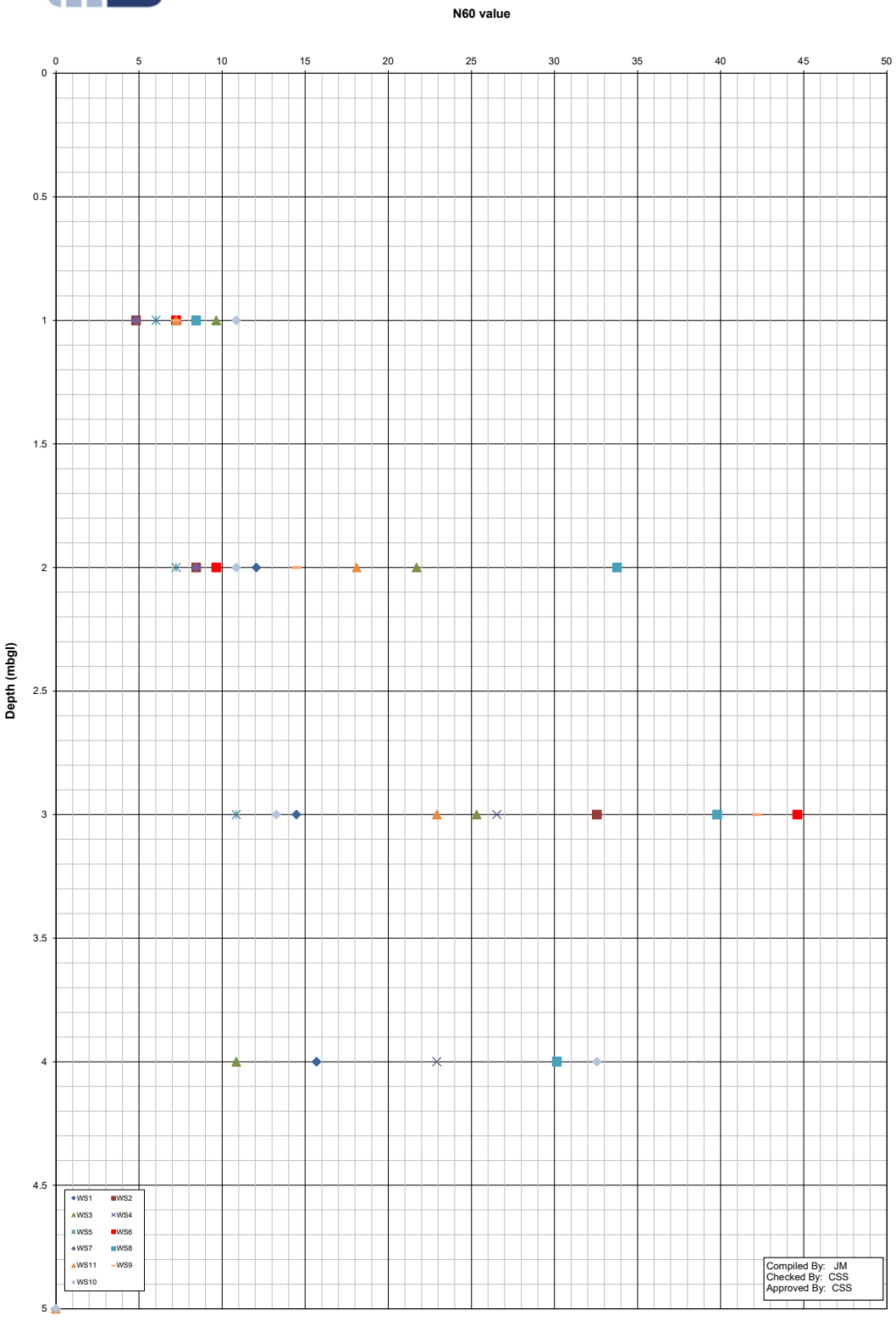


Figure 3: Batchelors Farm, Keymer Road, Burgess Hill RH15 0Q
N60-Depth Profile



APPENDIX 1

WINDOW SAMPLE LOGS AND INSTALLATION DETAILS

Ground and Environmental Services Limited

Unit 2 Montpelier Business Park Tel: 01233 646237
Dencora Way, Ashford
Kent TN23 4FG

Window
Sampler Log No. WS01
Sheet: 1 of 1

Equipment & Methods.
Premier Compact 110
_Support Used:None
_Backfill: 35mm diameter installation

Project Name: Batchelors Farm
Project Location: Keymer Road, Burgess Hill
Client: SDP Developers

Job No: 12531

Co-ordinates:
E:
N:

Ground Level (m):

Date Started:03/12/2020
Date Completed:03/12/2020

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
					Grass over: TOPSOIL composed of moist dark brownish grey clay slightly silty with frequent fine roots, occasional coarse aggregate.			(0.35)
					Dry firm to stiff light orange brown with mottled light grey slightly silty CLAY. **(Weald Clay)**	-0.35		0.35
			SN=7	1,1/1,1,2,3				
			SN=10	1,1/2,2,3,3				(3.65)
			SN=12	1,2/2,2,4,4				
			SN=13	2,1/3,3,3,4		-4.00		4.00

End of W/S 4.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: JM
Checked By: CSS
Scale:
Approved By:
FIG No. 5

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park
Dencora Way, Ashford
Kent TN23 4FG
T: 01233 646237

Hole ID. WS01

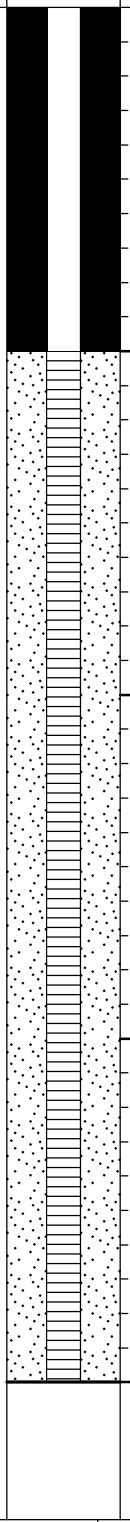
Installation Details & Readings

Sheet: 1 of 1

Equipment & Methods. Premier Compact 110 _Support Used:None _Backfill: 35mm diameter installation	Project Name: Batchelors Farm Project Location: Keymer Road, Burgess Hill Client: SDP Developers	Job No: 12531
Co-ordinates: E: N:	Ground Level (m):	Date Started:03/12/2020 Date Completed:03/12/2020

Installation Date : 03/12/2020
Installation Type : SP

Depth to TOP Response Zone : 1 (m)
Depth to BASE Response Zone : 4 (m)



Depth Related Remarks (Elevation)	
1	(-1.00)
End of Hole 4.00 m	
	(-4.00)

Compiled By:	Checked By:
JM	CSS
Scale:	Approved By:
FIG No.	

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG PIEZO/STANDPIPE LOG LOGS FINAL.GPJ GSG-AGS3-STD TEMPLATE.GDT 11/1/21

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park Tel: 01233 646237
Dencora Way, Ashford
Kent TN23 4FG

Window
Sampler Log No. WS02
Sheet: 1 of 1

Equipment & Methods.
Premier Compact 110
_Support Used:None
_Backfill: Arisings

Project Name: Batchelors Farm
Project Location: Keymer Road, Burgess Hill
Client: SDP Developers

Job No: 12531

Co-ordinates:
E:
N:

Ground Level (m):

Date Started:03/12/2020
Date Completed:03/12/2020

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
					Grass over: TOPSOIL composed of moist dark brownish grey clay slightly silty with frequent fine roots.			(0.30)
					Dry firm to stiff light orange brown with mottled light grey slightly silty CLAY. **(Weald Clay)**	-0.30		0.30
			SN=4	1,1/1,1,1,1				(1.70)
			SN=7	1,1/1,2,2,2		-2.00		2.00
2.50		D			Dry firm to stiff light brown with dark grey silty CLAY/MUDSTONE with occasional black lignite. **(Weald Clay)**			(1.00)
			SN=27	2,4/6,6,6,9		-3.00		3.00

End of W/S 3.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: JM
Checked By: CSS
Scale:
Approved By:
FIG No. 5

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park Tel: 01233 646237
Dencora Way, Ashford
Kent TN23 4FG

Window
Sampler Log No. WS03
Sheet: 1 of 1

Equipment & Methods.
Premier Compact 110
_Support Used:None
_Backfill: 35mm diameter installation

Project Name: Batchelors Farm
Project Location: Keymer Road, Burgess Hill
Client: SDP Developers

Job No: 12531

Co-ordinates:
E:
N:

Ground Level (m):

Date Started:03/12/2020
Date Completed:03/12/2020

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.25		D			TOPSOIL: Moist dark brownish grey clay slightly silty with frequent fine roots, occasional coarse aggregate.			(0.40)
						-0.40		0.40
0.70		D			Dry firm to stiff light tahn brown with mottled grey slightly silty CLAY with occasional fine roots and preserved roots. **(Weald Clay)**			(0.60)
			SN=8	1,1/2,2,2,2		-1.00		1.00
1.50		D			Dry firm to stiff light tan brown with mottled light grey slightly fissured very silty CLAY. Occasional siltstone/mudstone gravel. **(Weald Clay)**			(1.00)
			SN=18	2,3/4,5,5,4		-2.00		2.00
2.50		D			Dry firm to stiff light tan brown with mottled light grey slightly fissured clayey very weak MUDSTONE/SILTSTONE. **(Weald Clay)**			(1.40)
			SN=21	1,1/1,5,5,10		-3.40		3.40
3.50		D			Dry very weak slightly clayey MUDSTONE some oxidation. Recovered as mostly as gravel. **(Weald Clay)**			(0.60)
			SN=9	1,1/2,2,2,3		-4.00		4.00

End of W/S 4.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: JM
Checked By: CSS
Scale:
Approved By:
FIG No. 5

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park
Dencora Way, Ashford
Kent TN23 4FG
T: 01233 646237

Hole ID. WS03

Installation Details & Readings

Sheet: 1 of 1

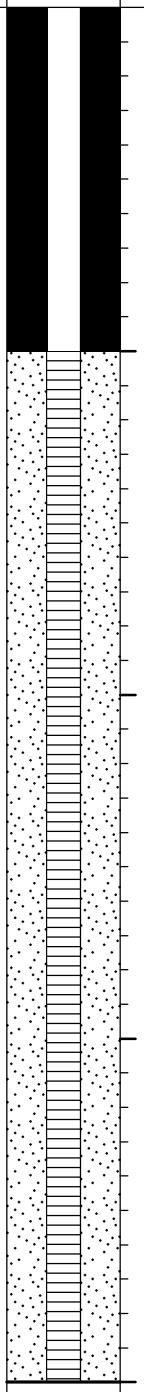
Equipment & Methods. Premier Compact 110 _Support Used:None _Backfill: 35mm diameter installation	Project Name: Batchelors Farm Project Location: Keymer Road, Burgess Hill Client: SDP Developers	Job No: 12531
Co-ordinates: E: N:	Ground Level (m):	Date Started:03/12/2020 Date Completed:03/12/2020

Installation Date : 03/12/2020
Installation Type : SP

Depth to TOP Response Zone : 1 (m)
Depth to BASE Response Zone : 4 (m)

Installation Diagram

Depth Related Remarks (Elevation)



1 (-1.00)

End of Hole 4.00 m

(-4.00)

Compiled By: JM	Checked By: CSS
Scale:	Approved By:
FIG No.	

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG PIEZO/STANDPIPE LOG LOGS FINAL.GPJ GSG-AGS3-STD TEMPLATE.GDT 11/1/21

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park Tel: 01233 646237
Dencora Way, Ashford
Kent TN23 4FG

Window
Sampler Log No. WS04
Sheet: 1 of 1

Equipment & Methods.
Premier Compact 110
_Support Used:None
_Backfill: 35mm diameter installation

Project Name: Batchelors Farm
Project Location: Keymer Road, Burgess Hill
Client: SDP Developers

Job No: 12531

Co-ordinates:
E:
N:

Ground Level (m):

Date Started:03/12/2020
Date Completed:03/12/2020

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20		D			Grass over: TOPSOIL composed of moist dark brownish grey clay slightly silty with frequent fine roots, occasional coarse aggregate.			(0.35)
						-0.35		0.35
0.70		D			Dry firm to stiff light orange brown with mottled light grey slightly silty CLAY. **(Weald Clay)** ...from 0.35 to 1.00 Occasional coarse sub angular flints			
			SN=6	1,1/1,1,2,2				
1.50		D						
			SN=8	1,1/2,2,2,2				(3.65)
2.50		D			...from 2.35 to 2.40 Heavily oxidised layer			
			SN=22	1,3/5,6,6,5	...from 2.80 Mudstone inclusions			
					...from 3.15 to 3.25 Silt band recovered as gravel			
3.50		D			...from 3.25 to 4.00 Occasional black lignite, some dessication			
			SN=19	1,3/3,4,6,6		-4.00		4.00

End of W/S 4.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: JM
Checked By: CSS
Scale:
Approved By:

FIG No. 5

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park
Dencora Way, Ashford
Kent TN23 4FG
T: 01233 646237

Hole ID. WS04

Installation Details & Readings

Sheet: 1 of 1

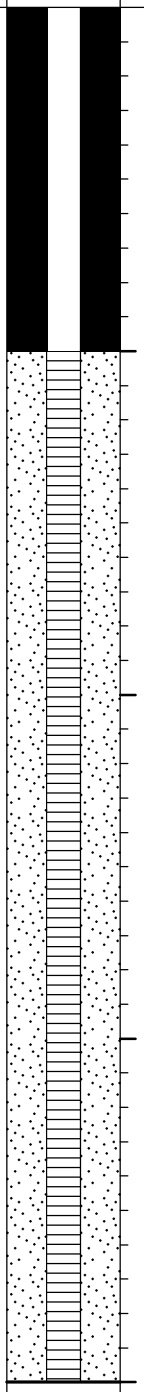
Equipment & Methods. Premier Compact 110 _Support Used:None _Backfill: 35mm diameter installation	Project Name: Batchelors Farm Project Location: Keymer Road, Burgess Hill Client: SDP Developers	Job No: 12531
Co-ordinates: E: N:	Ground Level (m):	Date Started:03/12/2020 Date Completed:03/12/2020

Installation Date : 03/12/2020
Installation Type : SP

Depth to TOP Response Zone : 1 (m)
Depth to BASE Response Zone : 4 (m)

Installation Diagram

Depth Related Remarks (Elevation)



1 (-1.00)

End of Hole 4.00 m

(-4.00)

Compiled By: JM	Checked By: CSS
Scale:	Approved By:
FIG No.	

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GSG PIEZO/STANDPIPE LOG LOGS FINAL.GPJ GSG-AGS3-STD TEMPLATE.GDT 11/1/21

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park Tel: 01233 646237
Dencora Way, Ashford
Kent TN23 4FG

Window
Sampler Log No. WS05
Sheet: 1 of 1

Equipment & Methods.
Premier Compact 110
_Support Used:None
_Backfill: Arisings

Project Name: Batchelors Farm
Project Location: Keymer Road, Burgess Hill
Client: SDP Developers

Job No: 12531

Co-ordinates:
E:
N:

Ground Level (m):

Date Started:03/12/2020
Date Completed:03/12/2020

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20		D			Grass over: TOPSOIL composed of moist dark brownish grey clay slightly silty with frequent fine roots, occasional coarse aggregate.	-0.30		(0.30) 0.30
0.70		D			Dry firm to stiff light orange brown with mottled light grey slightly silty CLAY. **(Weald Clay)** ...from 0.60 to 1.00 preserved roots			
			SN=5	1,1/1,1,2,1				
1.50		D						(2.70)
			SN=6	1,1/1,2,1,2				
2.50		D						
			SN=9	1,1/2,2,2,3	frequent coarse selenite crystals	-3.00		3.00

End of W/S 3.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: JM
Checked By: CSS
Scale:
Approved By:
FIG No. 5

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Ground and Environmental Services Limited

Unit 2 Montpelier Business Park Tel: 01233 646237
Dencora Way, Ashford
Kent TN23 4FG

Window
Sampler Log No. WS06

Sheet: 1 of 1

Equipment & Methods. Premier Compact 110 _Support Used:None _Backfill: Arisings	Project Name: Batchelors Farm Project Location: Keymer Road, Burgess Hill Client: SDP Developers	Job No: 12531
Co-ordinates: E: N:	Ground Level (m):	Date Started:03/12/2020 Date Completed:03/12/2020

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.30		D			MADEGROUND: Composed of red brick, asphalt and concrete.			(0.60)
0.70		D			MADEGROUND: Light brown and mottled grey clay with red brick throughout.	-0.60		0.60 (0.35)
			SN=6	1,1/1,1,2,2	Dry firm to stiff light brown with mottled grey silty CLAY. **(Weald Clay)**	-0.95		0.95
1.50		D						(1.05)
			SN=8	1,2/2,2,3,3	*Poor Recovery* Dry firm to stiff light brown with mottled grey silty CLAY. **(Weald Clay)**	-2.00		2.00
2.50		D						(1.00)
			SN=37	1,3/10,16,6,5		-3.00		3.00

End of W/S 3.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: JM	Checked By: CSS
Scale:	Approved By:

FIG No. 5

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park Tel: 01233 646237
Dencora Way, Ashford
Kent TN23 4FG

Window
Sampler Log No. WS07
Sheet: 1 of 1

Equipment & Methods.
Premier Compact 110
_Support Used:None
_Backfill: Arisings

Project Name: Batchelors Farm
Project Location: Keymer Road, Burgess Hill
Client: SDP Developers

Job No: 12531

Co-ordinates:
E:
N:

Ground Level (m):

Date Started:03/12/2020
Date Completed:03/12/2020

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.30		D			MADEGROUND: Aggregate, Asphalt and red brick.			(0.60)
0.70		D			Firm to stiff light tan brown with light grey silty CLAY, occasional preserved roots. **(Weald Clay)**	-0.60		0.60
			SN=4	1,1/0,1,1,2				
1.50		D						(1.40)
			SN=7	1,1/1,2,2,2		-2.00		2.00

End of W/S 2.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: JM
Checked By: CSS
Scale:
Approved By:
FIG No. 5

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park Tel: 01233 646237
Dencora Way, Ashford
Kent TN23 4FG

Window
Sampler Log No. WS08
Sheet: 1 of 1

Equipment & Methods.
Premier Compact 110
_Support Used:None
_Backfill: 35mm diameter installation

Project Name: Batchelors Farm
Project Location: Keymer Road, Burgess Hill
Client: SDP Developers

Job No: 12531

Co-ordinates:
E:
N:

Ground Level (m):

Date Started:04/12/2020
Date Completed:04/12/2020

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.30		D			TOPSOIL: Composed of dark brown silty CLAY with frequent fine roots.	-0.35		(0.35) 0.35
0.70		D			Dry firm to stiff light tahn brown with dark orange brown silty CLAY. Frequent oxidised fine to medium sub rounded siltstone gravels. **(Weald Clay)**	-1.00		(0.65) 1.00
			SN=7	1,1/2,2,1,2				
1.50		D			Dry firm to stiff light orangish brown with mottled light grey silty CLAY. **(Weald Clay)**	-2.00		(1.00) 2.00
			SN=28	3,3/6,7,7,8				
2.50		D			Dry firm to stiff light orange brown with dark grey CLAY/SILT and very weak mudstone. **(Weald Clay)**	-3.40		(1.40) 3.40
			SN=33	3,5/7,7,8,11				
3.50		D			Dry firm to stiff dark orange brown with dark grey weak MUDSTONE/CLAY. **(Weald Clay)**	-4.00		(0.60) 4.00
			SN=25	4,5/6,7,7,5				

End of W/S 4.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: JM
Checked By: CSS
Scale:
Approved By:
FIG No. 5

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park
Dencora Way, Ashford
Kent TN23 4FG
T: 01233 646237

Hole ID. WS08

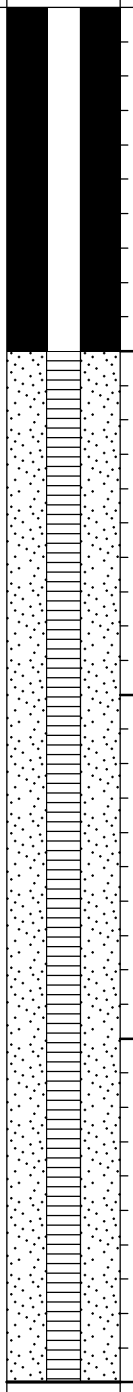
Installation Details & Readings

Sheet: 1 of 1

Equipment & Methods. Premier Compact 110 _Support Used:None _Backfill: 35mm diameter installation	Project Name: Batchelors Farm Project Location: Keymer Road, Burgess Hill Client: SDP Developers	Job No: 12531
Co-ordinates: E: N:	Ground Level (m):	Date Started:04/12/2020 Date Completed:04/12/2020

Installation Date : 04/12/2020
Installation Type : SP

Depth to TOP Response Zone : 1 (m)
Depth to BASE Response Zone : 4 (m)

Installation Diagram	Depth Related Remarks (Elevation)
	1 (-1.00) **End of Hole 4.00 m** (-4.00)

Compiled By:	Checked By:
JM	CSS
Scale:	Approved By:
FIG No.	

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Ground and Environmental Services Limited

Unit 2 Montpelier Business Park Tel: 01233 646237
Dencora Way, Ashford
Kent TN23 4FG

Window
Sampler Log No. WS09

Sheet: 1 of 1

Equipment & Methods.
Premier Compact 110
_Support Used:None
_Backfill: Arisings

Project Name: Batchelors Farm
Project Location: Keymer Road, Burgess Hill
Client: SDP Developers

Job No: 12531

Co-ordinates:
E:
N:

Ground Level (m):

Date Started:04/12/2020
Date Completed:04/12/2020

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20		D			TOPSOIL: Composed of dark brown silty CLAY with frequent fine roots.			(0.40)
						-0.40		0.40
0.70		D			Dry firm to stiff light tahn brown with dark orange brown silty CLAY. Frequent oxidised fine to medium sub rounded siltstone gravels. **(Weald Clay)**			
			SN=6	1,1/1,1,2,2				(1.60)
1.50		D						
			SN=12	2,1/2,3,3,4		-2.00		2.00
					Dry firm to stiff light orange brown with dark grey CLAY/SILT and mudstone. **(Weald Clay)**			
2.50		D						(1.00)
			SN=35	5,6/6,9,9,9		-3.00		3.00

End of W/S 3.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: JM
Checked By: CSS
Scale:
Approved By:

FIG No. 5

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park Tel: 01233 646237
Dencora Way, Ashford
Kent TN23 4FG

Window
Sampler Log No. WS10
Sheet: 1 of 1

Equipment & Methods.
Premier Compact 110
_Support Used:None
_Backfill: Arisings

Project Name: Batchelors Farm
Project Location: Keymer Road, Burgess Hill
Client: SDP Developers

Job No: 12531

Co-ordinates:
E:
N:

Ground Level (m):

Date Started:04/12/2020
Date Completed:04/12/2020

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20		D			TOPSOIL: Composed of dark brown silty CLAY with frequent fine roots.			(0.30)
						-0.30		0.30
0.70		D			Dry firm to stiff light tahn brown with dark orange brown silty CLAY. Frequent oxidised fine to medium sub rounded siltstone gravels. **(Weald Clay)**			
			SN=9	1,1/1,2,3,3				(1.70)
1.50		D						
			SN=9	1,2/2,2,2,3		-2.00		2.00
2.50		D			Dry firm to stiff dark grey with light orange brown silty CLAY. **(Weald Clay)**			(1.00)
			SN=11	1,2/2,3,3,3		-3.00		3.00
			SN=27	4,6/8,6,6,7				

End of W/S 3.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: JM
Checked By: CSS
Scale:
Approved By:
FIG No. 5

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park Tel: 01233 646237
Dencora Way, Ashford
Kent TN23 4FG

Window
Sampler Log No. WS11
Sheet: 1 of 1

Equipment & Methods.
Premier Compact 110
_Support Used:None
_Backfill: 35mm diameter installation

Project Name: Batchelors Farm
Project Location: Keymer Road, Burgess Hill
Client: SDP Developers

Job No: 12531

Co-ordinates:
E:
N:

Ground Level (m):

Date Started:04/12/2020
Date Completed:04/12/2020

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
0.20		D			TOPSOIL: Composed of dark brown silty CLAY with frequent fine roots.			(0.30)
						-0.30		0.30
0.70		D			Dry firm to stiff light tahn brown with dark orange brown silty CLAY. Frequent oxidised fine to medium sub rounded siltstone gravels. **(Weald Clay)**			
			SN=6	1,1/1,1,2,2				(1.70)
1.50		D						
			SN=15	2,2/3,3,4,5		-2.00		2.00
2.50		D			Dry firm to stiff dark grey with light orange brown silty MUDSTONE. Medium fissures. **(Weald Clay)**			
			SN=19	3,4/4,6,4,5				(2.00)
3.50		D						
						-4.00		4.00

End of W/S 4.00 m
(Thickness of basal layer not proven)

Remarks:

Logged By: JM
Checked By: CSS
Scale:
Approved By:
FIG No. 5

Notes: For explanation of symbols and abbreviations, see Key Sheet.

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park
Dencora Way, Ashford
Kent TN23 4FG
T: 01233 646237

Hole ID. WS11

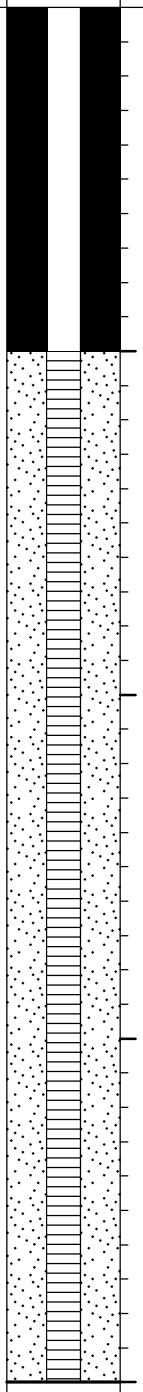
Installation Details & Readings

Sheet: 1 of 1

Equipment & Methods. Premier Compact 110 _Support Used:None _Backfill: 35mm diameter installation	Project Name: Batchelors Farm Project Location: Keymer Road, Burgess Hill Client: SDP Developers	Job No: 12531
Co-ordinates: E: N:	Ground Level (m):	Date Started:04/12/2020 Date Completed:04/12/2020

Installation Date : 04/12/2020
Installation Type : SP

Depth to TOP Response Zone : 1 (m)
Depth to BASE Response Zone : 4 (m)

Installation Diagram	Depth Related Remarks (Elevation)
	1 (-1.00) **End of Hole 4.00 m** (-4.00)

Compiled By:	Checked By:
JM	CSS
Scale:	Approved By:
FIG No.	

Notes: For explanation of symbols and abbreviations, see Key Sheet.

APPENDIX 2

DG365 SOAKAGE TEST RESULTS

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park
Dencora Way, Ashford
Kent TN23 4FG
Tel: 01233 646237

Trial Pit No. SA1

Sheet: 1 of 1

Equipment & Methods.
JCB 3CXSupport Used:None
Backfill: Arisings

Project Name: Batchelors Farm
Project Location: Keymer Road, Burgess Hill
Client: SDP Developers

Job No: 12531

Co-ordinates:
E:
N:

Ground Level (m):

Date Started:04/12/2020
Date Completed:04/12/2020

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
					Grass over: TOPSOIL composed of moist dark brownish grey clay slightly silty with frequent fine roots, occasional coarse aggregate.			(0.40)
					Dry firm to stiff light orange brown with mottled light grey slightly silty CLAY. **(Weald Clay)**	-0.40		0.40
								(2.05)
						-2.45		2.45

End of Trial Pit 2.45 m
(Thickness of basal layer not proven)

Remarks:

Logged By: JM
Checked By: CSS
Scale:
Approved By:
FIG No. 3

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GROUND AND ENVIRONMENTAL SERVICES LIMITED
Unit 2 Montpelier Business Park, Dencora Way, Ashford, Kent TN23 4FG
TEL : 01233 646237

SOAKAWAY TESTING

Test in accordance with BRE 365 Guidelines

Project Reference Number: 12531 Client: SDP Developers

SP1 Test 1

Site: Batchelors Farm

Location: Burgess Hill

Weather: Heavy rainfall

Date of Test: 04-Dec-20

TRIAL PIT DIMENSIONS

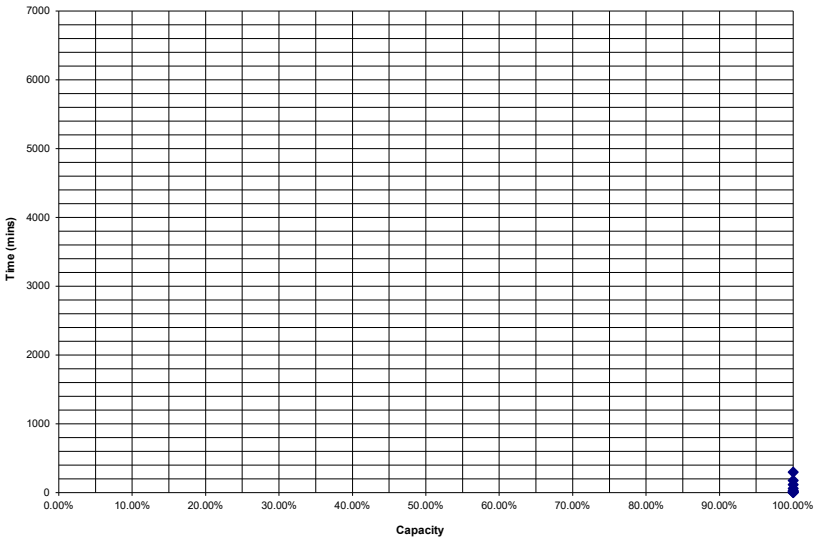
Width (m): 0.6 Length (m): 1.5

Depth (m): 2.45 Invert Depth (m): 1

Drainage time of test (mins): 300 0% Drained)

SOAKAGE RESULTS

Depth	(%)	Time
1	100.00%	0
1	100.00%	5
1	100.00%	10
1	100.00%	20
1	100.00%	30
1	100.00%	60
1	100.00%	120
1	100.00%	180
1	100.00%	300



2.45

INFILTRATION RATE

Depth (B.G.L) (m)	Infiltration Rate (m/s)
1.0 - 2.45	

Departures from the specified test method:

Remarks: No soakage

Authorised Signatory: C SPANTON Date: 7 1 2021

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park
Dencora Way, Ashford
Kent TN23 4FG
Tel: 01233 646237

Trial Pit No. SA2

Sheet: 1 of 1

Equipment & Methods.
JCB 3CXSupport Used:None
Backfill: Arisings

Project Name: Batchelors Farm
Project Location: Keymer Road, Burgess Hill
Client: SDP Developers

Job No: 12531

Co-ordinates:
E:
N:

Ground Level (m):

Date Started:04/12/2020
Date Completed:04/12/2020

Samples and In situ Testing				Field Records	DESCRIPTION	Reduced Level (m)	Legend	Depth (Thick) (m)
Depth (m)	No.	Type	Result					
					Grass over: TOPSOIL composed of moist dark brownish grey clay slightly silty with frequent fine roots, occasional coarse aggregate.			(0.30)
					Dry firm to stiff light orange brown with mottled light grey slightly silty CLAY. **(Weald Clay)**	-0.30		0.30 (2.20)
						-2.50		2.50

End of Trial Pit 2.50 m
(Thickness of basal layer not proven)

Remarks:

Logged By: JM
Checked By: CSS
Scale:
Approved By:
FIG No. 3

Notes: For explanation of symbols and abbreviations, see Key Sheet.

GROUND AND ENVIRONMENTAL SERVICES LIMITED
Unit 2 Montpelier Business Park, Dencora Way, Ashford, Kent TN23 4FG
TEL : 01233 646237

SOAKAWAY TESTING

Test in accordance with BRE 365 Guidelines

Project Reference Number: 12494 Client: SDP Developers

SP2 Test 1

Site: Batchelors Farm

Location: Burgess Hill

Weather: Heavy rainfall

Date of Test: 04-Dec-20

TRIAL PIT DIMENSIONS

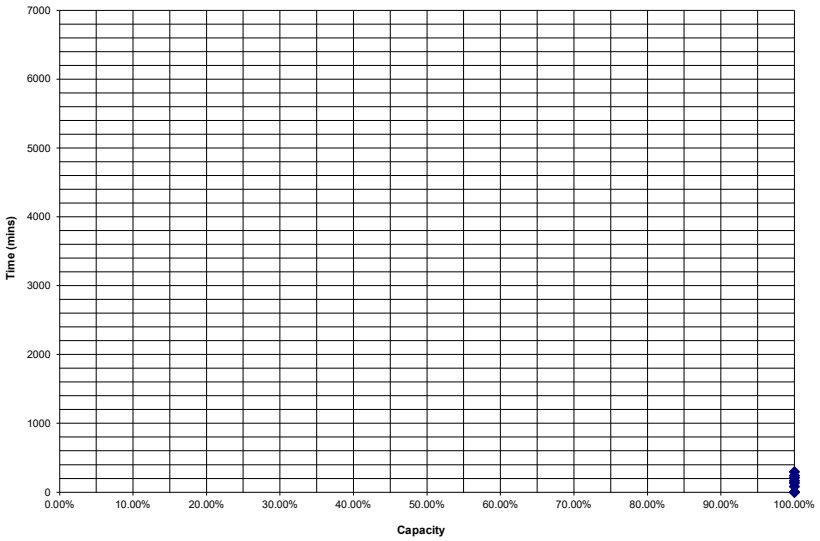
Width (m): 0.5 Length (m): 1.6

Depth (m): 2.5 Invert Depth (m): 0.9

Drainage time of test (mins): 300 0% Drained)

SOAKAGE RESULTS

Depth	(%)	Time
0.9	100.00%	0
0.9	100.00%	4
0.9	100.00%	84
0.9	100.00%	133
0.9	100.00%	170
0.9	100.00%	208
0.9	100.00%	240
0.9	100.00%	300
2.5		



INFILTRATION RATE

Depth (B.G.L) (m)	Infiltration Rate (m/s)
0.9 - 2.5	

Departures from the specified test method:

Remarks: No Soakage

Authorised Signatory: C SPANTON Date: 5 1 2021

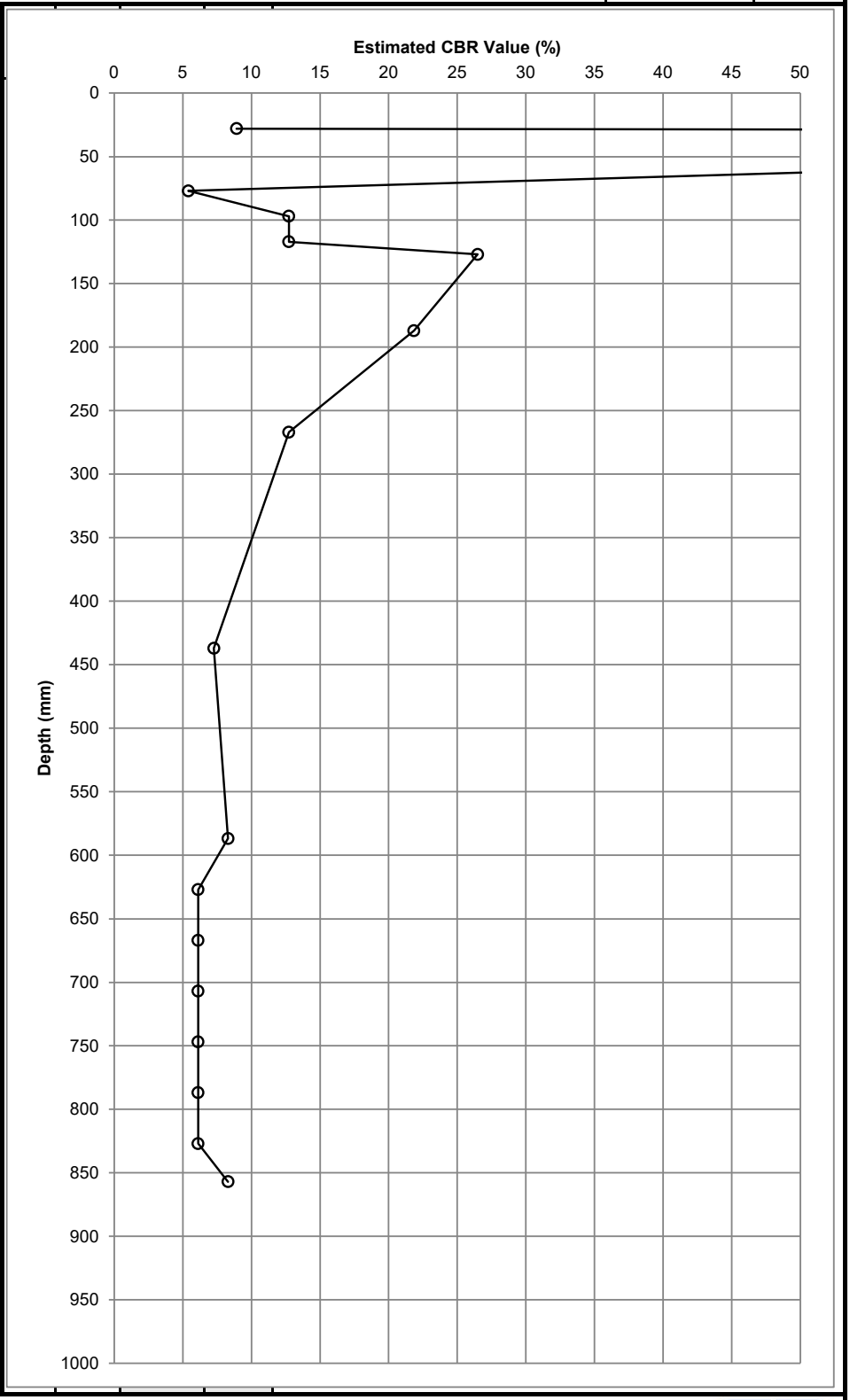
APPENDIX 3

DYNAMIC CONE PENETROMETER TEST RESULTS

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP1
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	83

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	28	28	9
2	30	2	145
3	32	2	145
4	77	45	5
5	97	20	13
6	117	20	13
7	127	10	26
12	187	12	22
16	267	20	13
21	437	34	7
26	587	30	8
27	627	40	6
28	667	40	6
29	707	40	6
30	747	40	6
31	787	40	6
32	827	40	6
33	857	30	8



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

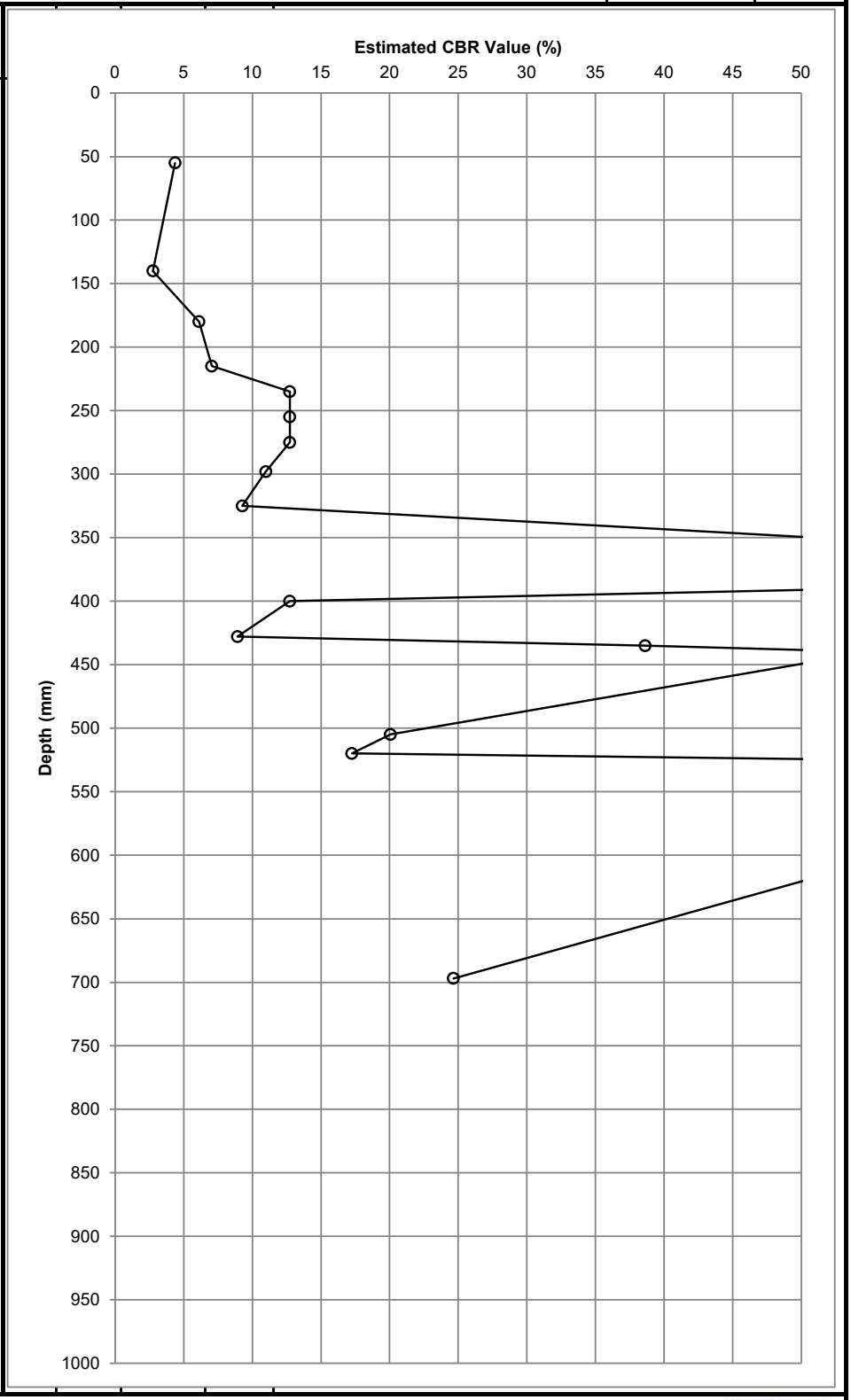
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP2
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	45

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	55	55	4
2	140	85	3
3	180	40	6
4	215	35	7
5	235	20	13
6	255	20	13
7	275	20	13
8	298	23	11
9	325	27	9
14	351	5	53
24	380	3	98
25	400	20	13
26	428	28	9
27	435	7	39
28	440	5	55
33	505	13	20
34	520	15	17
35	525	5	55
40	549	5	58
45	567	4	78
50	590	5	60
60	697	11	25



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

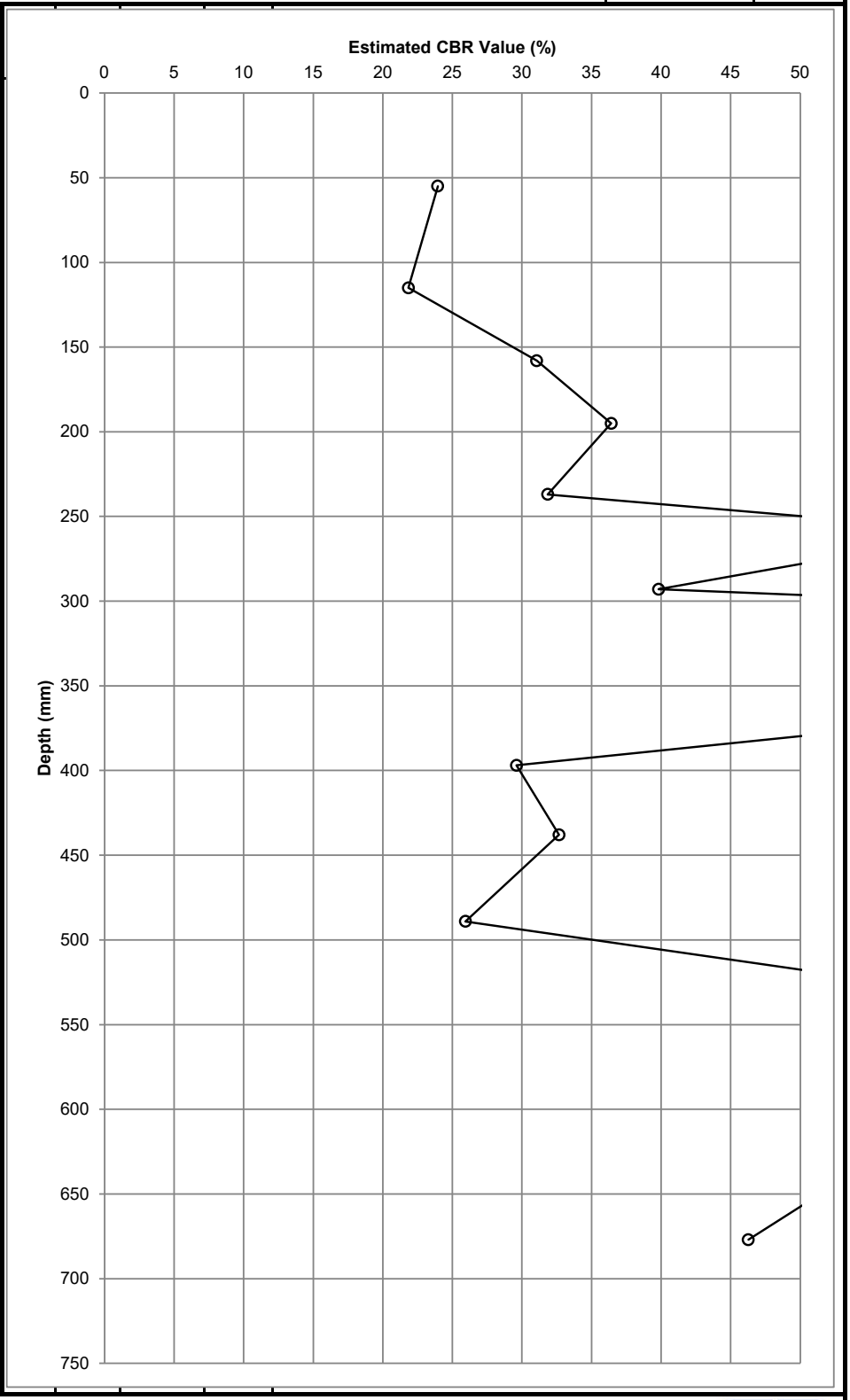
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP3
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	45

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
5	55	11	24
10	115	12	22
15	158	8.6	31
20	195	7.4	36
25	237	8.4	32
30	259	4.4	63
35	293	7	40
45	318	3	115
55	352	3	83
60	397	9	30
65	438	8	33
70	489	10	26
80	533	4	63
90	570	4	76
100	618	5	58
110	677	5.9	46



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

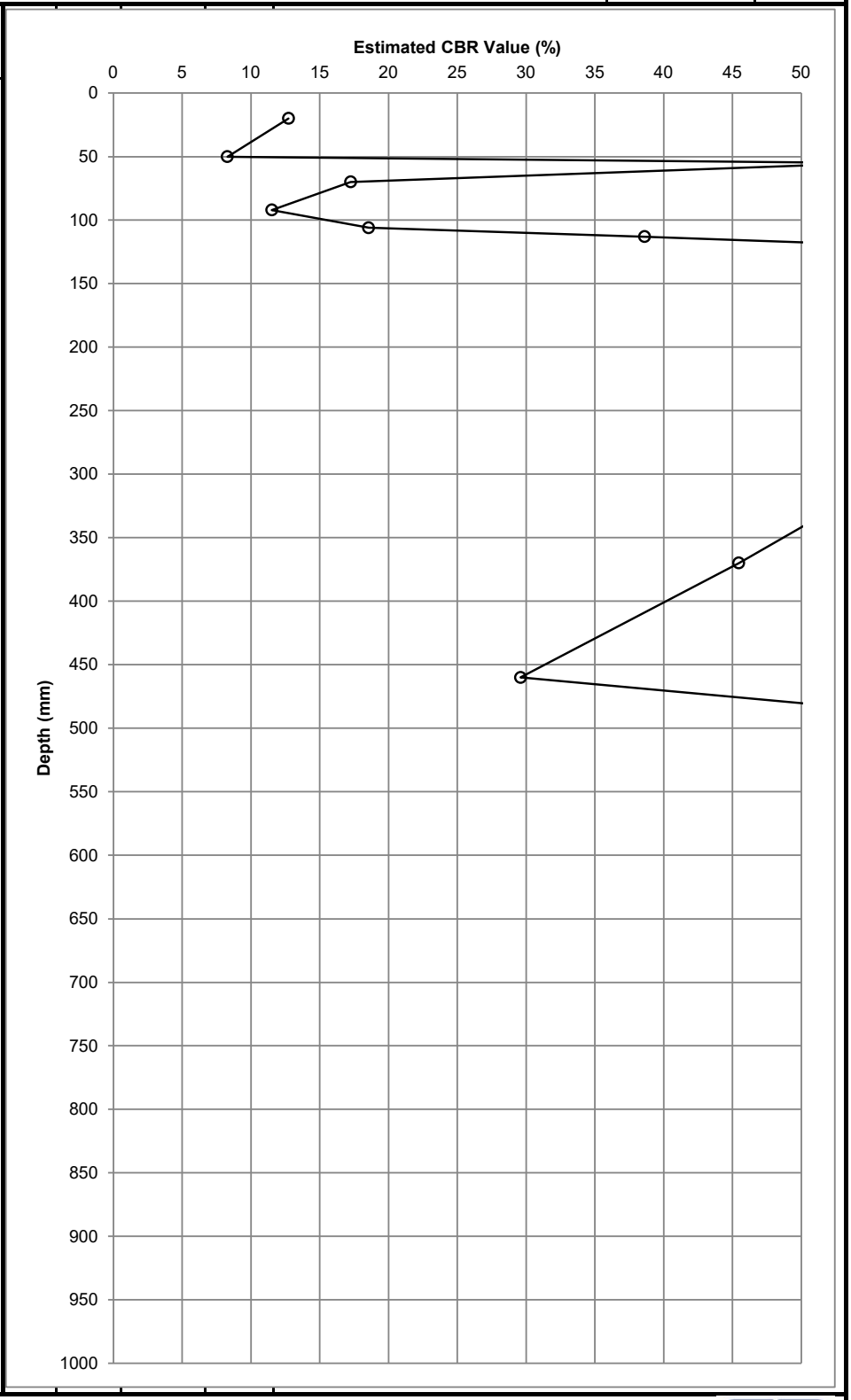
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP4
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	80

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	20	20	13
2	50	30	8
3	55	5	55
4	70	15	17
5	92	22	12
6	106	14	19
7	113	7	39
12	130	3	83
22	154	2	120
32	180	3	110
42	223	4	65
52	260	4	76
62	310	5	55
72	370	6	45
82	460	9	30
92	500	4	70
102	510	1	302
112	555	5	62



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

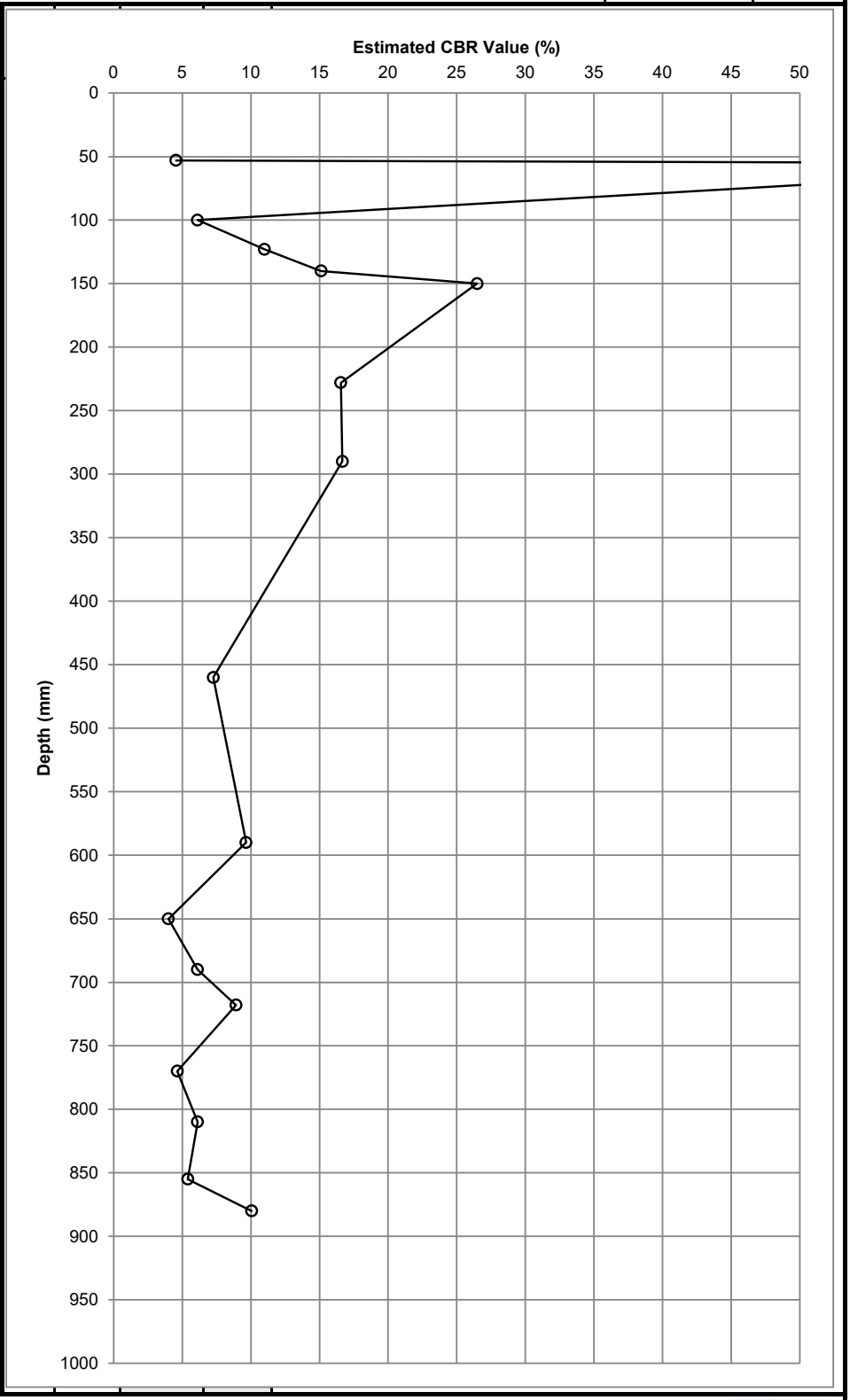
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP5
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	60

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	53	53	5
2	56	3	95
3	60	4	70
4	100	40	6
5	123	23	11
6	140	17	15
7	150	10	26
12	228	15.6	17
16	290	15.5	17
21	460	34	7
26	590	26	10
27	650	60	4
28	690	40	6
29	718	28	9
30	770	52	5
31	810	40	6
32	855	45	5
33	880	25	10



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

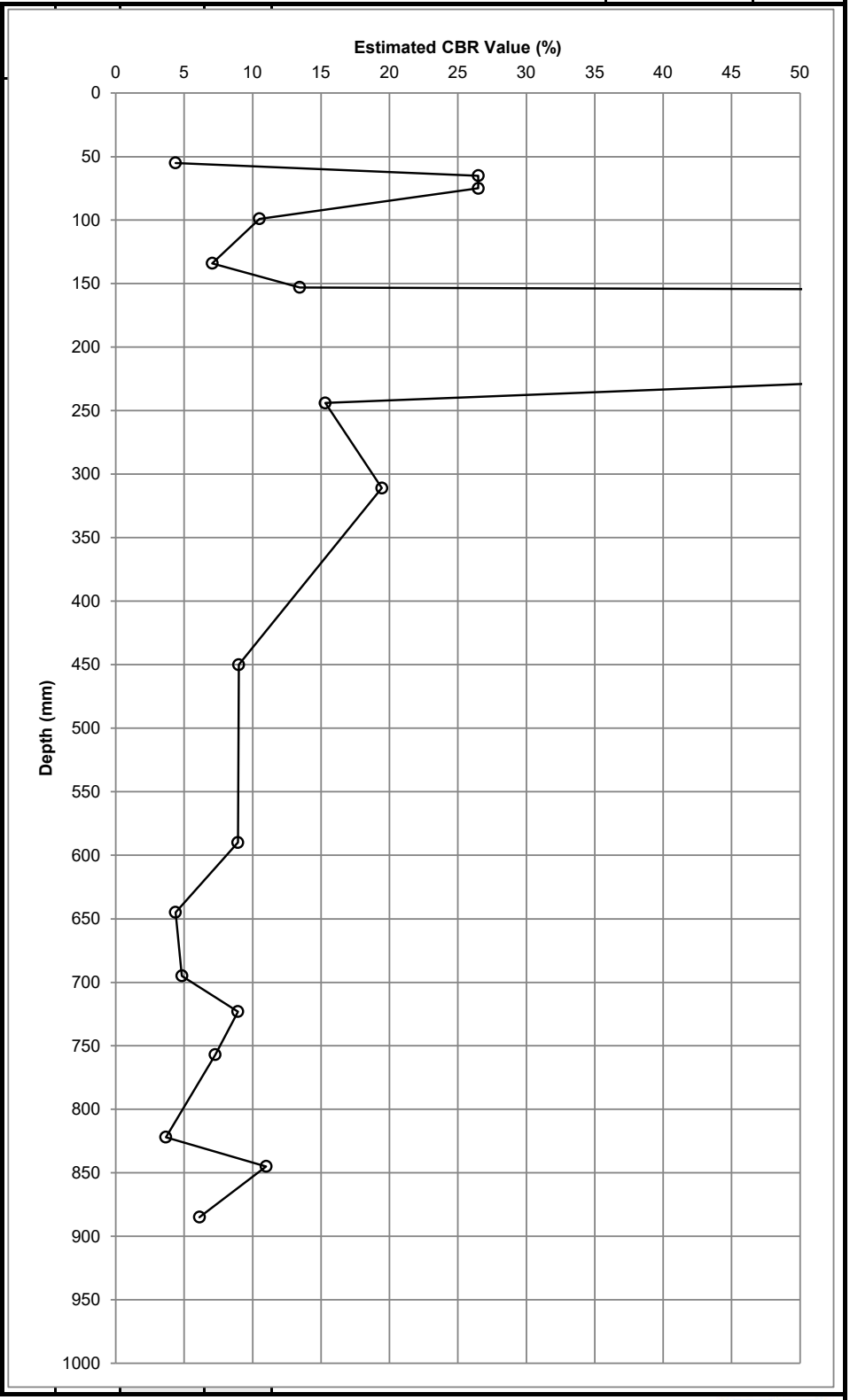
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP6
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	55

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	55	55	4
2	65	10	26
3	75	10	26
4	99	24	10
5	134	35	7
6	153	19	13
11	160	1	212
16	244	17	15
21	311	13	19
26	450	28	9
31	590	28	9
32	645	55	4
33	695	50	5
34	723	28	9
35	757	34	7
36	822	65	4
37	845	23	11
38	885	40	6



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

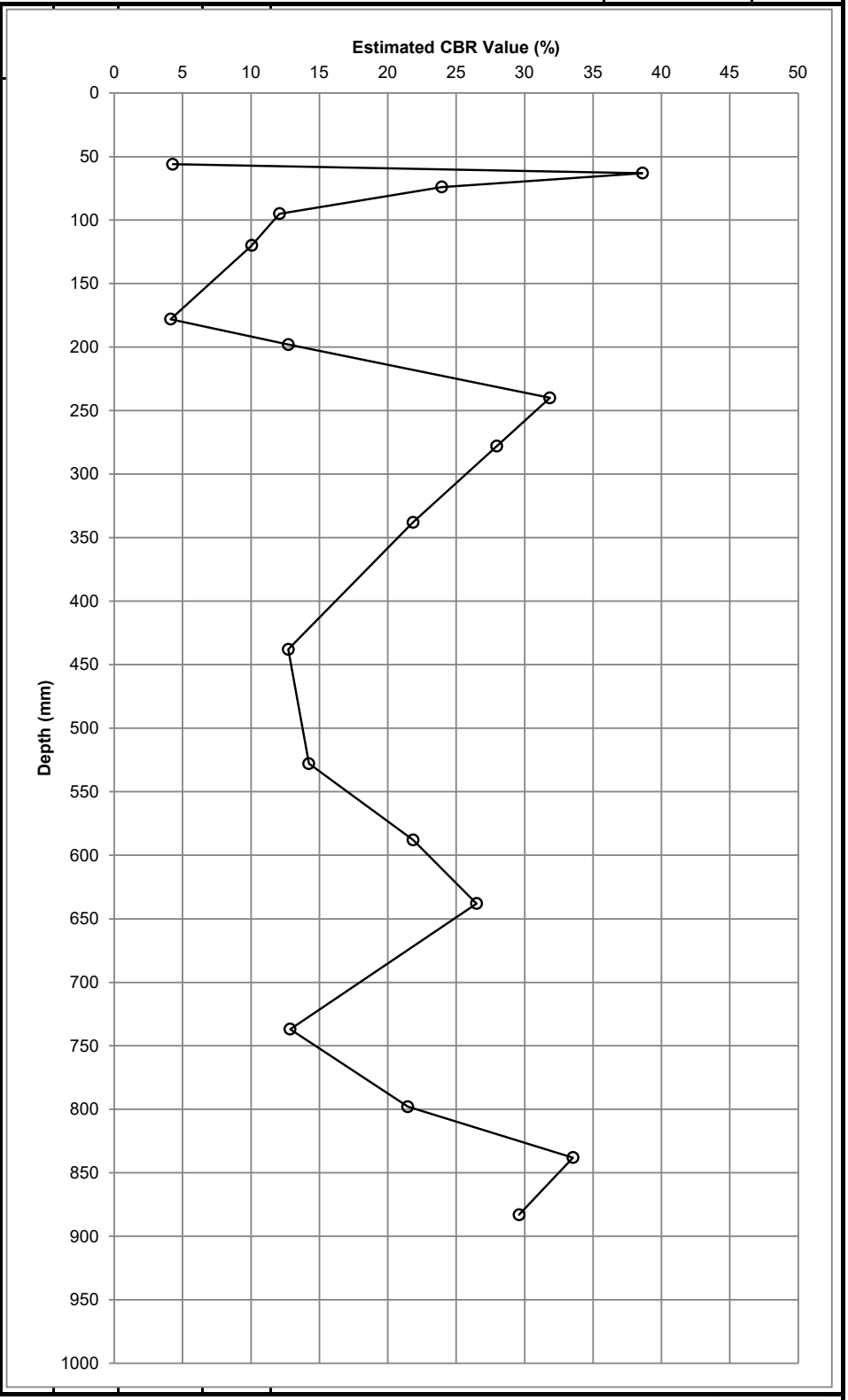
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP7
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	62

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	56	56	4
2	63	7	39
3	74	11	24
4	95	21	12
5	120	25	10
6	178	58	4
7	198	20	13
12	240	8	32
16	278	10	28
21	338	12	22
26	438	20	13
31	528	18	14
36	588	12	22
41	638	10	26
46	737	20	13
51	798	12	21
56	838	8	34
61	883	9	30



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

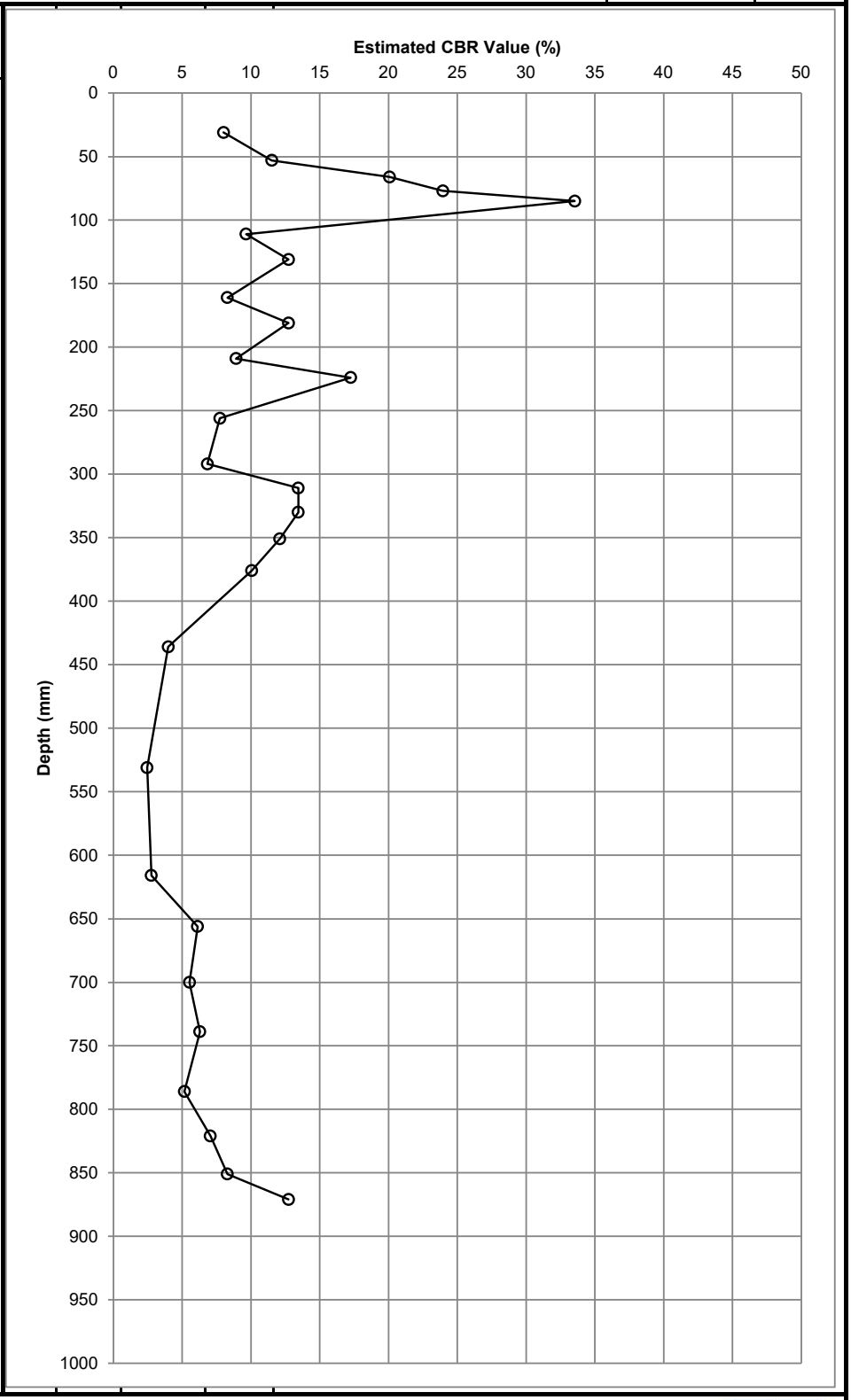
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP8
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	69

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	31	31	8
2	53	22	12
3	66	13	20
4	77	11	24
5	85	8	34
6	111	26	10
7	131	20	13
8	161	30	8
9	181	20	13
10	209	28	9
11	224	15	17
12	256	32	8
13	292	36	7
14	311	19	13
15	330	19	13
16	351	21	12
17	376	25	10
18	436	60	4
19	531	95	2
20	616	85	3
21	656	40	6
22	700	44	6
23	739	39	6
24	786	47	5
25	821	35	7
26	851	30	8
27	871	20	13



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

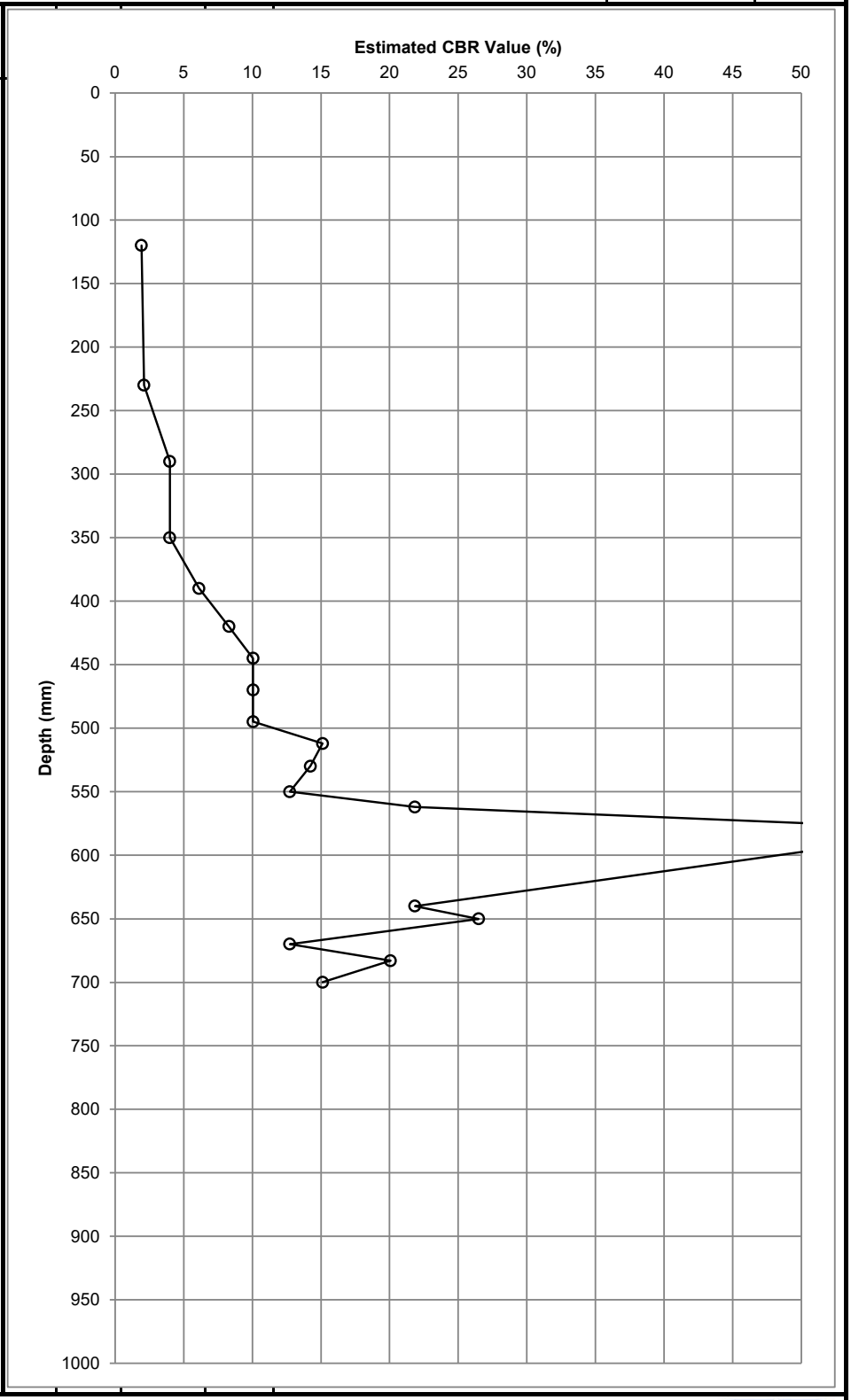
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP9
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	240

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	120	120	2
2	230	110	2
3	290	60	4
4	350	60	4
5	390	40	6
6	420	30	8
7	445	25	10
8	470	25	10
9	495	25	10
10	512	17	15
11	530	18	14
12	550	20	13
13	562	12	22
17	580	5	62
22	640	12	22
23	650	10	26
24	670	20	13
25	683	13	20
26	700	17	15



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

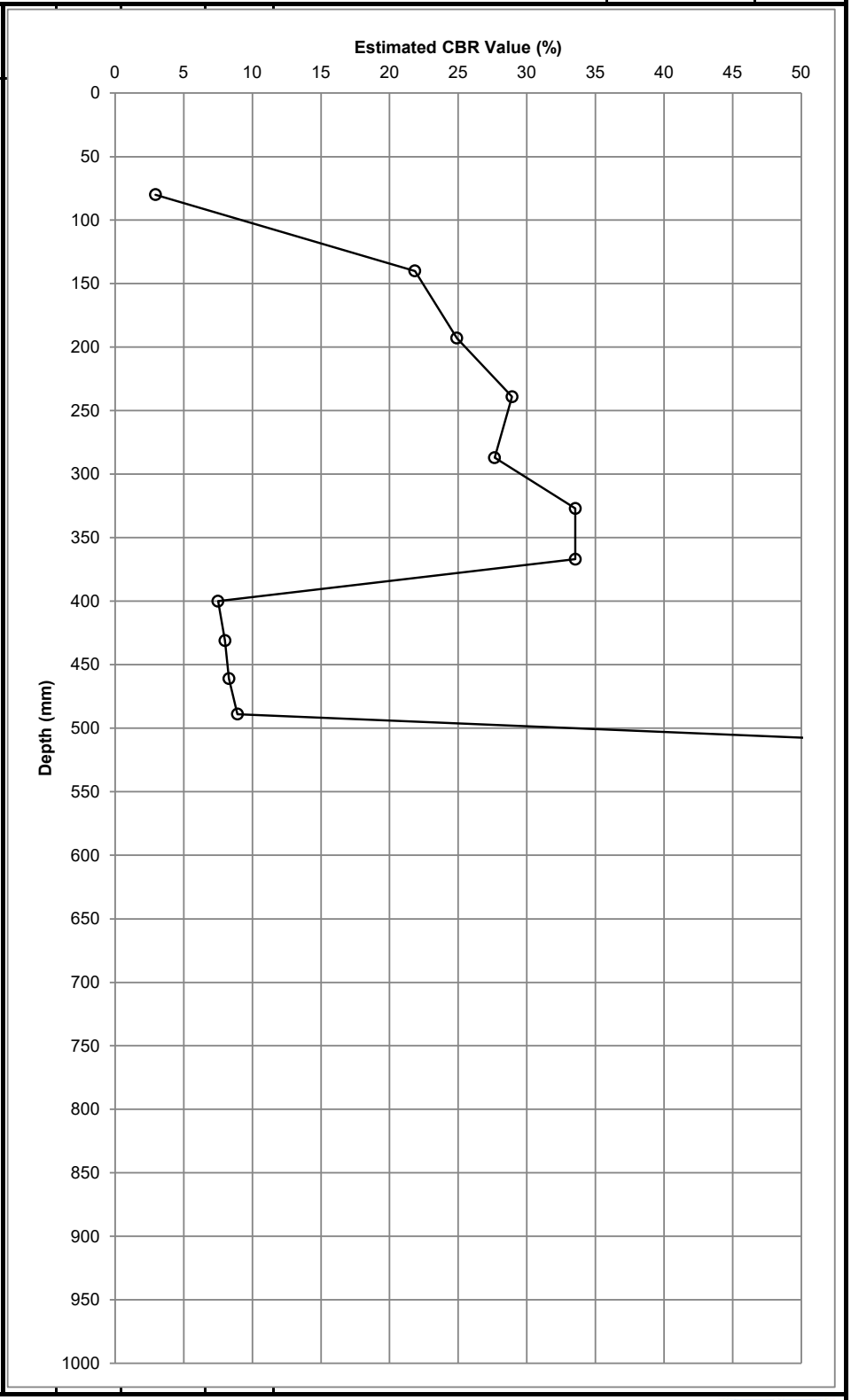
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP10
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	302

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	80	80	3
6	140	12	22
11	193	10.6	25
16	239	9.2	29
21	287	9.6	28
26	327	8	34
31	367	8	34
32	400	33	7
33	431	31	8
34	461	30	8
35	489	28	9
40	512	5	60
45	530	4	78
50	539	2	162
55	555	3	88
60	560	1	302
65	572	2	120
70			
75			
85			



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

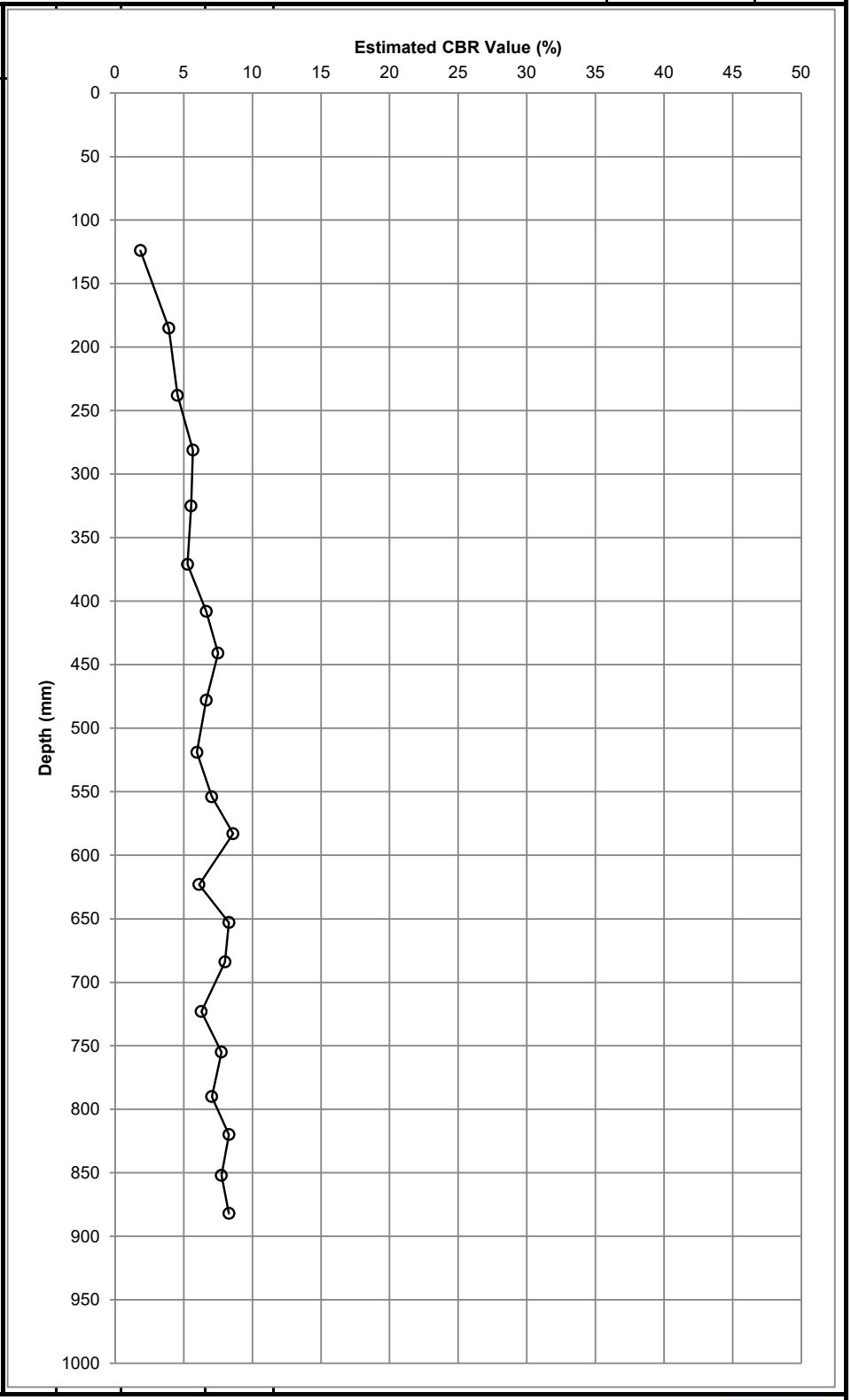
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP11
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	77

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	124	124	2
2	185	61	4
3	238	53	5
4	281	43	6
5	325	44	6
6	371	46	5
7	408	37	7
8	441	33	7
9	478	37	7
10	519	41	6
11	554	35	7
12	583	29	9
13	623	40	6
14	653	30	8
15	684	31	8
16	723	39	6
17	755	32	8
18	790	35	7
19	820	30	8
20	852	32	8
21	882	30	8



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

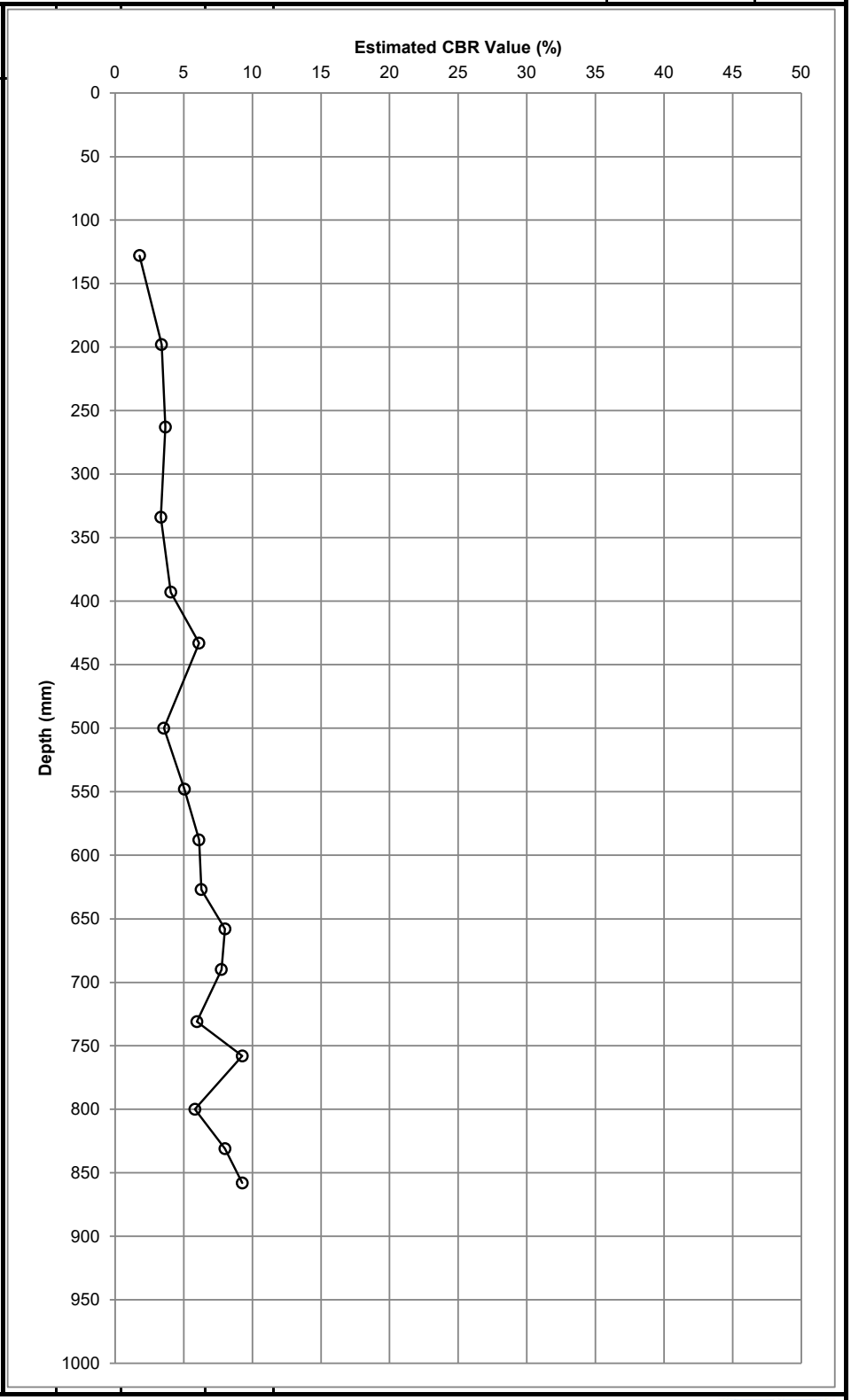
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP12
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	82

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	128	128	2
2	198	70	3
3	263	65	4
4	334	71	3
5	393	59	4
6	433	40	6
7	500	67	4
8	548	48	5
9	588	40	6
10	627	39	6
11	658	31	8
12	690	32	8
13	731	41	6
14	758	27	9
15	800	42	6
16	831	31	8
17	858	27	9



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

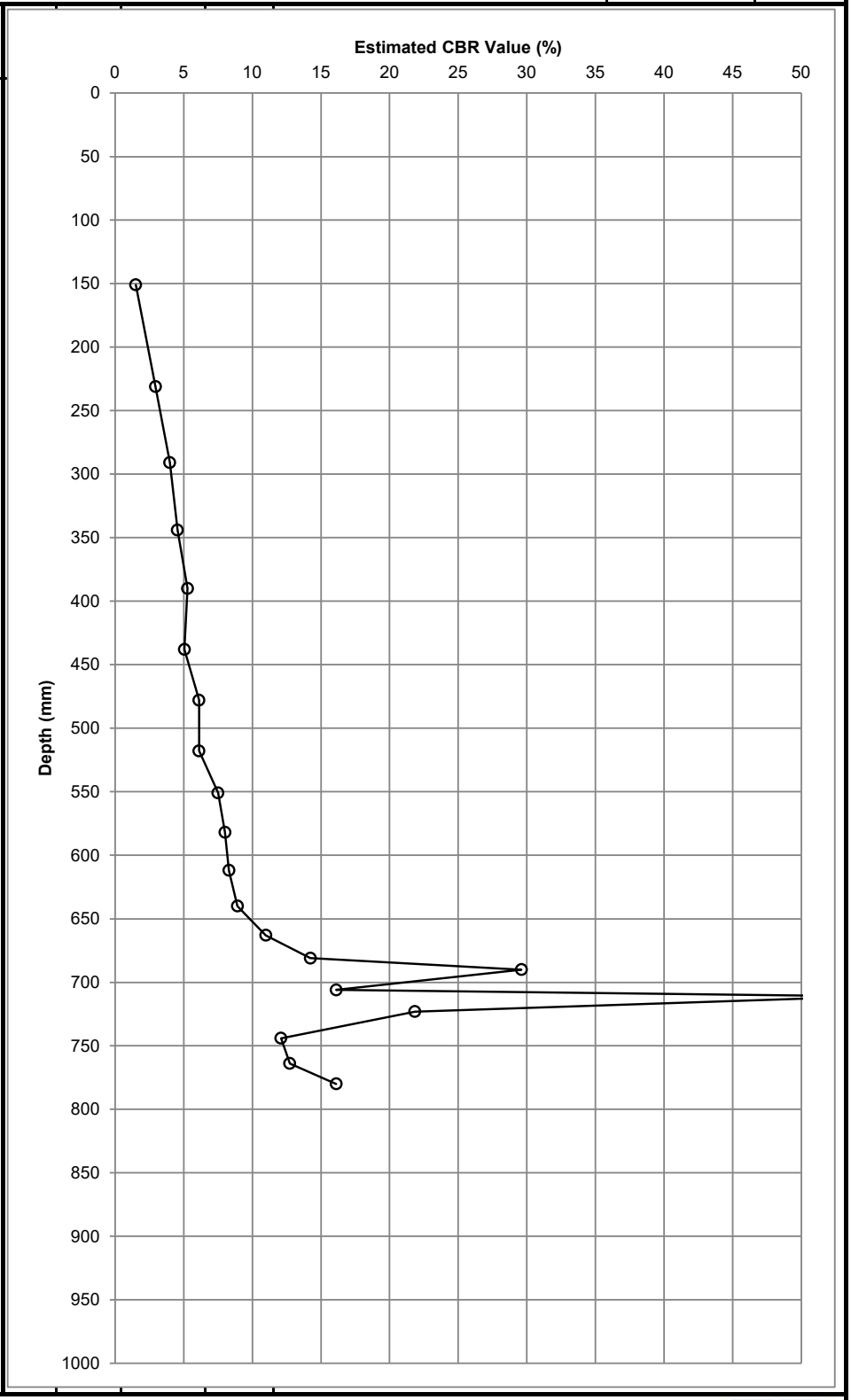
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP13
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	151

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	151	151	2
2	231	80	3
3	291	60	4
4	344	53	5
5	390	46	5
6	438	48	5
7	478	40	6
8	518	40	6
9	551	33	7
10	582	31	8
11	612	30	8
12	640	28	9
13	663	23	11
14	681	18	14
15	690	9	30
16	706	16	16
17	711	5	55
18	723	12	22
19	744	21	12
20	764	20	13
21	780	16	16



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

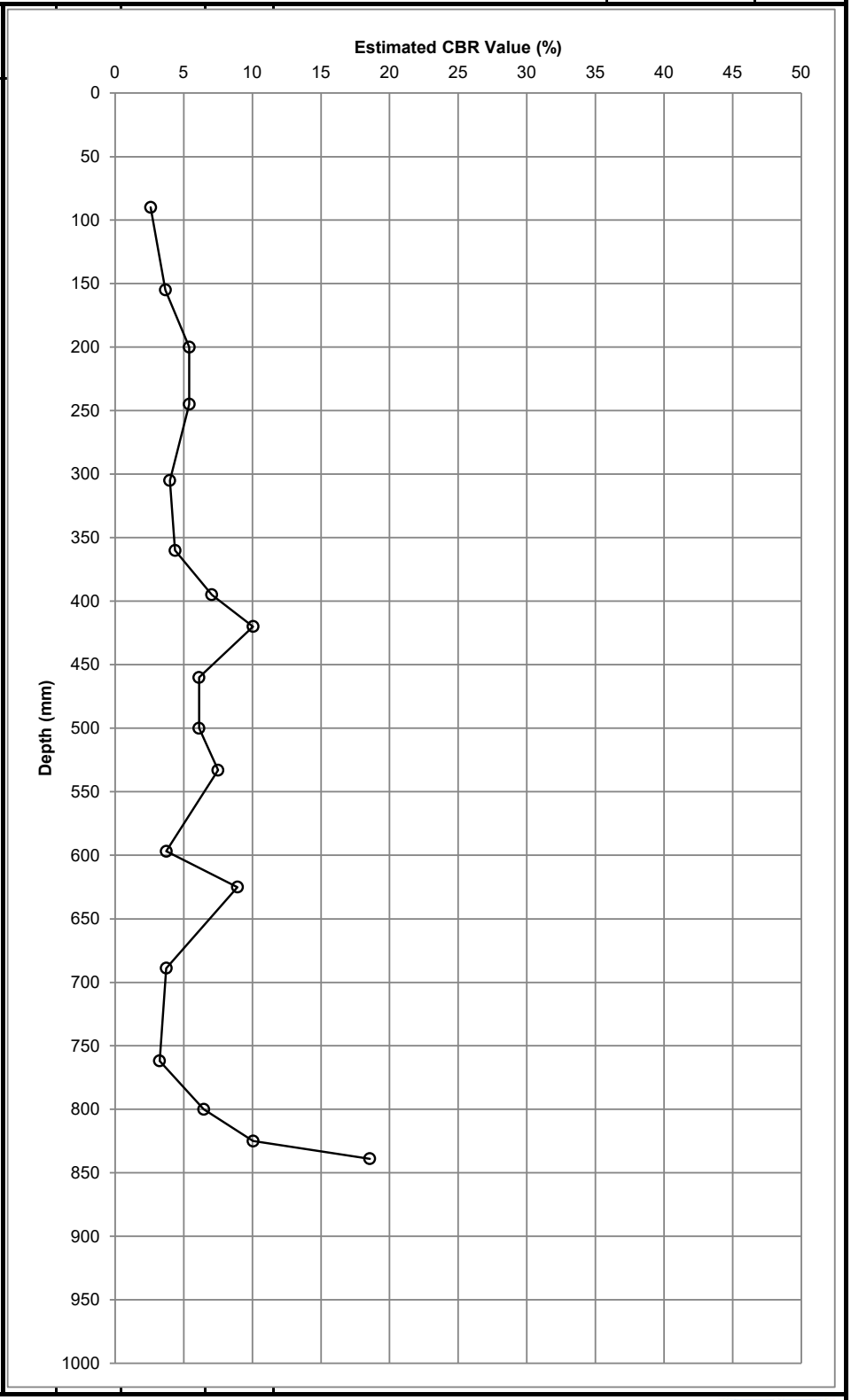
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP14
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	100

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	90	90	3
2	155	65	4
3	200	45	5
4	245	45	5
5	305	60	4
6	360	55	4
7	395	35	7
8	420	25	10
9	460	40	6
10	500	40	6
11	533	33	7
12	597	64	4
13	625	28	9
14	689	64	4
15	762	73	3
16	800	38	6
17	825	25	10
18	839	14	19



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

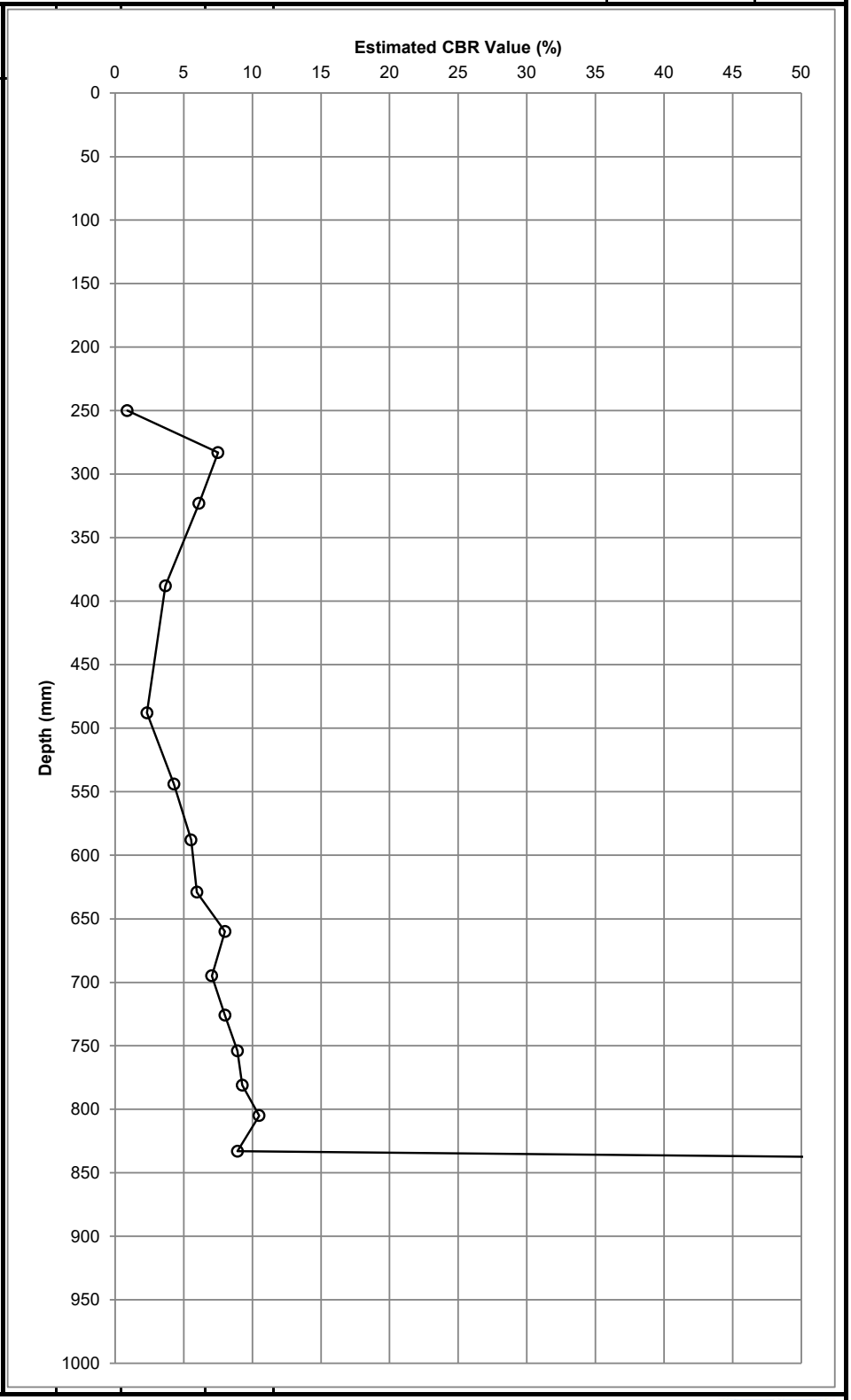
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP16
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	102

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	250	250	1
2	283	33	7
3	323	40	6
4	388	65	4
5	488	100	2
6	544	56	4
7	588	44	6
8	629	41	6
9	660	31	8
10	695	35	7
11	726	31	8
12	754	28	9
13	781	27	9
14	805	24	10
15	833	28	9
16	838	5	55



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

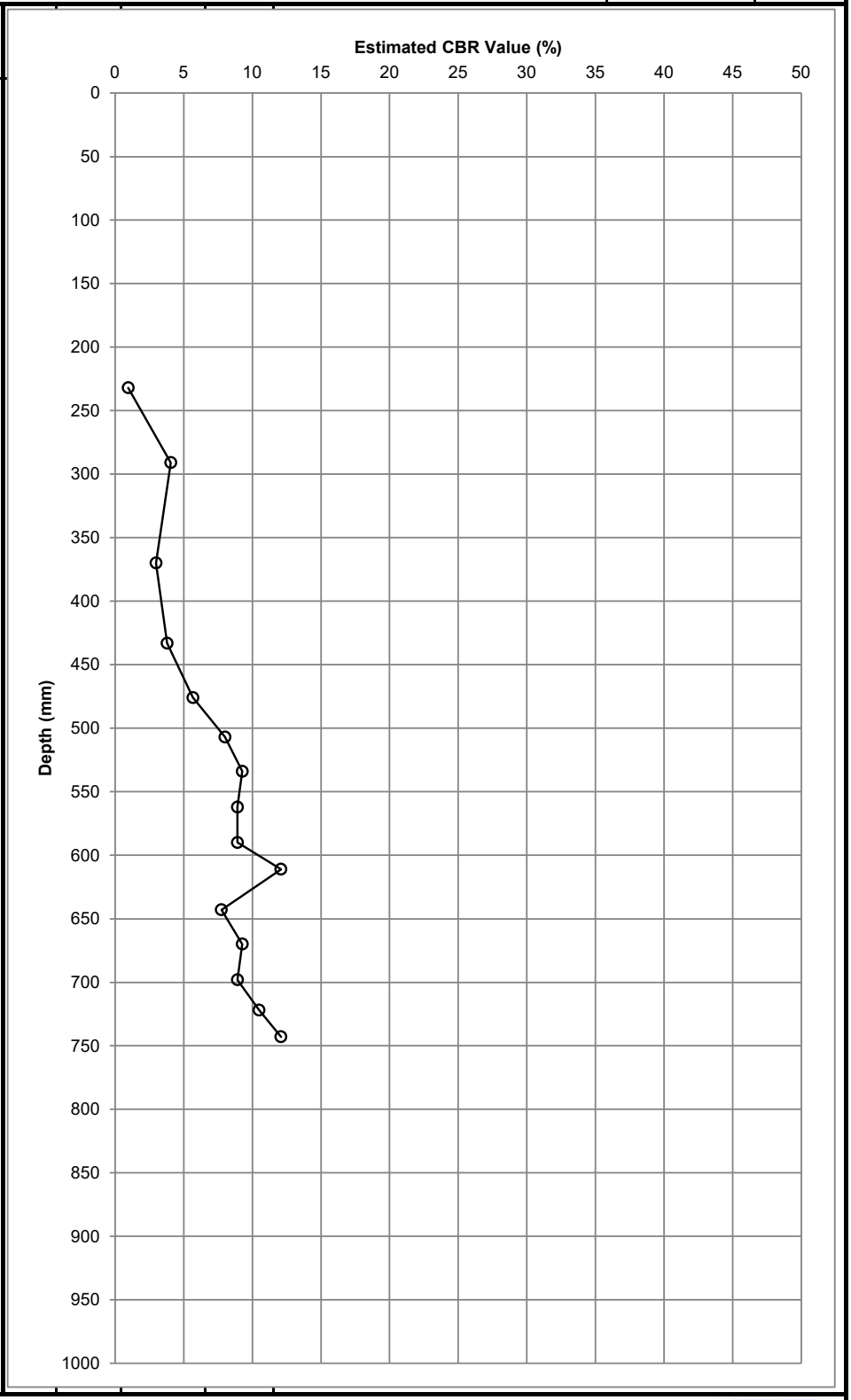
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP15
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	170

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	232	232	1
2	291	59	4
3	370	79	3
4	433	63	4
5	476	43	6
6	507	31	8
7	534	27	9
8	562	28	9
9	590	28	9
10	611	21	12
11	643	32	8
12	670	27	9
13	698	28	9
14	722	24	10
15	743	21	12



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

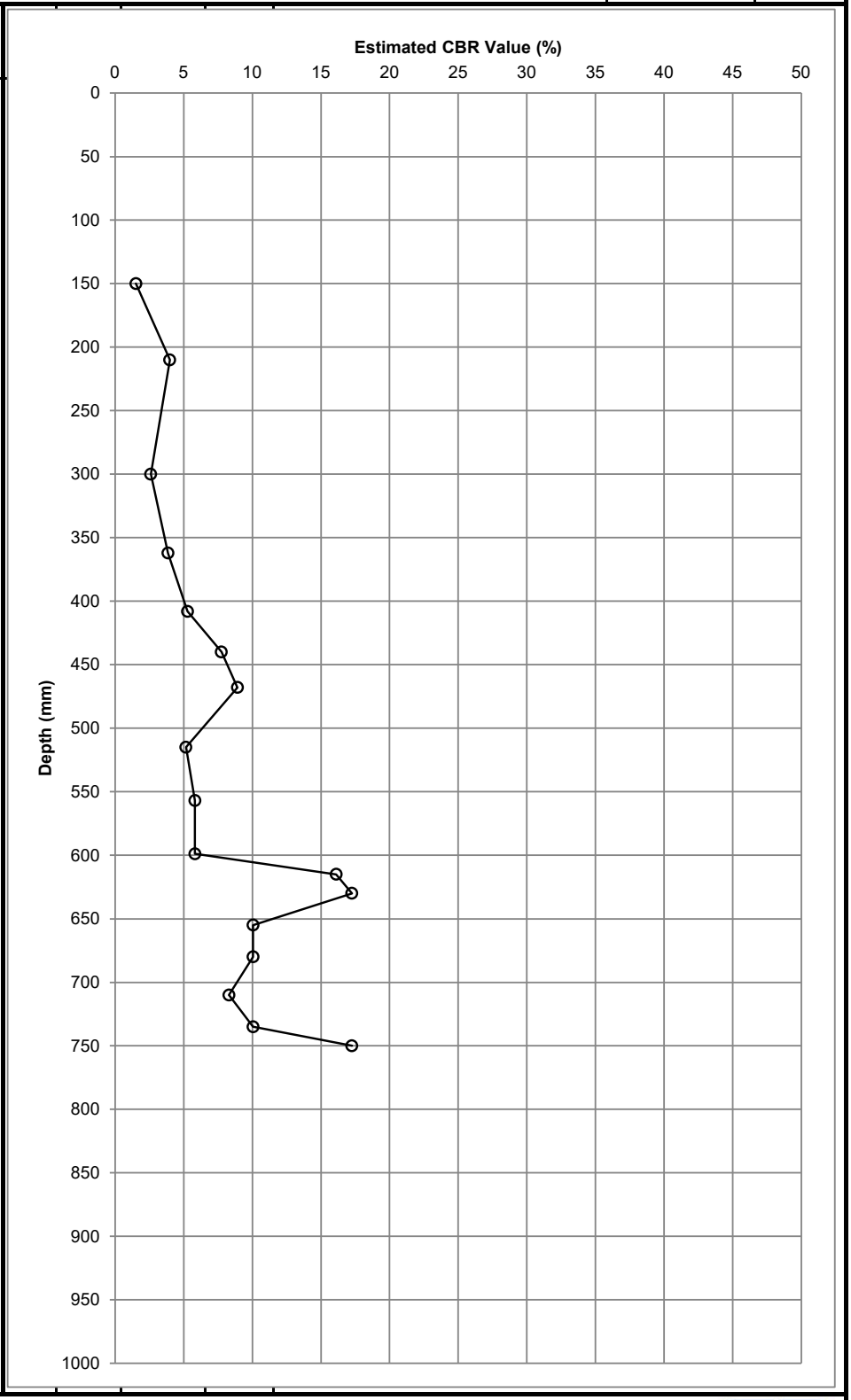
Tested By: CSS **Approved By: CSS**

Checked By: JM

DYNAMIC CONE PENETROMETER TEST RESULTS

		Test No	DCP17
		Date:	15-Dec
Project Name:	**Batchelors Farm, Keymer Road, Burgess Hill**	**Project No:**	12531
Client Name:	**SDP Developers**	**Zero Reading**	190

No. of Blows	Depth (mm)	Penetration mm/blow	Est CBR (%)
0	0		
1	150	150	2
2	210	60	4
3	300	90	3
4	362	62	4
5	408	46	5
6	440	32	8
7	468	28	9
8	515	47	5
9	557	42	6
10	599	42	6
11	615	16	16
12	630	15	17
13	655	25	10
14	680	25	10
15	710	30	8
16	735	25	10
17	750	15	17



GROUND AND ENVIRONMENTAL SERVICES LIMITED
Ground Investigation and Environmental Consultants

Tested By: CSS **Approved By: CSS**

Checked By: JM

APPENDIX 4

SOIL GAS MONITORING RESULTS

SOIL GAS SURVEY

Project:	Batchelors Farm			Date:	11/12/2020						GA 5000/Dipmeter
Location:	Burgess Hill			Weather:	Overcast - 8/8 Cloud Cover						
Job No.	12531			Temp:	6 ºC						

Monitoring Point No.	Time	O2 (% v/v)	CO2 (% v/v)	CH4 (% v/v)	H2S (PPM)	CO (PPM)	PID (PPM)	Flow (l/hr)	Water (mbgl)	Site Observations/ Comments
WS 1	10:24	20.0	1.0	0	0	0	<10	<0.1	3.25	
WS3	10:30	17.2	1.7	0	0	0	<10	<0.1	3.7	
WS4	10:47	19.1	2.8	0	0	0	<10	<0.1	3.8	
WS8	10:55	17.3	1.8	0	0	0	<10	<0.1	3.45	
WS11	11:04	15.2	3.4	0	0	0	<10	<0.1	3.7	

Time	Barometric Pressure
10:00	1011 mbar
Datum:	

Tested by: JM

Checked by: CSS

Ground and Environmental Services Limited

Accuracy and range of Gas Analyser 5000 (GA5000)

Gas	Accuracy: Gas Concentrations 0-5%	5-15%	0-FS	Range
CH_4	+/-0.5%	+/-3%		0-70% to specification, 0-100% reading
CO_2	+/-0.5%	+/-3%		0-40% to specification, 0-100% reading
O_2	+/-1%	+/-1%		0-25%
CO			+/-10%FS	0-500ppm
H_2S			+/-10%FS	0-200ppm
B.P.	+/- 5 mBar			700-1200 mBar
Flow:				

Notes:

CH4: methane in percent volume per volume (% v/v)

CO2: carbon dioxide in %v/v

O2: oxygen in % v/v

H2S: hydrogen sulphide in part per million (ppm)

CO: carbon monoxide in ppm

B.P.: Barometric pressure in mBar

Flow: Gas flow in litre per hour (l/h)

SOIL GAS SURVEY

Project:	Batchelors Farm			Date:	15/12/2020						GA 5000/Dipmeter
Location:	Burgess Hill			Weather:	Overcast - 7/8 Cloud Cover						
Job No.	12531			Temp:	5 ºC						

Monitoring Point No.	Time	O2 (% v/v)	CO2 (% v/v)	CH4 (% v/v)	H2S (PPM)	CO (PPM)	PID (PPM)	Flow (l/hr)	Water (mbgl)	Site Observations/ Comments	
										Time	Barometric Pressure
WS 1	Destroyed										
WS3	11:30	17.0	2.5	0	0	0	<10	<0.1	3.4	11:00	1001 mbar
WS4	11:47	16.7	2.5	0	0	0	<10	<0.1	3.85	Datum:	
WS8	11:55	14.7	1.9	0	0	0	<10	<0.1	3.5		
WS11	00:04	15.0	3.0	0	0	0	<10	<0.1	3.8		

Tested by: JM

Checked by: CSS

Ground and Environmental Services Limited

Accuracy and range of Gas Analyser 5000 (GA5000)

Gas	Accuracy: Gas Concentrations			Range
	0-5%	5-15%	0-FS	
CH_4	+/-0.5%	+/-3%		0-70% to specification, 0-100% reading
CO_2	+/-0.5%	+/-3%		0-40% to specification, 0-100% reading
O_2	+/-1%	+/-1%		0-25%
CO			+/-10%FS	0-500ppm
H_2S			+/-10%FS	0-200ppm
B.P.	+/- 5 mBar			700-1200 mBar
Flow:				

Notes:

CH4: methane in percent volume per volume (% v/v)

CO2: carbon dioxide in %v/v

O2: oxygen in % v/v

H2S: hydrogen sulphide in part per million (ppm)

CO: carbon monoxide in ppm

B.P.: Barometric pressure in mBar

Flow: Gas flow in litre per hour (l/h)

SOIL GAS SURVEY

Project:	Batchelors Farm			Date:	07/01/2021						GA 5000/Dipmeter
Location:	Burgess Hill			Weather:	Overcast - 7/8 Cloud Cover						
Job No.	12531			Temp:	0 ºC						

Monitoring Point No.	Time	O2 (% v/v)	CO2 (% v/v)	CH4 (% v/v)	H2S (PPM)	CO (PPM)	PID (PPM)	Flow (l/hr)	Water (mbgl)	Site Observations/ Comments	
										Time	Barometric Pressure
WS 1	Destroyed										
WS3	12:30	17.2	2.6	0	0	0	<10	<0.1	3.35	12:30	1015 mbar
WS4	12:45	16.9	2.7	0	0	0	<10	<0.1	3.85	Datum:	
WS8	12:55	15.0	1.7	0	0	0	<10	<0.1	3.4		
WS11	13:05	14.8	2.9	0	0	0	<10	<0.1	3.8		

Tested by: JM

Checked by: CSS

Ground and Environmental Services Limited

Accuracy and range of Gas Analyser 5000 (GA5000)

Gas	Accuracy: Gas Concentrations 0-5%	5-15%	0-FS	Range
CH_4	+/-0.5%	+/-3%		0-70% to specification, 0-100% reading
CO_2	+/-0.5%	+/-3%		0-40% to specification, 0-100% reading
O_2	+/-1%	+/-1%		0-25%
CO			+/-10%FS	0-500ppm
H_2S			+/-10%FS	0-200ppm
B.P.	+/- 5 mBar			700-1200 mBar
Flow:				

Notes:

CH4: methane in percent volume per volume (% v/v)

CO2: carbon dioxide in %v/v

O2: oxygen in % v/v

H2S: hydrogen sulphide in part per million (ppm)

CO: carbon monoxide in ppm

B.P.: Barometric pressure in mBar

Flow: Gas flow in litre per hour (l/h)

APPENDIX 5

LABORATORY TEST RESULTS

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park
Dencora Way
Ashford
Kent
TN23 4FG

www.genvs.com
E: info@genvs.com
T: 01233 646237

Client: SDP Developers **Project No:** 12531

Site: Batchelors Farm **Date** 23/12/2020

Date Received: 10/12/2020

Date Tested: 22/12/2020

Test Results

Location ID	Depth (m)	MC (%)	LL (%)	PL (%)	PI (%)	% passing 425 µm sieve	Classification	Sample type
WS 1	0.7	35	79	27	52	98	CV	D
WS 1	1.5	31	69	29	40	98	CH	D
WS 2	0.7	37	80	29	51	98	CV	D
WS 3	1.5	19	44	23	21	98	CI	D
WS 4	1.5	24	60	30	30	98	CH	D
WS 5	2.5	31	69	30	39	98	CH	D
WS 6	1.5	30	68	29	39	98	CH	D
WS 7	1.5	32	69	28	41	98	CH	D
WS 8	0.7	28	58	28	30	98	CH	D
WS 9	1.5	30	69	27	42	98	CH	D
WS 10	1.5	33	69	28	41	98	CH	D
WS 11	0.7	35	80	30	50	98	CV	D

Tested by: STP Checked by: CSS Approved by: CSS

Ground and Environmental Services Limited
Unit 2 Montpelier Business Park
Dencora Way
Ashford
Kent
TN23 4FG

www.genvs.com
E: info@genvs.com
T: 01233 646237

Client: SDP Developers **Project No:** 12531

Site: Batchelors Farm **Date** 23/12/2020

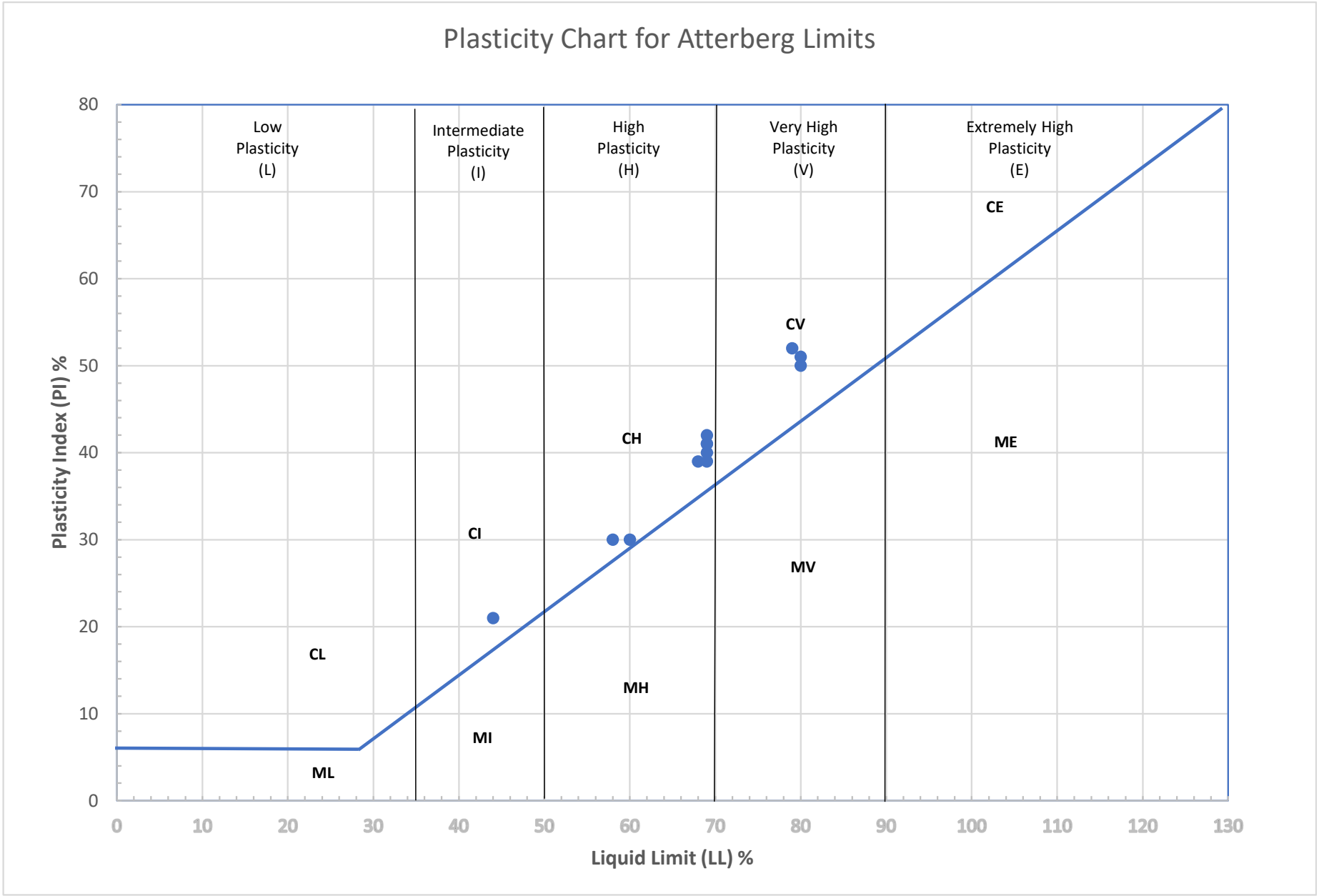
Date Received: 10/12/2020

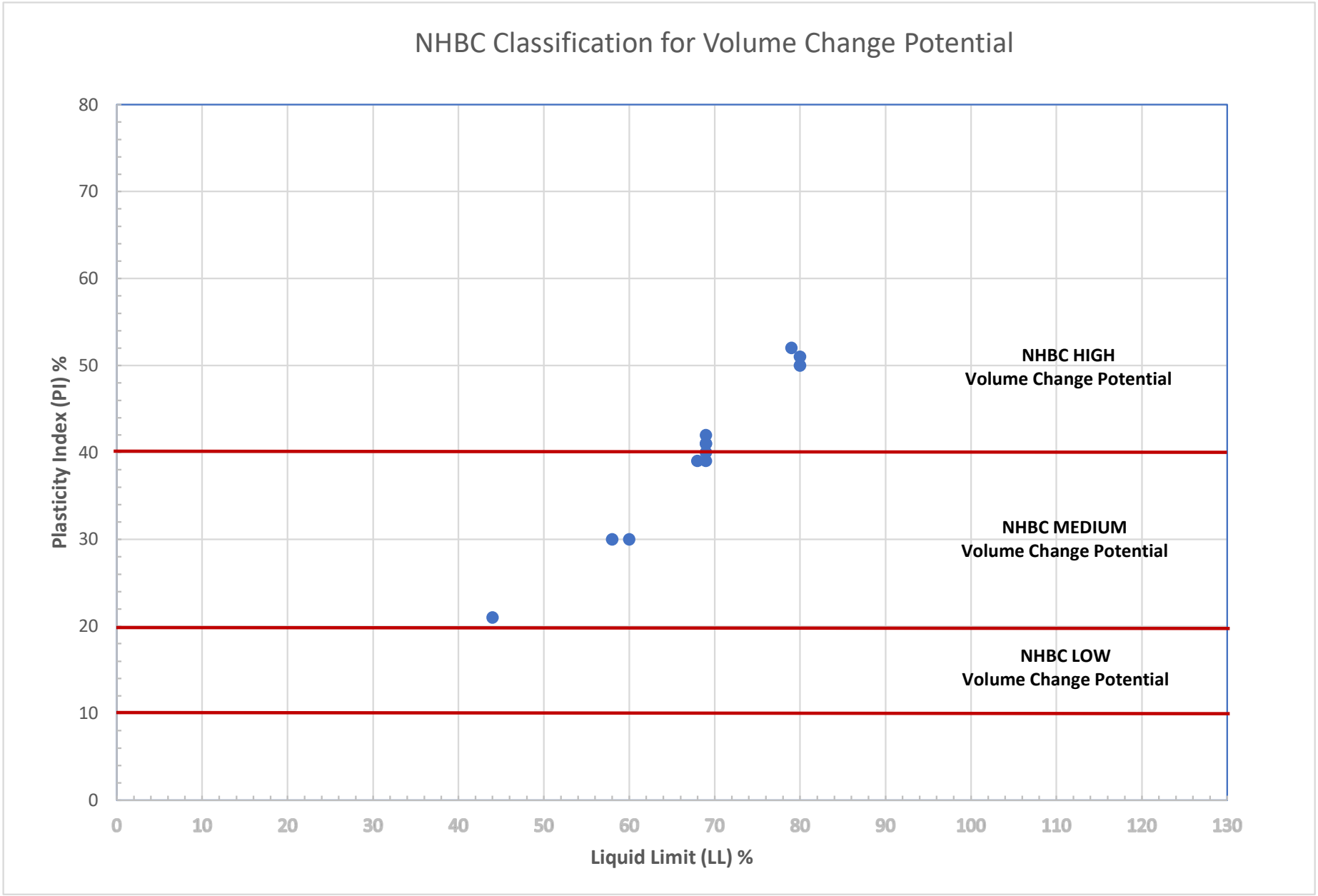
Date Tested: 22/12/2020

Visual Descriptions

Location ID	Depth	Description
WS 1	0.7	Light brown with mottled grey silty CLAY
WS 1	1.5	Light tan brown with light grey silty CLAY
WS 2	0.7	Light tan brown with dark orange brown silty CLAY
WS 3	1.5	Light tan brown with mottled grey silty CLAY
WS 4	1.5	Light orange brown with mottled light grey silty CLAY
WS 5	2.5	Light orange brown with mottled light grey silty CLAY
WS 6	1.5	Light brown with mottled grey silty CLAY
WS 7	1.5	Light tan brown with light grey silty CLAY
WS 8	0.7	Light tan brown with dark orange brown silty CLAY
WS 9	1.5	Light tan brown with dark orange brown silty CLAY
WS 10	1.5	Light tan brown with dark orange brown silty CLAY
WS 11	0.7	Light tan brown with dark orange brown silty CLAY

Tested by: STP Checked by: CSS Approved by: CSS


Plasticity Chart for Atterberg Limits
Low Plasticity (L)
Intermediate Plasticity (I)
High Plasticity (H)
Very High Plasticity (V)
Extremely High Plasticity (E)
CE
CV
CH
ME
CI
MV
CL
MH
MI
ML
Plasticity Index (PI) %
Liquid Limit (LL) %
0
10
20
30
40
50
60
70
80
90
100
110
120
130


NHBC Classification for Volume Change Potential
Plasticity Index (PI) %
Liquid Limit (LL) %
0
10
20
30
40
50
60
70
80
90
100
110
120
130
NHBC HIGH
Volume Change Potential
NHBC MEDIUM
Volume Change Potential
NHBC LOW
Volume Change Potential

APPENDIX 6

ANALYTICAL TEST RESULTS

Joe Millen
Ground & Environmental Services Ltd
Unit 2
Montpelier Business Park
Dencora Way
Ashford
Kent
TN23 4FG

DETS Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 20-14561

Site Reference:	Batchelors Farm
Project / Job Ref:	12531
Order No:	GES/4156.12531
Sample Receipt Date:	09/12/2020
Sample Scheduled Date:	09/12/2020
Report Issue Number:	1
Reporting Date:	16/12/2020

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 20-14561	**Date Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Ground & Environmental Services Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Batchelors Farm	**TP / BH No**	WS1	WS2	WS3	WS4	WS5
Project / Job Ref: 12531	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: GES/4156.12531	**Depth (m)**	0.20	0.30	0.25	0.20	0.20
Reporting Date: 16/12/2020	**DETS Sample No**	515570	515571	515572	515573	515574

Determinand	Unit	RL	Accreditation					
Stone Content	%	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	8.0	7.7	6.6	6.5	6.1
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	164	116	22	19	13
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.16	0.12	0.02	0.02	0.01
Organic Matter	%	< 0.1	MCERTS	3.8	3.4	3.9	7.4	6.4
Arsenic (As)	mg/kg	< 2	MCERTS	16	19	24	15	16
Barium (Ba)	mg/kg	< 2.5	MCERTS	168	87	80	39	57
Beryllium (Be)	mg/kg	< 0.5	MCERTS	0.8	0.7	0.8	0.6	0.6
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	NONE	0.8	0.2	0.3	< 0.2	0.3
Chromium (Cr)	mg/kg	< 2	MCERTS	23	23	22	18	20
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	32	24	26	16	20
Lead (Pb)	mg/kg	< 3	MCERTS	56	35	42	31	45
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	12	6	7	4	5
Selenium (Se)	mg/kg	< 2	MCERTS	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 1	MCERTS	47	33	34	25	28
Zinc (Zn)	mg/kg	< 3	MCERTS	176	77	114	58	107
Mineral Oil (C10 - C40)	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 20-14561	**Date Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Ground & Environmental Services Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Batchelors Farm	**TP / BH No**	WS6	WS7	WS8	WS9	WS10
Project / Job Ref: 12531	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: GES/4156.12531	**Depth (m)**	0.30	0.30	0.20	0.20	0.20
Reporting Date: 16/12/2020	**DETS Sample No**	515575	515576	515577	515578	515579

Determinand	Unit	RL	Accreditation					
Stone Content	%	< 0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	7.0	9.8	7.0	6.4	5.9
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	31	33	46	26	12
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.03	0.03	0.05	0.03	0.01
Organic Matter	%	< 0.1	MCERTS	2.7	2.8	4.3	6.1	4.5
Arsenic (As)	mg/kg	< 2	MCERTS	12	10	16	19	15
Barium (Ba)	mg/kg	< 2.5	MCERTS	258	154	66	44	52
Beryllium (Be)	mg/kg	< 0.5	MCERTS	1.4	1.5	0.7	0.7	0.7
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	NONE	< 0.2	0.6	0.2	0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	21	18	19	22	20
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	35	15	17	18	16
Lead (Pb)	mg/kg	< 3	MCERTS	155	117	68	39	42
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	15	9	6	5	6
Selenium (Se)	mg/kg	< 2	MCERTS	< 3	< 3	< 3	< 3	< 3
Vanadium (V)	mg/kg	< 1	MCERTS	40	35	29	30	28
Zinc (Zn)	mg/kg	< 3	MCERTS	68	913	101	79	54
Mineral Oil (C10 - C40)	mg/kg	< 10	MCERTS	< 10	< 10	< 10	< 10	< 10

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 20-14561	**Date Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Ground & Environmental Services Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Batchelors Farm	**TP / BH No**	WS11	S1	S2	S3	S4
Project / Job Ref: 12531	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: GES/4156.12531	**Depth (m)**	0.20	None Supplied	None Supplied	None Supplied	None Supplied
Reporting Date: 16/12/2020	**DETS Sample No**	515580	515581	515582	515583	515584

Determinand	Unit	RL	Accreditation					
Stone Content	%	< 0.1	NONE	< 0.1				
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	5.6				
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	12				
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.01				
Organic Matter	%	< 0.1	MCERTS	5.5				
Arsenic (As)	mg/kg	< 2	MCERTS	12				
Barium (Ba)	mg/kg	< 2.5	MCERTS	34				
Beryllium (Be)	mg/kg	< 0.5	MCERTS	0.6				
W/S Boron	mg/kg	< 1	NONE	< 1				
Cadmium (Cd)	mg/kg	< 0.2	NONE	< 0.2				
Chromium (Cr)	mg/kg	< 2	MCERTS	16				
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2				
Copper (Cu)	mg/kg	< 4	MCERTS	13				
Lead (Pb)	mg/kg	< 3	MCERTS	36				
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1				
Nickel (Ni)	mg/kg	< 3	MCERTS	5				
Selenium (Se)	mg/kg	< 2	MCERTS	< 3				
Vanadium (V)	mg/kg	< 1	MCERTS	24				
Zinc (Zn)	mg/kg	< 3	MCERTS	47				
Mineral Oil (C10 - C40)	mg/kg	< 10	MCERTS	< 10				

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 20-14561	**Date Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Ground & Environmental Services Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Batchelors Farm	**TP / BH No**	S5	S6	S7	S8	S9
Project / Job Ref: 12531	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: GES/4156.12531	**Depth (m)**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Reporting Date: 16/12/2020	**DETS Sample No**	515585	515586	515587	515588	515589

Determinand	Unit	RL	Accreditation					
Stone Content	%	< 0.1	NONE					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS					
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS					
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS					
Organic Matter	%	< 0.1	MCERTS					
Arsenic (As)	mg/kg	< 2	MCERTS					
Barium (Ba)	mg/kg	< 2.5	MCERTS					
Beryllium (Be)	mg/kg	< 0.5	MCERTS					
W/S Boron	mg/kg	< 1	NONE					
Cadmium (Cd)	mg/kg	< 0.2	NONE					
Chromium (Cr)	mg/kg	< 2	MCERTS					
Chromium (hexavalent)	mg/kg	< 2	NONE					
Copper (Cu)	mg/kg	< 4	MCERTS					
Lead (Pb)	mg/kg	< 3	MCERTS					
Mercury (Hg)	mg/kg	< 1	MCERTS					
Nickel (Ni)	mg/kg	< 3	MCERTS					
Selenium (Se)	mg/kg	< 2	MCERTS					
Vanadium (V)	mg/kg	< 1	MCERTS					
Zinc (Zn)	mg/kg	< 3	MCERTS					
Mineral Oil (C10 - C40)	mg/kg	< 10	MCERTS					

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 20-14561	**Date Sampled**	None Supplied	None Supplied	None Supplied		
Ground & Environmental Services Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied		
Site Reference: Batchelors Farm	**TP / BH No**	S10	WAC Comp	WAC Comp		
Project / Job Ref: 12531	**Additional Refs**	None Supplied	None Supplied	None Supplied		
Order No: GES/4156.12531	**Depth (m)**	None Supplied	0.20 - 0.30	0.70		
Reporting Date: 16/12/2020	**DETS Sample No**	515590	515591	515592		

Determinand	Unit	RL	Accreditation					
Stone Content	%	< 0.1	NONE					
Asbestos Screen (S)	N/a	N/a	**ISO17025**	Not Detected	Not Detected	Not Detected		
pH	pH Units	N/a	**MCERTS**					
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	**MCERTS**					
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	**MCERTS**					
Organic Matter	%	< 0.1	**MCERTS**					
Arsenic (As)	mg/kg	< 2	**MCERTS**		12	20		
Barium (Ba)	mg/kg	< 2.5	**MCERTS**		217	280		
Beryllium (Be)	mg/kg	< 0.5	**MCERTS**		1.6	1.4		
W/S Boron	mg/kg	< 1	NONE		< 1	< 1		
Cadmium (Cd)	mg/kg	< 0.2	NONE		0.4	0.3		
Chromium (Cr)	mg/kg	< 2	**MCERTS**		21	26		
Chromium (hexavalent)	mg/kg	< 2	NONE					
Copper (Cu)	mg/kg	< 4	**MCERTS**		28	47		
Lead (Pb)	mg/kg	< 3	**MCERTS**		66	31		
Mercury (Hg)	mg/kg	< 1	**MCERTS**		< 1	< 1		
Nickel (Ni)	mg/kg	< 3	**MCERTS**		11	21		
Selenium (Se)	mg/kg	< 2	**MCERTS**		< 3	< 3		
Vanadium (V)	mg/kg	< 1	**MCERTS**		38	32		
Zinc (Zn)	mg/kg	< 3	**MCERTS**		503	76		
Mineral Oil (C10 - C40)	mg/kg	< 10	**MCERTS**					

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 20-14561	**Date Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Ground & Environmental Services Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Batchelors Farm	**TP / BH No**	WS1	WS2	WS3	WS4	WS5
Project / Job Ref: 12531	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: GES/4156.12531	**Depth (m)**	0.20	0.30	0.25	0.20	0.20
Reporting Date: 16/12/2020	**DETS Sample No**	515570	515571	515572	515573	515574

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.23	0.16	0.14
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.44	0.18	0.31
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.40	0.17	0.28
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.15	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 20-14561	Date Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Ground & Environmental Services Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Batchelors Farm	TP / BH No	WS6	WS7	WS8	WS9	WS10
Project / Job Ref: 12531	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: GES/4156.12531	Depth (m)	0.30	0.30	0.20	0.20	0.20
Reporting Date: 16/12/2020	DETS Sample No	515575	515576	515577	515578	515579

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	0.17	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	0.59	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	0.66	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	16.40	0.16	< 0.1	< 0.1	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	3.44	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	27.30	0.39	0.19	0.15	< 0.1
Pyrene	mg/kg	< 0.1	MCERTS	24.10	0.38	0.18	0.15	< 0.1
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	10.70	0.16	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	8.15	0.23	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	8.22	0.29	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	3.11	0.12	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	6.75	0.15	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	2.60	< 0.1	< 0.1	< 0.1	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	0.73	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	2.35	< 0.1	< 0.1	< 0.1	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	115	1.9	< 1.6	< 1.6	< 1.6

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Speciated PAHs							
DETS Report No: 20-14561	**Date Sampled**	None Supplied					
Ground & Environmental Services Ltd	**Time Sampled**	None Supplied					
Site Reference: Batchelors Farm	**TP / BH No**	WS11					
Project / Job Ref: 12531	**Additional Refs**	None Supplied					
Order No: GES/4156.12531	**Depth (m)**	0.20					
Reporting Date: 16/12/2020	**DETS Sample No**	515580					

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1				
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1				
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1				
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1				
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1				
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Fluoranthene	mg/kg	< 0.1	MCERTS	0.17				
Pyrene	mg/kg	< 0.1	MCERTS	0.16				
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1				
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1				
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1				
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6				

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - EPH Banded (Type D)							
DETS Report No: 20-14561	**Date Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Ground & Environmental Services Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Batchelors Farm	**TP / BH No**	WS1	WS2	WS3	WS4	WS5
Project / Job Ref: 12531	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: GES/4156.12531	**Depth (m)**	0.20	0.30	0.25	0.20	0.20
Reporting Date: 16/12/2020	**DETS Sample No**	515570	515571	515572	515573	515574

Determinand	Unit	RL	Accreditation					
EPH (>C8 - C10)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH (>C10 - C12)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH (>C12 - C16)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH (>C16 - C21)	mg/kg	< 1	MCERTS	< 1	< 1	3	5	3
EPH (>C21 - C35)	mg/kg	< 6	NONE	< 6	< 6	< 6	< 6	< 6
EPH (C8 - C35)	mg/kg	< 6	NONE	< 6	< 6	< 6	< 6	< 6

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - EPH Banded (Type D)						
DETS Report No: 20-14561	**Date Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Ground & Environmental Services Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Batchelors Farm	**TP / BH No**	WS6	WS7	WS8	WS9	WS10
Project / Job Ref: 12531	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: GES/4156.12531	**Depth (m)**	0.30	0.30	0.20	0.20	0.20
Reporting Date: 16/12/2020	**DETS Sample No**	515575	515576	515577	515578	515579

Determinand	Unit	RL	Accreditation					
EPH (>C8 - C10)	mg/kg	< 1	MCERTS	4	3	2	< 1	< 1
EPH (>C10 - C12)	mg/kg	< 1	MCERTS	5	4	2	< 1	< 1
EPH (>C12 - C16)	mg/kg	< 1	MCERTS	8	< 1	< 1	< 1	< 1
EPH (>C16 - C21)	mg/kg	< 1	MCERTS	133	3	4	< 1	1
EPH (>C21 - C35)	mg/kg	< 6	NONE	145	28	< 6	< 6	< 6
EPH (C8 - C35)	mg/kg	< 6	NONE	295	38	7	< 6	< 6

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - EPH Banded (Type D)						
DETS Report No: 20-14561	**Date Sampled**	None Supplied				
Ground & Environmental Services Ltd	**Time Sampled**	None Supplied				
Site Reference: Batchelors Farm	**TP / BH No**	WS11				
Project / Job Ref: 12531	**Additional Refs**	None Supplied				
Order No: GES/4156.12531	**Depth (m)**	0.20				
Reporting Date: 16/12/2020	**DETS Sample No**	515580				

Determinand	Unit	RL	Accreditation					
EPH (>C8 - C10)	mg/kg	< 1	MCERTS	< 1				
EPH (>C10 - C12)	mg/kg	< 1	MCERTS	< 1				
EPH (>C12 - C16)	mg/kg	< 1	MCERTS	< 1				
EPH (>C16 - C21)	mg/kg	< 1	MCERTS	2				
EPH (>C21 - C35)	mg/kg	< 6	NONE	< 6				
EPH (C8 - C35)	mg/kg	< 6	NONE	< 6				

DETS Ltd
: 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/3

					Landfill Waste Acceptance Criteria Limits		
DETS Report No: 20-14561	**Date Sampled**	None Supplied			**Inert Waste Landfill**	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Ground & Environmental Services Ltd	**Time Sampled**	None Supplied					
Site Reference: Batchelors Farm	**TP / BH No**	WAC Comp					
Project / Job Ref: 12531	**Additional Refs**	None Supplied					
Order No: GES/4156.12531	**Depth (m)**	0.20 - 0.30					
Reporting Date: 16/12/2020	**DETS Sample No**	515591					
Determinand	**Unit**	**MDL**					
TOC[MU]	%	< 0.1	2		3%	5%	6%
Loss on Ignition	%	< 0.01	6.50		--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05		6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1		1	--	--
Mineral Oil[MU]	mg/kg	< 10	< 10		500	--	--
Total PAH[MU]	mg/kg	< 1.7	< 1.7		100	--	--
pH[MU]	pH Units	N/a	6.3		--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	< 1		--	To be evaluated	To be evaluated

Eluate Analysis	**2:1 mg/l**	**8:1 mg/l**		**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**		
Arsenic[U]	< 0.01	< 0.01		< 0.2	0.5	2	25
Barium[U]	< 0.02	< 0.02		< 0.1	20	100	300
Cadmium[U]	< 0.0005	< 0.0005		< 0.02	0.04	1	5
Chromium[U]	< 0.005	< 0.005		< 0.20	0.5	10	70
Copper[U]	0.02	0.02		< 0.5	2	50	100
Mercury[U]	< 0.0005	< 0.0005		< 0.005	0.01	0.2	2
Molybdenum[U]	0.005	0.003		< 0.1	0.5	10	30
Nickel[U]	< 0.007	< 0.007		< 0.2	0.4	10	40
Lead[U]	< 0.005	< 0.005		< 0.2	0.5	10	50
Antimony[U]	0.006	< 0.005		< 0.05	0.06	0.7	5
Selenium[U]	0.005	< 0.005		< 0.05	0.1	0.5	7
Zinc[U]	0.005	0.011		< 0.2	4	50	200
Chloride[U]	8	7		67	800	15000	25000
Fluoride[U]	< 0.5	0.6		5.4	10	150	500
Sulphate[U]	44	21		237	1000	20000	50000
TDS	219	184		1875	4000	60000	100000
Phenol Index	< 0.01	< 0.01		< 0.5	1	-	-
DOC	27.9	24.3		247	500	800	1000
Leach Test Information							
Sample Mass (kg)	0.21						
Dry Matter (%)	83.5						
Moisture (%)	19.8						
Stage 1							
Volume Eluate L2 (litres)	0.32						
Filtered Eluate VE1 (litres)	0.18						

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
Stated limits are for guidance only and DETS Ltd cannot be held responsible for any discrepencies with current legislation
M Denotes MCERTS accredited test
U Denotes ISO17025 accredited test

DETS Ltd
: 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Waste Acceptance Criteria Analytical Certificate - BS EN 12457/3

DETS Report No: 20-14561	**Date Sampled**	None Supplied	
Ground & Environmental Services Ltd	**Time Sampled**	None Supplied	
Site Reference: Batchelors Farm	**TP / BH No**	WAC Comp	
Project / Job Ref: 12531	**Additional Refs**	None Supplied	
Order No: GES/4156.12531	**Depth (m)**	0.70	
Reporting Date: 16/12/2020	**DETS Sample No**	515592	

Determinand	**Unit**	**MDL**		**Landfill Waste Acceptance Criteria Limits**		
				Inert Waste Landfill	**Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
TOC[MU]	%	< 0.1	0.6	3%	5%	6%
Loss on Ignition	%	< 0.01	3.90	--	--	10%
BTEX[MU]	mg/kg	< 0.05	< 0.05	6	--	--
Sum of PCBs	mg/kg	< 0.1	< 0.1	1	--	--
Mineral Oil[MU]	mg/kg	< 10	< 10	500	--	--
Total PAH[MU]	mg/kg	< 1.7	< 1.7	100	--	--
pH[MU]	pH Units	N/a	9.3	--	>6	--
Acid Neutralisation Capacity	mol/kg (+/-)	< 1	< 1	--	To be evaluated	To be evaluated

Eluate Analysis	**2:1 mg/l**	**8:1 mg/l**		**Cumulative 10:1 mg/kg**	**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg (mg/kg)**		
Arsenic[U]	< 0.01	< 0.01		< 0.2	0.5	2	25
Barium[U]	< 0.02	0.02		0.2	20	100	300
Cadmium[U]	< 0.0005	< 0.0005		< 0.02	0.04	1	5
Chromium[U]	< 0.005	< 0.005		< 0.20	0.5	10	70
Copper[U]	< 0.01	< 0.01		< 0.5	2	50	100
Mercury[U]	< 0.0005	< 0.0005		< 0.005	0.01	0.2	2
Molybdenum[U]	< 0.001	< 0.001		< 0.1	0.5	10	30
Nickel[U]	< 0.007	< 0.007		< 0.2	0.4	10	40
Lead[U]	< 0.005	< 0.005		< 0.2	0.5	10	50
Antimony[U]	< 0.005	< 0.005		< 0.05	0.06	0.7	5
Selenium[U]	< 0.005	< 0.005		< 0.05	0.1	0.5	7
Zinc[U]	0.185	0.051		0.6	4	50	200
Chloride[U]	23	7		81	800	15000	25000
Fluoride[U]	< 0.5	< 0.5		< 1	10	150	500
Sulphate[U]	125	43		469	1000	20000	50000
TDS	213	97		1031	4000	60000	100000
Phenol Index	< 0.01	< 0.01		< 0.5	1	-	-
DOC	7.2	6.9		69.2	500	800	1000
Leach Test Information							
Sample Mass (kg)	0.22						
Dry Matter (%)	79.5						
Moisture (%)	25.8						
Stage 1							
Volume Eluate L2 (litres)	0.31						
Filtered Eluate VE1 (litres)	0.09						

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
Stated limits are for guidance only and DETS Ltd cannot be held responsible for any discrepencies with current legislation
M Denotes MCERTS accredited test
U Denotes ISO17025 accredited test

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 20-14561	
Ground & Environmental Services Ltd	
Site Reference: Batchelors Farm	
Project / Job Ref: 12531	
Order No: GES/4156.12531	
Reporting Date: 16/12/2020	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
^ 515570	WS1	None Supplied	0.20	17.7	Brown sandy clay with brick
^ 515571	WS2	None Supplied	0.30	23.8	Brown clay with stones
^ 515572	WS3	None Supplied	0.25	24.6	Brown clay with vegetation
^ 515573	WS4	None Supplied	0.20	23.2	Brown loamy sand with vegetation
^ 515574	WS5	None Supplied	0.20	22.6	Brown loamy sand with vegetation
^ 515575	WS6	None Supplied	0.30	12.3	Brown loamy sand with stones and brick
^ 515576	WS7	None Supplied	0.30	8.2	Brown loamy gravel with brick and concrete
^ 515577	WS8	None Supplied	0.20	22.6	Brown loamy sand with vegetation
^ 515578	WS9	None Supplied	0.20	26.8	Brown loamy sand with vegetation
^ 515579	WS10	None Supplied	0.20	21.5	Brown sandy clay with vegetation
^ 515580	WS11	None Supplied	0.20	25	Brown sandy clay with vegetation
^ 515591	WAC Comp	None Supplied	0.20 - 0.30	16.6	Brown loamy sand with stones and concrete
^ 515592	WAC Comp	None Supplied	0.70	20.5	Brown clay with brick

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample I/S

Unsuitable Sample U/S

^ no sampling date provided; unable to confirm if samples are within acceptable holding times

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 4480

Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 20-14561
Ground & Environmental Services Ltd
Site Reference: Batchelors Farm
Project / Job Ref: 12531
Order No: GES/4156.12531
Reporting Date: 16/12/2020

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

Parameter	Matrix Type	Suite Reference	Expanded Uncertainity Measurement	Unit
TOC	Soil	BS EN 12457	13.49	%
Loss on Ignition	Soil	BS EN 12457	17	%
BTEX	Soil	BS EN 12457	14	%
Sum of PCBs	Soil	BS EN 12457	23	%
Mineral Oil	Soil	BS EN 12457	9	%
Total PAH	Soil	BS EN 12457	20	%
pH	Soil	BS EN 12457	0.399	Units
Acid Neutralisation Capacity	Soil	BS EN 12457	18	%
Arsenic	Leachate	BS EN 12457	16.63	%
Barium	Leachate	BS EN 12457	14.29	%
Cadmium	Leachate	BS EN 12457	14.44	%
Chromium	Leachate	BS EN 12457	18.06	%
Copper	Leachate	BS EN 12457	21.27	%
Mercury	Leachate	BS EN 12457	24.13	%
Molybdenum	Leachate	BS EN 12457	12.55	%
Nickel	Leachate	BS EN 12457	20.08	%
Lead	Leachate	BS EN 12457	13.43	%
Antimony	Leachate	BS EN 12457	18.85	%
Selenium	Leachate	BS EN 12457	18.91	%
Zinc	Leachate	BS EN 12457	13.71	%
Chloride	Leachate	BS EN 12457	16	%
Fluoride	Leachate	BS EN 12457	19.4	%
Sulphate	Leachate	BS EN 12457	19.63	%
TDS	Leachate	BS EN 12457	12	%
Phenol Index	Leachate	BS EN 12457	14	%
DOC	Leachate	BS EN 12457	10	%
Clay Content	Soil	BS 3882: 2015	15	%
Silt Content	Soil	BS 3882: 2015	14	%
Sand Content	Soil	BS 3882: 2015	13	%
Loss on Ignition	Soil	BS 3882: 2015	17	%
pH	Soil	BS 3882: 2015	0.399	Units
Carbonate	Soil	BS 3882: 2015	16	%
Total Nitrogen	Soil	BS 3882: 2015	12	%
Phosphorus (Extractable)	Soil	BS 3882: 2015	24	%
Potassium (Extractable)	Soil	BS 3882: 2015	20	%
Magnesium (Extractable)	Soil	BS 3882: 2015	26	%
Zinc	Soil	BS 3882: 2015	14.9	%
Copper	Soil	BS 3882: 2015	16	%
Nickel	Soil	BS 3882: 2015	17.7	%
Available Sodium	Soil	BS 3882: 2015	23	%
Available Calcium	Soil	BS 3882: 2015	23	%
Electrical Conductivity	Soil	BS 3882: 2015	10	%

Craig Spanton
Ground & Environmental Services Ltd
Unit 2
Montpelier Business Park
Dencora Way
Ashford
Kent
TN23 4FG

DETS Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 20-14715

Site Reference:	Batchelors Farm
Project / Job Ref:	12531
Order No:	GES/4167.12537
Sample Receipt Date:	11/12/2020
Sample Scheduled Date:	11/12/2020
Report Issue Number:	1
Reporting Date:	17/12/2020

Authorised by:

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate						
DETS Report No: 20-14715	**Date Sampled**	10/12/20	10/12/20	10/12/20	10/12/20	10/12/20
Ground & Environmental Services Ltd	**Time Sampled**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Batchelors Farm	**TP / BH No**	WS 1	WS 3	WS 5	WS 8	WS 10
Project / Job Ref: 12531	**Additional Refs**	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: GES/4167.12537	**Depth (m)**	0.70	1.50	2.50	0.70	1.50
Reporting Date: 17/12/2020	**DETS Sample No**	516151	516152	516153	516154	516155

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS	6.9	5.9	6.3	5.7	5.9
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	407	55	1750	58	168
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.41	0.06	1.75	0.06	0.17

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Samples Descriptions page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Sample Descriptions	
DETS Report No: 20-14715	
Ground & Environmental Services Ltd	
Site Reference: Batchelors Farm	
Project / Job Ref: 12531	
Order No: GES/4167.12537	
Reporting Date: 17/12/2020	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
516151	WS 1	None Supplied	0.70	22.2	Light brown sandy clay
516152	WS 3	None Supplied	1.50	15.4	Light brown sandy clay
516153	WS 5	None Supplied	2.50	21.1	Brown clay
516154	WS 8	None Supplied	0.70	20.1	Brown sandy clay
516155	WS 10	None Supplied	1.50	22.2	Brown clay

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

4480

Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 20-14715
Ground & Environmental Services Ltd
Site Reference: Batchelors Farm
Project / Job Ref: 12531
Order No: GES/4167.12537
Reporting Date: 17/12/2020

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

APPENDIX 7

GUIDELINES ON CONTAMINANT LEVELS

Human Health

CLEA Soil Guideline values (SGV)

The UKs primary contaminated land guidance is contained within the Contaminated Land Exposure Assessment (CLEA) framework. Within this framework a number of Soil Guideline Values (SGVs) were published for key contaminants along with toxicological guideline values relating to intake thresholds. The soil guideline values provided by the CLEA model represent intervention values for end uses based upon potential human exposure and soil concentrations of a contaminant above these values might represent an unacceptable risk to the health of the site users. The Environment Agency had an ongoing programme of SGV publication with associated toxicological information for key contaminants. Where SGVs are available then they should be used as the basis for any human health risk assessment.

All CLEA SGVs were withdrawn for use by the Environment Agency in 2008 whilst they are under review and pending the availability of new toxicological data. To date, new SGV values have been set for benzene, toluene, ethylbenzene and xylene and mercury and selenium. In the absence of the new SGVs and toxicological report data, GES have used appropriate screening tools or Generic Assessment Criteria Levels as assessment criteria guidelines for those determinands not currently assigned SGVs. It should be noted that the former SGVs for metals were in general agreement with those site specific levels generated by RBCA and other similar computer model based risk assessment tools.

The GES screening assessment of contaminants within samples has been carried out using these model generated values in the absence of any other values or guidelines. The version of the CLEA model, v1.06, was used. The published SGVs are shown below. Nickel SGV has been withdrawn (2015) pending an assessment of the toxicological data used in the model for nickel. Published SGV values.

	Soil Guideline Value (mg kg^{-1})		
Land use	**Residential**	**Allotment**	**Commercial**
Inorganic arsenic	32	43	640
Nickel	130	230	1,800
Cadmium	10	1.8	230
Phenol	420	280	3200
Elemental Hg	1	26	26
Inorganic Hg	170	80	3600
Methyl Hg	11	8	410
Selenium	350	120	13,000
Benzene	0.33	0.07	95
Toluene	610	120	4400
Ethylbenzene	350	90	2800
o-Xylene	250	160	2600
r-Xylene	240	180	3500
m-Xylene	230	160	3200

Based on a sandy loam soil as defined in Environment Agency (2009b) and 6% SOM.

DEFRA Category four screening level (C4SL)

In addition to the SGVs, guideline screening values proposed in the DEFRA document SP1010-Development of Category 4 Screening Levels for Assessment of Land affected by Contamination Final Project Report (C4SL) are considered along with the suitable for use levels (S4USL) derived by the Chartered Institute of Environmental Health (CIEH) in partnership with the Land Quality Management Organization (LQM). The screening levels are given for residential, commercial, allotment or public open space end uses.

PARAMETER	Residential		Commercial	Allotment	Public open Space near residential POS_{resi}	Public park land POS_{park}	Sources
	With Plant uptake	Without Plant uptake					
Inorganics - mg/kg unless stated							
Arsenic (inorganic)	37	40	640	49	79	170	DEFRA C4SL
Beryllium	1.7	1.7	12	35	2.2	63	LQM/S4USL
Boron	290	11,000	240,000	45	21,000	46,000	LQM/CIEH
Cadmium	22	150	410	3.9	220	880	LQM/S4USL
Chromium III	910	910	8,600	18,000	1,500	33,000	LQM/CIEH
Chromium VI	21	21	49	170	21	250	LQM/S4USL
Copper	2,400	7,100	68,000	520	12,000	44,000	LQM/CIEH
lead	200	310	2,300	80	630	1,300	DEFRA C4SL
Mercury (Inorganic)	40	56	1,100	19	120	240	LQM/CIEH
Nickel	180	180	980	230	230	3,400	LQM/CIEH
Selenium	250	430	12,000	88	1,100	1,800	LQM/CIEH
Vanadium	410	1,200	9,000	91	2,000	5,000	LQM/CIEH
Zinc	3,700	40,000	730,000	620	81,000	170,000	LQM/CIEH
Total sulphate	2400	2400	2400	2400	2400	2400	BRE (2005)
Water-soluble sulphate (g/l)	0.5	0.5	0.5	0.5	0.5	0.5	BRE (2005)
pH	<5	<5	<5	<5	<5	<5	-

CLEA does not currently provide guidance for total Polycyclic Aromatic Hydrocarbons (PAHs). A standalone Defra C4SL for benzo(a)pyrene has been assigned and is shown below. In addition, the Chartered Institute of Environmental Health (CIEH) in partnership with the Land Quality Management Organization (LQM) used CLEA software to derive Generic Assessment Criteria (GAC) and Assessment Sub Criteria (ASC) for the following PAH compounds:

PARAMETER	Residential						Commercial			Allotment			POS	POS	Source
	With Plant uptake			Without Plant uptake											
SOM %	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	resi	park	
Organics - mg/kg unless stated															
Acenaphthene	200	490	1080	2000	3600	5200	75000	92000	100000	34	85	202			CLEA/LQM CIEH
Acenaphthylene	170	400	900	2000	3600	5200	76000	92000	100000	28	68	163			CLEA/LQM CIEH
Anthracene	2300	5400	10700	30000	34000	36000	520000	530000	540000	380	947	2230			CLEA/LQM CIEH
Benzo(a)anthracene	7.5	11	13	12	14	15	170	170	180	2.9	6.5	13			CLEA/LQM CIEH
Benzo(a)pyrene C4SL			5			5.3			77			5.7	10	21	DEFRA C4SL
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	44	45	45	1	2.2	3.9			CLEA/LQM CIEH
Benzo(g,h,i)perylene	315	340	350	360	360	360	3900	4000	4000	290	480	646			CLEA/LQM CIEH
Benzo(k)fluoranthene	77	93	100	110	110	110	1200	1200	1200	37	76	129			CLEA/LQM CIEH
Chrysene	15	22	27	30	31	32	350	350	350	4.1	9.5	19			CLEA/LQM CIEH
Dibenzo(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	3.5	3.6	3.6	0.14	0.27	0.44			CLEA/LQM CIEH
Fluoranthene	280	560	890	1500	1600	1600	23000	23000	23000	52	127	288			CLEA/LQM CIEH
Fluorene	165	390	850	2200	3400	4200	60000	67000	70000	27	67	158			CLEA/LQM CIEH
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	500	510	510	9.5	21	40			CLEA/LQM CIEH
Naphthalene	1	2.3	5.5	1	2.4	6	100	260	600	4	9.8	23			CLEA/LQM CIEH
Phenanthrene	95	220	440	1300	1400	1500	22000	22000	23000	15	38	90			CLEA/LQM CIEH
Pyrene	620	1200	2000	3700	3800	3800	54000	54000	55000	11	271	620			CLEA/LQM CIEH

Petroleum Hydrocarbons represent a complex situation being a mixture of a range of compounds, the relative concentrations of which may change over time.

As discussed above, Generic Assessment Criteria (GAC) for total petroleum hydrocarbons according to both their molecular weight and chemical structure and also for a range of soil organic matter (SOM) content values have been derived using CLEA software.

The LQM CIEH GACs are again presented according to their soil organic matter content and proposed end use of the land. The generic assessment criteria for a 1%, 2.5% and 6% SOM content are tabulated below and presented according to the proposed end use.

	LQM CIEH Generic Assessment Criteria (mg/kg dry weight soil)													
	Residential						Allotment Land Use			Commercial Land Use				
	With Plant Uptake			Without Plant Uptake										
SOM %	**1**	**2.5**	**6**	**1**	**2.5**	**6**	**1**	**2.5**	**6**	**1**	**2.5**	**6**		
Aliphatic														
EC 5 – 6	24	40	80	24	40	80	752	1730	3900	2400	4000	8000		
EC > 6 – 8	52	110	250	52	110	250	2304	5580	13000	5200	11000	25000		
EC > 8 – 10	13	30	70	13	30	70	321	770	1700	1300	3000	7000		
EC > 10 – 12	60	150	360	60	150	360	2153	4300	7150	6000	15000	32000		
EC > 12 – 16	500	1200	2600	500	1200	2600	10800	12400	13200	42000	72000	90000		
EC > 16 – 35	41000	69000	94000	41000	69000	94000	240000	260000	260000	140000	160000	180000		
EC > 35 – 44	41000	69000	94000	41000	69000	94000	240000	260000	260000	140000	160000	180000		
Aromatic														
EC 5 – 7 (benzene)	50	110	240	155	300	630	12	25	57	15000	28000	55000		
EC > 7 – 8 (toluene)	100	240	550	370	800	1800	21	50	117	33000	68000	130000		
EC > 8 – 10	20	50	110	20	53	125	8.6	21	50	2000	5000	120000		
EC > 10 – 12	63	150	340	120	280	650	12.5	31	74	11000	22000	31000		
EC > 12 – 16	140	320	660	1100	1900	2300	23	57	134	35000	37000	38000		
EC > 16 – 21	260	540	930	1800	1900	1900	47	112	260	28000	28000	28000		
EC > 21 – 35	1100	1400	1700	1900	1900	1900	370	820	1500	28000	28000	28000		
EC > 35 – 44	1100	1400	1700	1900	1900	1900	370	820	1500	28000	28000	28000		
													POS_{resi}	POS_{park}
Benzene DEFRA C4SL	0.06	0.13	0.3 (0.87)	0.16	0.3	0.64 (3.3)	0.016	0.033	0.073 (0.18)	15	28	57 (98)	140	230
Toluene	104	240	550	370	830	1800	22	50	117	33000	68000	130000		
Ethylbenzene	30	62	150	34	81	190	16	38	91	3200	7000	16000		
o-xylene	30	70	170	40	90	200	28	67	160	3700	8000	19000		
m-xylene	30	70	160	34	80	190	30	74	170	3400	8000	18000		
p-xylene	30	70	160	33	80	180	28	69	160	3200	8000	17000		

TPH values calculated using CLEA v1.06 with parameter changes in accord with DEFRA (2014) C4SL and LQM/CIEH (2015)

Inert Material

The limit values for inert waste are given in the EC Landfill Directive 1999/31/EC as applied under the Environmental Permitting (England and Wales) (Amendment) (EU Exit) Regulations 2019 (*SI 2019/39*) and as defined by the council decision establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC(2003/33/EC).

The regulations and associated guidance provide waste acceptance criteria, which set the limits of contaminants permitted in various waste categories going to landfill. These criteria are of particular use where CLEA guidance or DEFRA Screening values has not yet been provided.

Inert waste is defined as waste which contains insignificant potential for pollution and does not endanger the quality of surface water or groundwater. The Landfill Directive states that inert waste will not adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm human health.

For risk assessment purposes we would consider that any materials (soils) containing concentrations of potential contaminants that would result in them being classified as inert would be considered as uncontaminated and therefore representing a low risk to human health.

Similarly, such material would not be considered to represent a significant risk to water resources.

Where CLEA or Defra screening values exist, these would always be used in preference to inert waste values when assessing risks to human health.

Selected inert waste acceptance criteria as given in Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills for the Landfill Directive are given below.

Landfill acceptance criteria for inert waste (mg/kg)	
Total organic carbon (TOC)	30,000
BTEX compounds	6
Mineral oils (C10 – C40)	500
PCBs	1
PAH	100

Risks to Plants

The CLEA framework does not provide a method for the assessment of phytotoxic risks to plants. However maximum permissible concentrations have been published in the Sludge (Use in Agriculture) Regulations 1989 (SI 1989, No. 1263). This legislation enforces the provisions of the EC Directive 86/278/EEC for potentially toxic elements (PTEs) on soils for agricultural use where sewage sludge has been applied (see table below). These limits relate to the potential risk to plants and not human health for which CLEA is the overriding risk assessment model.

Maximum permissible concentration in agricultural soils following sewage sludge application (mg/kg).				
	pH 5.0<5.5	**pH 5.5<6.0**	**pH 6.0-7.0**	**pH >7.0**
Zinc	200	250	300	450
Copper	80	100	135	200
Nickel	50	60	75	110

Risks to buried concrete

The potential risks to buried concrete can be assessed by reference to the BRE Special Digest 1 (SD1) entitled 'Concrete in Aggressive Ground'. This document provides a methodology for the specification of concrete based on the ground conditions encountered and is based upon chemical analysis and associated factors (e.g. groundwater). The guidance provides a Design Sulphate Class (DS) based upon the ground conditions and it is considered that a low concentration of sulphate and pH (i.e. DS – 1 and DS – 2) is considered to represent a low risk to buildings.

Risks to buried services

In addition, where water is supplied in plastic pipes which could come into contact with contaminated ground then this can lead to premature failures, resulting in leakage and loss of water quality. Risks to water supply pipes are assessed using guidance published by the UK Water Industry Research (UKWIR) entitled '*Guidance for the Selection of Water Pipes to be used in Brownfield Sites'* (Report Ref. No. 10/WM/03/21). This is known as the UKWIR guidance.

Previous guidance from WRAS has been withdrawn but may still be in use by certain water supply companies. In general water companies have adopted a common set of guidelines as given in the ***Contaminated Land Assessment Guidance from January 2014.***

Additional threshold values for determining pipe material have also been published by certain water supply companies. If these threshold values are exceeded then consideration should be given to the selection of pipe material or to the use of barrier pipes. The UKWIR threshold values, together with those of certain water supply companies are presented in the table below for a range of potential hazards.

Substance[(1)]	Water UK Guidance	Thames Water
Total VOC	0.5	-
Total BTEX & MTBE	0.1	0.1 or either
Total SVOC	2	-
EC5-EC10 aliphatic and aromatic hydrocarbons	2	-
EC5-EC12 aliphatic hydrocarbons		0.5
EC5-EC12 aromatic hydrocarbons		0.5
EC10-EC16 aliphatic and aromatic hydrocarbons	10	-
EC12-EC21 aliphatic hydrocarbons		10
EC12-EC21 aromatic hydrocarbons		10
EC16-EC40 aliphatic and aromatic hydrocarbons	500	-
EC21-EC35 aliphatic hydrocarbons		500
EC21-EC35 aromatic hydrocarbons		500
Phenols	2	5*
Cresols and chlorinated phenols	2	2
Naphthalene	**-**	**5**
Ethers	0.5	-
Nitrobenzene	0.5	-
Ketones	0.5	-
Aldehydes	0.5	-
Amines	0	-
Corrosives pH and EC	# ##	

All units mg kg-1 in soil;
pH <7 for wrapped steel, pH <5 wrapped ductile iron and copper and ##EC >400µS/cm;
*Phenol limit at 2mg/kg in presence of BTEX.

APPENDIX 8

PAH SOURCE RATIO INDICATOR

Potential Sources of PAH Contamination Based on PAH Ratios