GEO Environmental Engineering

PHASE 2: SUPPLEMENTARY GROUND INVESTIGATION

PROPOSED COMMERCIAL DEVELOPMENT OF LAND

ADJACENT TO ST THOMAS CROSS ROUNDABOUT

VALE VIEW, EGREMONT, CUMBRIA

FOR:

THOMAS GRAHAM AND SONS LTD

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DOCUMENT CONTROL SHEET

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1.0 Introduction

1.1 Brief

GEO Environmental Engineering Ltd (GEO) were commissioned by the Consultant, A L Daines & Partners LLP on behalf of the Client, Thomas Graham and Sons Ltd to carry out a supplementary ground investigation on land adjacent to St Thomas Cross Roundabout near Vale View in Egremont, Cumbria. The Client plans to develop the land for commercial end use.

The supplementary investigation was carried out to further assess the risk to Controlled Waters (watercourses which pass through the site) from made ground which has previously been identified on the site associated with the historical land use (former railway lines and heaps).

The Environment Agency have concerns regarding the risks to surface waters (watercourses) which could be polluted by contaminants that are mobilised during construction. Therefore, this investigation was undertaken to understand the current pollutant levels within the watercourses, both upstream and downstream of the site and to understand the potential for existing made ground materials to generate leachable contaminants which could pollute surface waters or be mobilised during construction.

1.2 Site Location and Description

The site, occupying an area of c.5.55ha is located in the southern part of Egremont, immediately west of the A595 trunk road as indicated on the site location plan included in Appendix I. Access to the site is from Vale View to the North.

- National Grid Reference: 301421, 509819
- Post Code: CA22 2RW (approximate only)

The site comprises a large agricultural field which is used for pasture and is predominantly surfaced with long unkempt grasses, occasional scrub vegetation and exposed soils. Evidence of a former railway siding is present in the east of the site in the form of mounds of coarse granular material including possible railway ballast and a steeply sided cutting in the south-eastern part.

A former railway was also present along the western boundary and evidence of this can be seen in the site topography where it appears to have been raised and levelled although the ground has now grassed over. The western boundary slopes steeply to the fields below which is likely to have been a former railway embankment.

A small culverted watercourse (stream) enters the site in the north east part where it is open for a short section as it crosses the site. The watercourse enters another culvert shortly before flowing off site to the west. The exact route of the culverted sections beyond the site boundaries is unclear, however, the culverts appear well constructed and in a good condition.

A watercourse also crosses the southern part of the site. The stream enters the site along the south western boundary where it flows into a culvert. It then emerges from the culvert along the western boundary. The culvert appears well constructed and in good condition.

Further details relating to the watercourses and the culverts including photographs are included in Appendix I.

The presence of historical railway lines/sidings and spoil heaps is a potential source of made ground. However, no other sources of potential contamination sources were noted on site.

The site undulates with areas of steep ground in places. Overall, levels fall from the highest part in the north east at c.63m OD to the lowest part along the south west boundary at c.42m OD. A copy of the topographical survey drawing is included in Appendix I.

1.3 Proposed Development

The Client plans to develop the site for commercial end use.

The plans indicate a large commercial building and several small commercial / industrial units with car parking, access roads, storage and other associated infrastructure. The buildings are located centrally within the northern part of the site. There are currently no development plans for the southern part of the site.

Drainage plans indicate that the surface waters will be collected from the buildings and areas of hardstanding via a conventional drainage system which will include Geocullular attenuation crates, Hydrobrakes, Klargester Aqua Oil Separators and Kingspan Aquatreat Separators prior to being discharged to the existing watercourse which crosses the northern part of the site.

The proposed site layout plan and the drainage plans are included in Appendix I. Further details relating to the proposed development should be obtained from the Consultant.

2.0 Previous Reports

GEO have completed a Phase 1: Desk Top Study (DTS) Report and a Phase 2: Ground Investigation Report for the site, details of which are included below:

- Phase 1 Desk Top Study (Preliminary Environmental Risk Assessment), ref: 2021-4760, dated: 5th April 2022.
- Phase 2: Ground Investigation Report, ref: 2021-4760, dated: 13th July 2022.

A summary of the previous reports is included below, however, it is recommended that the both documents are read in conjunction with this report.

2.1 Desk Top Study (April 2022)

The DTS indicated a low to moderate geotechnical risk associated the site. The risk is dependent on the location of the proposed buildings/structures due to possible deep made ground across the western parts which could necessitate alternative foundation solutions such as piles. The report also indicated that consideration should be given to the slope stability for any construction along the western part of the site. Other risks include a culvert in the southern part of the site. The risk of coal or iron ore mining was considered negligible.

The risk of ground contamination was deemed very low. Although there is a potential for localised contaminants within the soil associated with the former land uses and possible made ground, the risk to human health based on a commercial end use was considered very low. The report recommended intrusive investigations to confirm the shallow ground conditions.

The risk of groundwater contamination was deemed negligible. However, the Environment Agency has since disagreed with this assessment and provided the following comment regarding possible risks to Controlled Waters:

> *'The potential contamination within made ground as part of railway infrastructure presents a medium risk of contamination that could be mobilised during construction to pollute controlled waters. Controlled waters are particularly sensitive in this location because there are culverted watercourses crossing the site.'*

A very low risk of ground gas was deemed appropriate due to the potential for deep made ground which could be a potential source.

2.2 Ground Investigation (July 2022)

The ground investigation comprised 7 No. mini-percussive boreholes (BH01 to BH07), 26 trial pits (TP01 to TP26), gas and groundwater monitoring and chemical screening of soil samples for human health risk assessment and to aid waste disposal.

The investigation encountered made ground across the site to a maximum depth of c.1.80m bgl although the depth may increase further west adjacent to the former railway embankment. As predicted by the desk top study, the made ground was typically encountered along the routes of the former railway lines, and in the north eastern part which was previously occupied by unspecified heaps (possible spoil).

The made ground in the north eastern part (former heaps) typically comprised gravel, cobbles and boulders of aggregate within a loamy soil matrix. Made ground beneath the former eastern railway

comprised clayey sandy gravel, cobbles and boulders of aggregate, shale, sandstone and occasional clinker, slag, ash, coal and reworked silty clay. Occasional fabric and metal were also noted.

Beneath the route of the historical western railway line, the made ground comprised gravel, cobbles and boulders of aggregate with shallow pockets of clinker, ash, shale and occasional metal and brick.

Made ground was noted to be limited to the historical features (railways and heaps) with the majority of the site comprising topsoil overlying natural drift deposits.

Natural drift deposits beneath the site typically comprised firm, firm to stiff and stiff sandy very gravelly clay with occasional cobbles, and bands of silty sandy gravel of mixed lithology. Bedrock was not encountered.

With the exception of occasional minor pockets of perched groundwater at depths of between c.1.40m and c.2.20m bgl, the exploratory holes typically remained dry during the intrusive ground investigation works.

Samples of the made ground were scheduled for chemical screening as part of the human health risk assessment. The screening included metals, asbestos, poly-aromatic hydrocarbons (PAH), petroleum hydrocarbons, MTBE and BTEX. The results of the laboratory screening were all below the generic assessment criteria values for a commercial / industrial end use. As such, remediation was not deemed necessary.

Six samples of made ground were scheduled to Waste Acceptance Criteria (WAC) screening to aid the disposal of made ground materials during construction.

3.0 Ground Investigation Reporting

3.1 Ground Investigation Aims and Objectives

The overall objective of this Supplementary Ground Investigation is to provide information relating to the chemical properties of the surface waters (streams) that pass through the site and the potential for the existing made ground to generate leachable contaminants that could potentially pollute the surface waters. This information can be used to assess the overall risk to surface waters from future earthworks and/or development on the site.

3.2 Guidelines, Codes of Practice and Third-Party Accreditations

This report incorporates a Level 1 Risk Assessment for Controlled Waters. The laboratory testing (ground contamination) was completed by a UKAS and MCERTS accredited laboratory with details given in Sections 6. Copies of the test reports are contained within Appendix III.

This Ground Investigation Report has been completed in general accordance with the following documents:

- Land Contamination Risk Management Stages 1 to 4 (LCRM – www.gov.uk) – April 2021.
- BS10175: 2017: Code of Practice for the Investigation of Potentially Contaminated Sites.
- BS5930: 2020: Code of Practice for Site Investigations.
- BS1377: 1990: Methods of test for soils for civil engineering purposes.
- CIRIA Report C665: 2015.
- Eurocode 7 – Geotechnical Design (Part 1: General Rules and; Part 2: Ground Investigation and Testing).
- UK Specification for Ground Investigation, 2nd Edition. Site Investigation Steering Group, 2011.
- Effective Site Investigation. Site Investigation Steering Group, 2013.
- SP1010 Development of Category 4 Screening Levels Main Report, 2014.
- The LQM/CIEH S4UL's for Human Health Risk Assessment, 2015.

3.3 Ground Investigation Limitations of Use

Although every effort is made to ensure a full and comprehensive investigation has been completed, it should always be borne in mind that ground conditions have the potential to vary between exploratory hole locations and it is recommended that the developer adopt a "watching brief" during the redevelopment works to ensure that any potential variations encountered are identified and dealt with in an appropriate manner.

The conclusions and recommendations presented within this report are considered reasonable based on the available information. However, these cannot be guaranteed to gain regulatory approval. Therefore, the report should be passed to the appropriate regulatory authorities and/or other key stakeholders, including warranty providers in order to seek their approval of the findings prior to undertaking any development works.

The Ground Investigation Report and its contents are limited to the boundaries of the site, as indicated on the Plans in Appendix I. Reliance on the report is for the named Client only. No reliance, copying or use of this report (in part or whole) by any Third Party is permitted without prior written approval from Geo Environmental Engineering Ltd, with intellectual copyright remaining the sole property of the author. Reliance on the report and its associated information is strictly in accordance with Geo Environmental Engineering Ltd Terms and Conditions, copies of which are available on request.

4.0 Ground Investigation Fieldwork

4.1 Intrusive Investigation Fieldworks Summary

The supplementary ground investigation works were completed on the 13th April 2023. The exploratory holes were targeted to the areas where deep or significant made ground had previously been encountered in order to recover made ground samples for chemical screening.

The exploratory hole location plan is provided in Appendix I.

The ground investigation works comprised:

- 7 No. Mechanically Excavated Trial Pits (TP27 to TP33) to depths of between c.1.00m and c.1.70m bgl.
- Water sampling from the watercourses.
    - Water samples were recovered both upstream and downstream of the site (as close as possible without accessing the culverts).
- Laboratory chemical screening of soil and stream water samples.
    - 6 No. samples of made ground were scheduled to soil leachate screening.

The works were supervision by a suitably qualified and experienced Geo-Environmental Engineer and the fieldworks were undertaken in accordance with BS5930:2020, BS1377:1990 and Eurocode 7 (Part I and II).

At each exploratory hole location, the surfacing type, made ground, natural ground and groundwater conditions were observed, with in-situ testing undertaken and samples recovered. Details of the ground conditions are included on the exploratory hole logs which are included in Appendix II together with other relevant ground investigation data.

The chemical laboratory tests results are provided in Appendix III.

All depths included in the report are in metres below ground level (m bgl), unless stated otherwise.

5.0 Ground and Groundwater Conditions

5.1 General

The following section provides a summary of the ground conditions encountered across the site during the supplementary investigation. Reference should be made to the exploratory hole logs included in Appendix II for detailed descriptions of the strata and groundwater conditions.

All depths are reported in metres below ground level (m bgl) unless stated otherwise.

5.1.1 Made Ground and Topsoil

The trial pits were located in areas where previous investigations have encountered deep or significant made ground.

The supplementary trial pits encountered occasional topsoil (c.0.05m to c.0.22m thick) overlying made ground to depths of between c.0.47m and c.1.40m bgl. This comprised gravel, cobbles and boulders of aggregate, shale, clinker, ash and coal, although aggregate (possible railway ballast) was by far the most common material. The pockets of ash/clinker deposits encountered across the western parts were typically shallow, appearing within the top 1m. The granular deposits were occasionally bound within a reworked clay or loamy clay matrix and some organic material was also noted.

The made ground noted in the trial pits was considered very similar and generally representative of the materials encountered across the site during the previous investigation.

No visual or olfactory evidence of fuel/oil type contamination (no staining, odour or free product) or any landfill type waste such as potentially biodegradable, decomposable or putrescible materials were encountered.

5.1.2 Natural Drift Deposits

Natural drift deposits typically comprised firm to stiff or stiff gravelly clay or gravel and cobbles of mixed lithology.

5.1.3 Solid Geological Deposits (Bedrock)

Solid strata (bedrock) was not encountered during the ground investigation.

5.2 Groundwater

All of the trial pits remained dry during the intrusive fieldworks.

6.0 Laboratory Testing

6.1 Controlled Waters Risk Assessment

To enable the completion of a Level 1 Generic Quantitative Risk Assessment (GQRA) for Controlled Waters, samples of both stream water and made ground were recovered and scheduled to chemical screening. Further details are presented below:

6.1.1 Stream Water Sampling

Samples of water were recovered from the watercourses, both upstream and downstream of the site. For safety, access to the culverts was not permitted, therefore, the samples were recovered as close as possible to the site boundaries.

The sampling locations are indicated on a plan included in Appendix I. Photographs of the watercourses and culverts are also presented in Appendix I.

The samples were recovered in 1 litre amble glass bottles. The samples were screened at the following UKAS and MCERTS accredited laboratory:

- Chemtech Environmental Testing of Stanley, County Durham.

The sampling was completed following several days of steady rainfall to ensure maximum contaminant concentrations within the watercourses (if ongoing leaching is still occurring). The water levels were noted as generally low. The water was noted to be slightly grey/cloudy and turbulent both upstream and downstream of the site in both watercourses.

6.1.2 Soil Leachate Screening

6 No. samples of made ground recovered from the trial pits at depths of between c.0.30m and c.0.70m bgl were scheduled to soil leachate screening at the following UKAS and MCERTS accredited laboratory:

- Chemtech Environmental Testing of Stanley, County Durham.

As per the previous soil screening, Potential Contaminants of Concern (PCOC's) were determined based on the site history (railways and unspecified heaps) and soil descriptions within the exploratory holes.

Representative samples of the made ground were subjected to soil-leachate screening for the following range of potential contaminants:

- **Inorganic Soil Suite:** Metals (Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium and Zinc), Cyanide (total), Hardness, pH and Sulphate.
- **Organic Soil Suite (Human Health Risk Assessment):** Speciated Polycyclic Aromatic Hydrocarbons (PAH – USEPA 16), Speciated Petroleum Hydrocarbons, MTBE and BTEX.

The full catalogue of soil screening results and test detection limits can be seen in the Chemtech report (ref: 121657) contained in Appendix III.

7.0 Generic Quantitative Risk Assessment (GQRA)

7.1 Methodologies for Assessing Risks

7.1.1 Methodology for Assessing Risk to Controlled Waters

Soil-leachate screening has been completed in order to determine the potential mobility of contaminants within the made ground. The assessment is completed by soaking the made ground sample material within water and determining the contaminant concentrations within the water after a fixed duration.

This provides a potential worst-case scenario where the materials are saturated in water rather than the water filtering through the materials where the potential for leaching would be significantly less.

Water samples were recovered from the streams, and these were scheduled to laboratory screening in order to assess the existing concentrations of potential contaminants and to determine if the site is currently impacting the surface water quality. It also provides a base line for any future assessments which may be required during construction. Where a significant impact is occurring from the site, higher contaminant concentrations would be expected in the downstream samples. However, other potential sources of contamination are present within the vicinity of the site including roads, a garage, housing and agricultural fields which can all cause contaminant wash-off into the watercourses and could also be responsible for contamination within the surface waters.

The results of the surface water and soil-leachate screening are assessed using UK published Generic Assessment Criteria (GAC) for freshwater were possible. Where suitable assessment criteria are not available for environmental receptors such as the PAH concentrations, the test results have been compared against assessment criteria for stringent UK Drinking Water Standards (UK DWS), Test Detection Limits (TDL) or other Environmental Guidelines where appropriate.

The GAC have been derived using the following guidance documents:

- EA Environmental Quality Standard (EQS) for Freshwater.
- EU Environmental Quality Standard (EQS) for Freshwater.
- The River Basin Districts Typology, Standard and Groundwater Threshold Values within the Water Framework Directive 2010 (updated values 2014).
- UK Drinking Water Standards taken for Water Supply (Water Quality) Regulations 1989 and 2000.
- Environmental Risk Limits (Netherlands National Institute for Public Health and the Environment).

The results of the analysis and chosen GAC are presented in the Contamination Assessment Sheet (waters) contained in Appendix IV. Where the results exceed the GAC values, the results are highlighted in yellow. Where exceedances are noted, they do not automatically indicate a significant risk to the Controlled Waters, especially where the results are assessed against GAC for drinking water standards as the assessment criteria are very stringent.

7.2 Controlled Waters Risk Assessment – Comparison with Guidance Levels

7.2.1 Leachate Concentrations

The results of the inorganic leachate screening have been compared to published Generic Assessment Criteria (GAC). The results indicate variable concentrations with pH values indicating neutral to slightly alkali conditions. The leachate results were typically low with none exceeding the GAC values. As such, inorganic contaminants within the made ground do not pose a risk to Controlled Waters.

The concentrations of Poly-Aromatic Hydrocarbons (PAH) were all below, or close to the test detection limits with none exceeding the assessment criteria values. As such, potential PAH compounds within the made ground do not pose a significant risk to Controlled Waters.

The concentrations of petroleum hydrocarbons were typically low, however, concentrations of heavy end aromatic petroleum compounds marginally exceeded the assessment criteria for UK drinking water standards (UK DWS). The elevated compounds include C16-21, C21-35 and C35-44 and were recorded at concentrations of between 12mg/kg and 28mg/kg. The assessment criteria for all petroleum hydrocarbons are set at 10mg/kg. This is discussed Further in Section 8.

The concentrations of BTEX and MTBE compounds was typically below the level of detection and are not considered to pose a risk to Controlled Waters.

7.2.2 Watercourse Contaminant Concentrations

The results of the laboratory screening on the watercourse samples indicate low concentrations of metals and inorganic contaminants with none exceeding the assessment criteria.

The results of the PAH screening typically indicate low concentrations which were mostly below the level of detection. However, marginally elevated concentrations of PAH compounds were detected in the upstream sample of the southern watercourse. The concentration of PAH compounds in the downstream sample were all below the level of detection. It is considered likely that the elevated PAH concentrations may have occurred due to particulate within the sample which may have been leached or may have directly affected the test results (although no evidence of particulate matter was noted in the sample). The results do not indicate a direct impact to Controlled Waters from potential PAH contamination on the site at present.

The results of the petroleum hydrocarbon screening indicate variable concentrations with the majority of the values below the GAC. However, elevated concentrations of aromatic hydrocarbons (C12-C16 and C16-C21) marginally exceeded the GAC values in both the northern and the southern watercourses. The elevated concentrations were recorded upstream of the site in the northern watercourse and downstream of the site in the southern watercourse. Again, it is likely that the results may have been skewed by minor particulate matter within the samples (although none was noted). Overall, the results do not indicate a direct impact to Controlled Waters (surface water quality) from potential hydrocarbon contamination present on site.

The concentration of MTBE and BTEX compounds was below the level of detection.

7.3.3 Controlled Waters Risk Assessment – Summary

Based on the Controlled Waters Risk Assessment above, the following contaminants have been identified as posing a potential risk to controlled waters:

- **Inorganic Contamination:** None.
- **Organic Contamination:** Variable, occasionally elevated upstream and downstream.

The results indicate some marginally elevated concentrations of both PAH and petroleum hydrocarbon compounds, however, these were recorded both upstream and downstream of the site and it is likely that these are associated with minor particulate within the water samples which may have affected the results. The test data does not indicate a direct impact to Controlled Waters from potential contamination present on site.

This is discussed further in Section 8.

8.0 Discussion and Recommendations

8.1 Ground and Groundwater Conditions Summary

The supplementary trial pits have encountered similar ground conditions to the previous investigation with made ground associated with the former railways and spoil heaps comprising granular deposits within occasional reworked clays and loamy soils. The granular fraction typically comprised aggregate (possible railway ballast) with shallow pockets of shale, clinker, ash and coal. The made ground was underlain by natural drift deposits comprising firm and stiff clays and gravel and cobbles of mixed lithology. Bedrock was not encountered.

The trial pits were all dry on completion.

During the investigation, no visual or olfactory evidence of fuel/oil type contamination (no staining, odour or free product) or any landfill type waste, potentially biodegradable, decomposable or putrescible materials were encountered.

8.2 Contamination Risk Assessment

8.2.1 Controlled Waters Risk Assessment and Discussion

During the ground investigation, no visual or olfactory evidence of mobile contamination (fuels, oils, etc…) were encountered.

The results of the chemical screening undertaken on the watercourse samples indicates variable results with some marginally elevated concentrations of both PAH and petroleum hydrocarbon compounds. However, the elevated values were recorded both upstream and downstream of the site with little correlation between the samples. The results do not suggest an existing link between potential contamination present on site and surface water quality. It is considered likely that the elevated contamination values are a result of particulates within the samples which may have entered during sampling and could have affected the results (the water was noted as turbulent and cloudy during sampling).

The results of the leachate screening indicate marginally elevated concentrations of heavy end aromatic petroleum compounds (>C16). However, all of the other potential contaminants were either below the level of detection or at low concentrations which do not pose a risk to Controlled Waters. The elevated compounds were recorded in samples recovered from trial pits TP29, TP30 and TP32, which were all located in the western part of the site and encountered made ground associated with the former railway embankment.

The results for petroleum hydrocarbons exceed the assessment criteria for stringent UK drinking water standards (UK DWS) but do not automatically indicate a potential risk to Controlled Water or Environmental Receptors. The results do indicate that heavy end aromatic petroleum hydrocarbon compounds within the made ground in the western part of the site could, in certain circumstances, leach into the surface waters at low concentrations.

Although the testing indicates potentially leachable petroleum hydrocarbon compounds, the risk is currently considered very low for the following reasons:

- No evidence of any hydrocarbon contamination (sheen, odour, staining) was noted within the made ground or within the water courses.
- Shallow groundwater was not encountered within the exploratory holes.

  - As the made ground is not saturated beneath the groundwater table, the potential for significant leaching is significantly reduced. Any surface waters passing through the made ground will have a brief exposure to any contaminants and the leaching potential will be low. The risk would be significantly higher if the made ground were saturated.
- Construction appears to be focused across the central and eastern parts of the site. As such, it is likely that the made ground in the western part of the site will remain largely undisturbed.
  - If the made ground remains undisturbed, there is less chance of it being exposed to surface waters or being mobilised during heavy rainfall events which could result in it flowing into the watercourses.
- The culverts appeared well constructed and were in a good condition.
  - Where the culverts pass through made ground, it is considered very unlikely that contaminants will be leached in significant volume.
- The proposed construction will incorporate a significant area of hardstand and buildings with drainage throughout.
  - This will significantly impede or stop infiltration of rainwater through any potentially contaminated made ground below, therefore reducing the potential for contaminants being leached into the water courses.
- Dilution and natural attenuation of any hydrocarbon compounds entering the water courses will occur to some degree.

8.2.2 Contaminant Mitigation Measures

Although the risk to surface waters is currently considered very low, there is a potential for increased leaching or mobilisation of contaminants during construction or earthworks when the soils are disturbed. The most likely pathways would be via contaminated waters (leached contaminants flowing into the watercourse) or from contaminated sediments entering the watercourses directly. Attenuation of contaminants is likely following completion of the development works once the disturbance has ceased and the soils have settled.

In order to reduce or mitigate the risks to the watercourses during construction, the following precautions are recommended:

- Sediment filters/barriers (silt traps) should be adopted between any earthworks or construction works and the watercourses.
  - These should be periodically inspected and checked to ensure that they are appropriately located, have not become overloaded and are working as intended.
- Made ground materials should not be left exposed at the surface following completion of the development.
- Extra care should be taken during any earthworks or construction along the western part of the site where ashy deposits and/or potentially deep made ground is anticipated.
  - If works are proposed that intercept the made ground materials across the western part of the site, extra care should be taken to ensure the made ground materials are handled appropriately to minimise potential run-off, leaching or cross contamination. Ashy materials should not be left exposed at the surface and may need to be disposed of appropriately.
- Made ground materials excavated as part of the proposed works should be disposed of offsite immediately or reused and sealed as quickly as possible.
  - Unsealed stockpiles can significantly increase the risk of leaching or mobilisation of contaminated sediment and should be avoided.
- The use of soakaway drainage should be prohibited within the development due to the potential for increased water flow through the made ground. Ideally, rainwater should be discharged directly to the existing stream via a drainage system with appropriate attenuation and oil/water separators.

The precautions noted above, and the use good construction practices should ensure that the risk to the water courses is kept very low or negligible.

8.2.3 Management Plans, Inspections and Chemical Screening Requirements

Independent third-party checks should be completed to ensure that sediment loading within the streams are kept to a minimum. The silt traps should be checked to ensure that they are appropriately located, have not become overloaded and are working as intended.

Samples of the watercourses should be taken during construction (initially at 2-month intervals, reducing to 4 month intervals after the first 6 months) to ensure that contaminant concentrations have not escalated. Where sediment loading is noted within the streams or chemical analysis indicates significantly increased contaminant concentrations, the works should be stopped to ensure that mitigation works can be put in place to reduce the impact.

The Developer should incorporate the precautions outlined above as well as noting the requirement for routine inspections/checks and standard best practices within an Environmental Management Plan (EMP) to ensure that all parties are aware of the environmental risks, the requirements and their responsibilities.

8.3 General Comments

Consideration must be made for variations to occur in the ground conditions between the exploratory hole locations for which GEO holds no responsibility and areas where limited access was available. It is therefore recommended that a “watching brief” and “observational technique” be applied to this site to ensure that if ground conditions appear to vary from those identified within this investigation report then advice should be sought from a suitably qualified and experienced Engineering Geologist, Geotechnical or Geo-Environmental Engineer.

The recommendations and opinions expressed in this report are based on the strata observed within the exploratory holes in addition to the results of the site and laboratory tests commissioned by GEO. Consequently, GEO takes no responsibility for conditions that have not been revealed or which occur between them. GEO takes no responsibility for the accuracy of third party information provided by sub-contract drillers or laboratories.

The conclusions and recommendations presented within this report are considered reasonable based on the available information. However, these cannot be guaranteed to gain regulatory approval. Therefore, the report should be passed to the appropriate regulatory authorities and/ or other key stakeholders including warranty providers in order to seek their approval of the findings prior to undertaking any works on site.

During the construction works it is likely that materials will be excavated on site (i.e. future foundations and buried utilities, etc.) that will not be able to be accommodated on site during to space and level constraints, ultimately requiring removal off site.

During the construction works, different materials should be stockpiled separately, and an appropriate waste disposal classification should be determined by the Design Team prior to removal. It may be the case that WAC testing is required to aid the assessment.

Where made ground materials or disturbed natural strata is to be removed, the results of the soil testing undertaken within this report can be used as a preliminary assessment and the anticipated waste disposal facility should be provided with a copy of the results for review. It may be the case that the waste facility requires additional contamination screening to aid the characterisation of the made ground for off-site disposal (i.e. Waste Acceptance Criteria – WAC) and it is recommended that this be confirmed by the design team prior to commencing on site.

During the construction phase, it may be the case that WAC screening is required to aid classification for disposal and it is recommended that all materials are classified prior to excavation and disposal off site.

Conversely, if materials are required to be brought to site to raise site levels or as part of a clean cover system then certification and/or soil testing results should be reviewed by a suitably experienced and qualified geo-environmental engineer to ensure that potentially contaminated materials are not being brought to site.

Any material movements may require a Material Management Plan (MMP) in accordance with CL:AIRE.

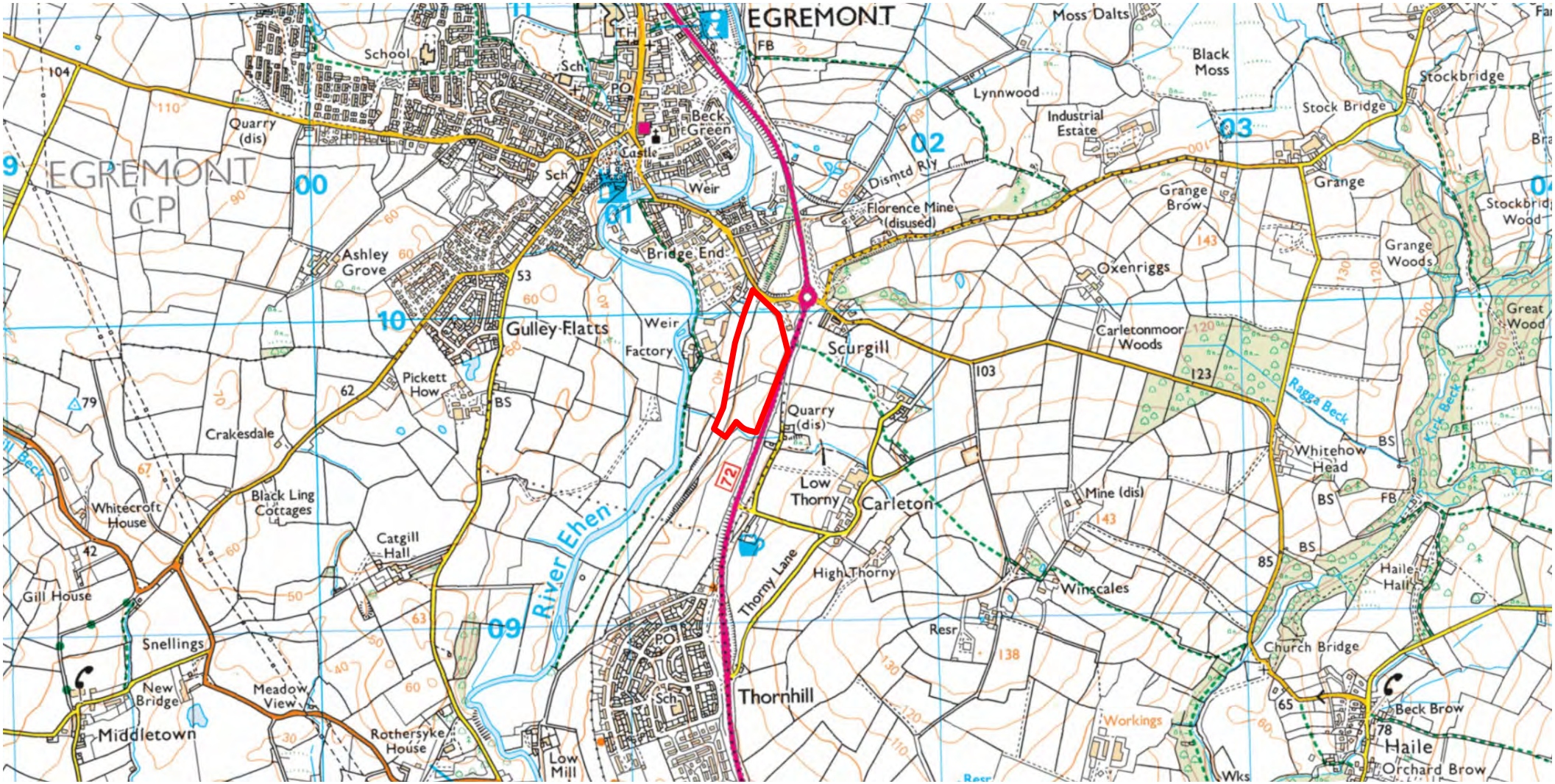
End of Report

Appendix I

- Site Location Plan
- Exploratory Hole Location Plan
- Surface Water Sampling Locations
- Sampling Location Photographs
- Proposed Site Layout Plan
- Proposed Drainage Plans

GEO Environmental Engineering

GEO2023-5823: St Thomas Cross Roundabout, Vale View, Egremont – Site Location



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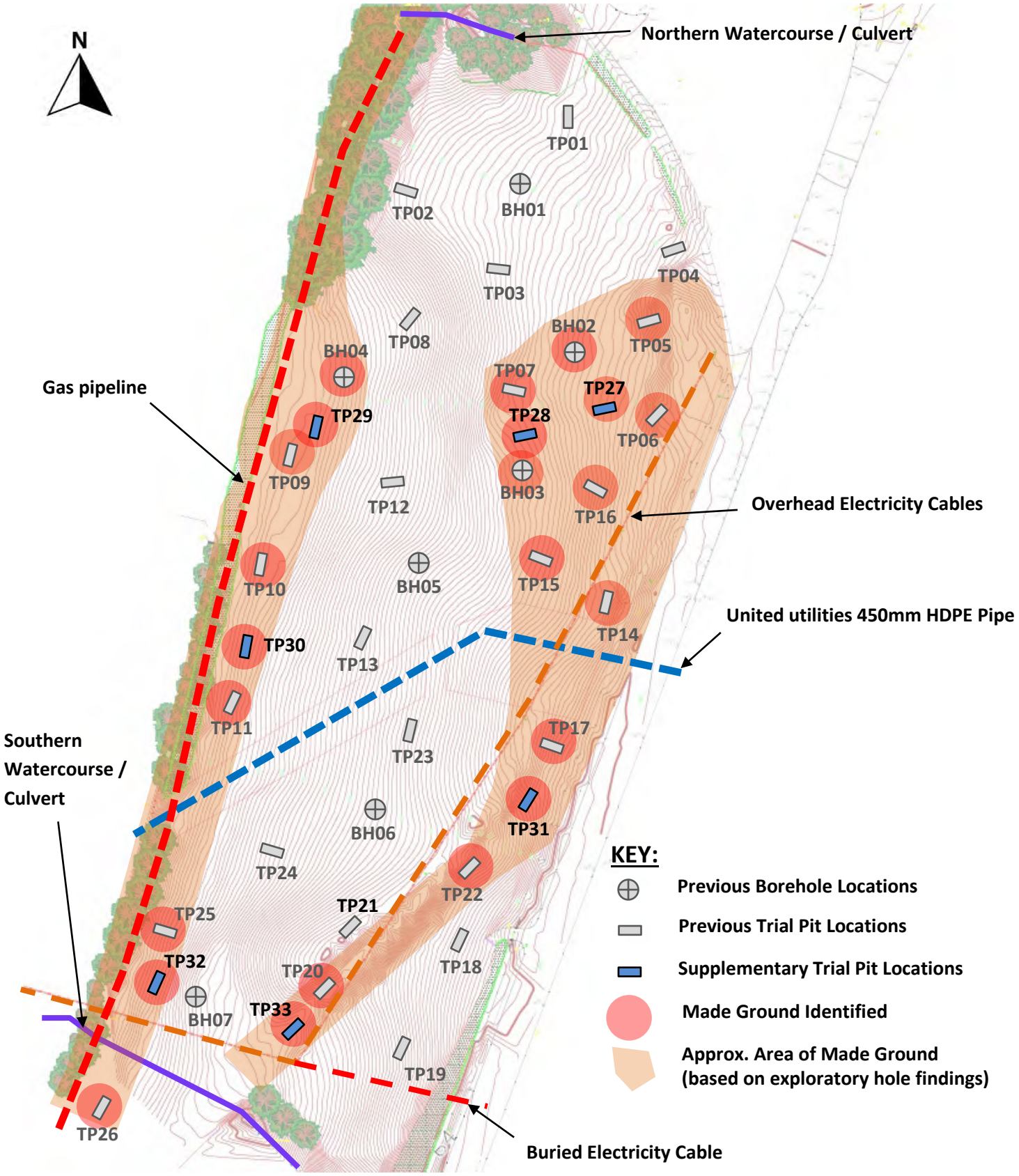
GEO2023-5823: Vale View, Egremont – Exploratory Hole Location Plan



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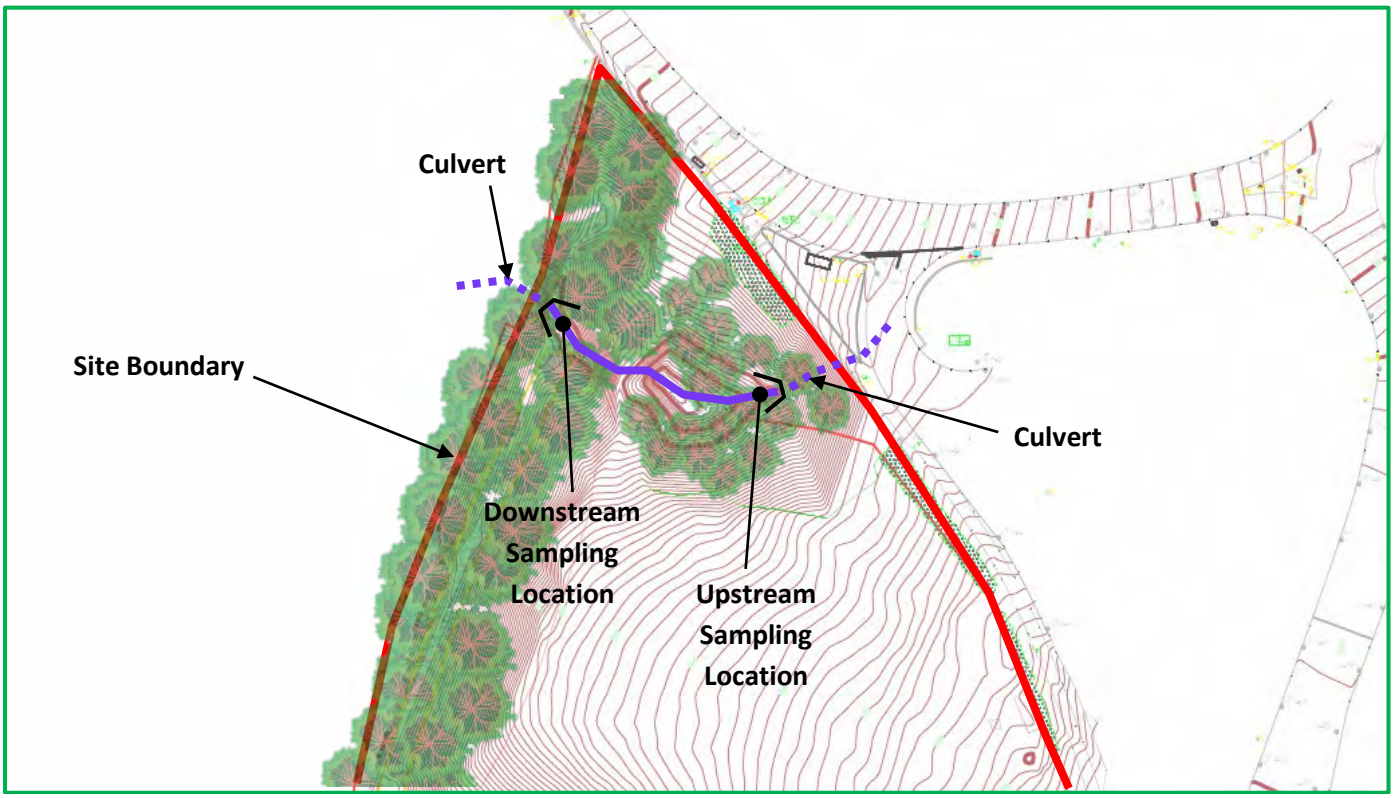
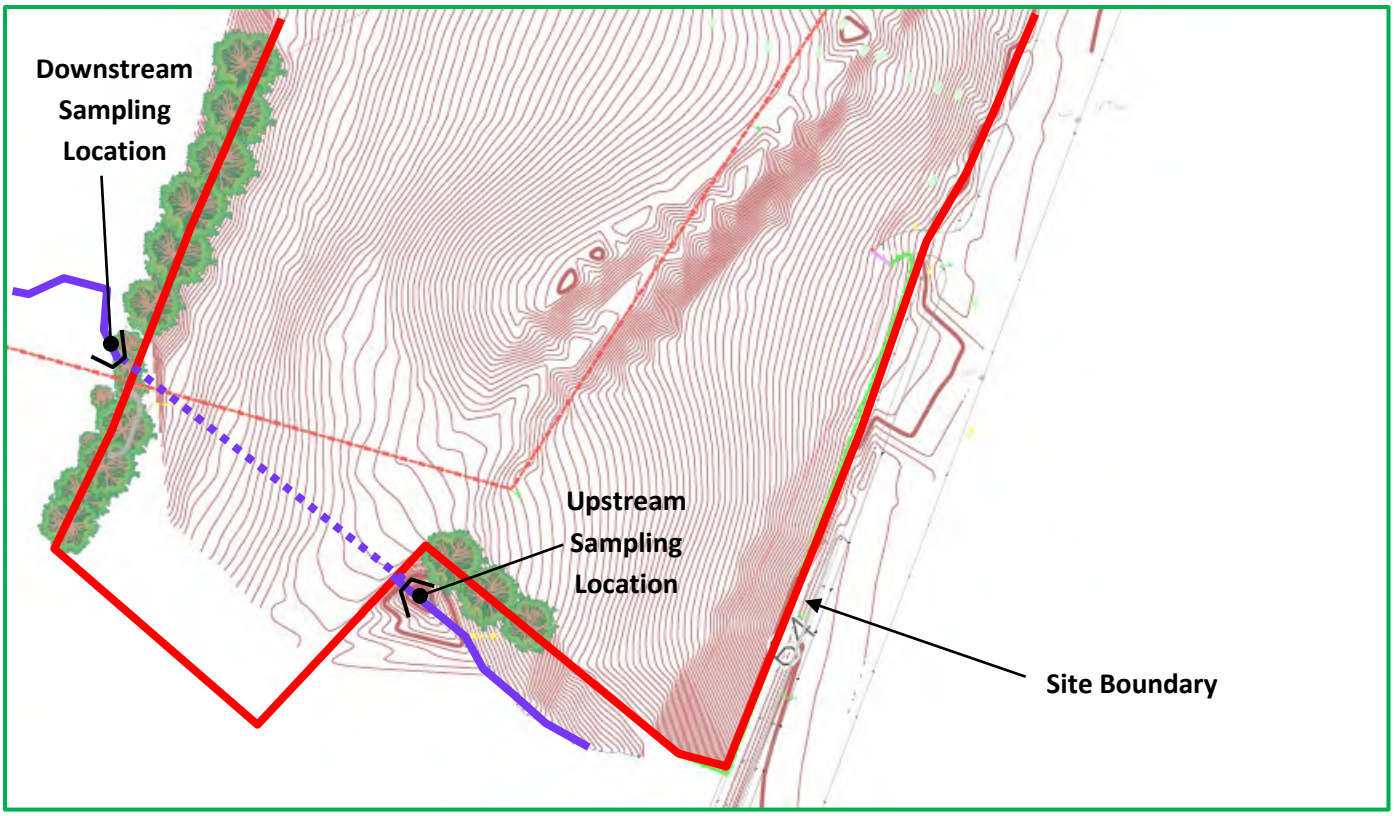
GEO2023-5823: Vale View, Egremont – Surface Water Sampling Locations



Northern Watercourse Route and Sampling Locations



Southern Watercourse Route and Sampling Locations

Website: www.geoenvironmentalengineering.com
Email: info@geoenvironmentalengineering.com
Telephone: 08456 768 895 / 07883 440 186

GEO2023-5823: Vale View, Egremont – Sampling Location Photographs (Page 1 of 2)

Northern Watercourse – Upstream Sampling Location at Culvert Exit

Northern Watercourse – Downstream Sampling Location at Culvert Entry

Website: www.geoenvironmentalengineering.com
Email: info@geoenvironmentalengineering.com
Telephone: 08456 768 895 / 07883 440 186

GEO2023-5823: Vale View, Egremont – Sampling Location Photographs (Page 2 of 2)

Southern Watercourse – Upstream Sampling Location at Culvert Entry

Northern Watercourse – Downstream Sampling Location at Culvert Exit

Website: www.geoenvironmentalengineering.com
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Telephone: 08456 768 895 / 07883 440 186

Architects PLUS

Site - subject of the application

Adjoining land - same owner as subject site

SCHEDULE OF MATERIALS

External:

TCB

Ambulance Station

Ashern

New House

Greenside

ST THOMAS'S CROSS

St Thomas's Cross House

St Thomas Cross Garage

SITE ENTRANCE

UNIT 4

UNIT 5

UNIT 6

UNIT 3

UNIT 2

UNIT 1

CAR PARKING
15no. spaces

MAIN BUILDING

LOWER YARD

UPPER YARD

STAFF CAR PARK
9no. cars

CUSTOMER CAR PARKING
28no. spaces

STAFF CAR PARKING
30no. spaces

5no. cars

10no. cars

5no. vans

2no. trailers

access control

EXIT ONLY

ENTRANCE & EXIT

ENTRANCE

GALVANISED STORE

Retaining wall

STYLE

CULVERT

WATERCOURSE

VALE VIEW

BUS SHELTER

GRASS SURFACE

FACRE PAVING

Extent of retaining walls/ batter TBC by SE

keep at 58.000?

1:20 tbc

1:19

1:23

1:25

1:40

1:37

1:42

A595

A-A

B-B

C-C

D-D

E-E

D
20002-PL11

N

Revision Description Drawn Approved Date

Proposed Block Plan

Thomas Graham, Egremont

0m 10m 20m 30m 40m 50m

VISUAL SCALE 1:500 @ A1

Victoria Galleries, Viadcut House, Victoria Viaduct, Carlisle, Cumbria, CA3 8AN | ap@architectsplus.co.uk | 01228 515144

WWW.ARCHITECTSPLUS.CO.UK

Registered Office
Victoria Galleries, Victoria House,
Victoria Viaduct, Carlisle, Cumbria, CA3 8AN

Company Registration
Architects Plus (UK) Limited
Registered in England No. 4221140

Drawing: Proposed Block Plan

Status: PL - Planning

Project: Thomas Graham, Egremont

Client name: Thomas Graham & Sons Ltd

Revision stage: 3 - Developed Design

DRAFT

Date	Drawn by	Scale @ A1	Drawing number	Revision
05.01.23	LC	1 : 500	20002-PL03	

STYLE

TACTILE PAVING

BUS SHELTER

Si
Lp

Si
Els

Mh
Cl 54.707

Gy
Cl 54.697

FW01 ø450
CL 54.707m
IL 53.500m TBC

Fh

M

Lp

Si

Lp

GRASS SURFACE

Mh
Cl 55.710

Gy
Cl 55.698

C_ba

Mh
Cl 55.714

TP

Gy
Cl 56.014

Gy
Cl 57.210

Lp

OUTLET INTO ORDINARY WATERCOURSE
IL 48.400(TBC)

SW18 ø1200
CL 50.500
IL 48.125

SW19 ø1200
HYDROBRAKE OPTIMUM
MD-SHE-0100-3700-0400-3700
CL 55.000
IL 52.500
DESIGN FLOW 3.7l/s
DESIGN HEAD 0.36m

71m ø300 PIPE @ 1 in 17

56m ø150 PIPE @ 1 in 80

82m ø225 PIPE @ 1 in 820

SW29 ø600
CL 55.350
IL 54.500

FFL 55.500

FW06 ø450
CL 55.350m
IL 54.500m

FW05 ø450
CL 55.350m
IL 54.600m

FW02 ø450
CL 55.350m
IL 54.200m

SW27 ø600
CL 55.350
IL 54.500

35m ø150 PIPE @ 1 in 87

GRAF ECOBLOCK INSPECT
FLEX GEOCELLULAR ATTENUATION CRATES
10 x 30 x 0.96m
(288m³ STORAGE)
IL 52.500

PERMEABLE PAVING WITH UNDERDRAINS

SW28 ø600
CL 55.350
IL 54.400

FW04 ø450
CL 55.350m
IL 54.800m

SW26 ø600
CL 55.350
IL 54.400

SW17 ø600
CL 52.500
IL 48.485

KLARGESTER AQUA OIL FORECOURT SEPERATOR
SW33 ø1200
CL 55.350
IL 54.150

KINGSPAN AQUATREAT SEPERATOR SWT010
SW24 ø1200
CL 55.350
IL 54.200

FW03 ø450
CL 55.350m
IL 54.600m

KINGSPAN AQUATREAT SEPERATOR SWT010
SW34 ø1500
CL 56.850
IL 55.500

52m ø150 PIPE @ 1 in 11

ø60 RISING MAIN (5.4m LIFT)

SW08 ø1200
CL 56.000
IL 53.500

23m ø150 PIPE @ 1 in 14

16m ø300 PIPE @ 1 in 533

10.8m ø300 PIPE @ 1 in 540

SW07 ø1200
CL 57.400
IL 55.225

SW06 ø1200
CL 57.200
IL 55.195

SW05 ø1200
HYDROBRAKE OPTIMUM
MD-SHE-0091-3400-0800-3400
CL 56.975
IL 55.165
DESIGN FLOW 3.4 l/s
DESIGN HEAD 0.8m

STN 01

Gy
Cl 58.437

STN 02

TP

Mh
Cl 59.661

SW13 ø1200
CL 53.000
IL 52.000

52m ø300 PIPE @ 1 in 26

SW23 ø1200
CL 54.000
IL 53.000

SW25 ø1200
CL 56.000
IL 55.000

56m ø300 PIPE

DUAL SEWAGE PUMPING STATION
1000l – 6m LIFT

SW16 ø1200

DRAINAGE NOTES

1. THIS DESIGN IS BASED ON INFORMATION SUPPLIED BY THIRD PARTIES, AND MAYBE SUBJECT TO CHANGE RESULTING FROM UPDATES AVAILABLE FROM SAID PARTIES.
2. THE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE MANUFACTURERS SPECIFICATOINS AND DETAILS WHERE APPLICABLE.
3. UNADOPTED FW & SW DRAINAGE IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE CURRENT BUILDING REGULATIONS, BS EN752 AND BS EN12056.
4. DRAINS ARE TO BE CONSTRUCTED USING UPVC BUILDING DRAINAGE SYSTEM PIPEWORK TO BS 4660 AND BS EN1401-1, BEDDED AND BACKFILLED IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS AND THE SPECIFICATIONS UNLESS OTHERWISE SPECIFIED.
5. CHANNEL DRAINS TO BE GENERALLY ACO M100D 0.0 WITH SUMP UNIT OR SIMILAR APPROVED UNLESS STATED OTHERWISE. GRATING TO BE IN ACCORDANCE WITH ARCHITECT OR LANDSCAPE ARCHITECT SPECIFICATION.
6. BACKFILLING OF DRAIN TRENCHES ADJACENT TO BUILDINGS OR OTHER STRUCTURES IS TO BE IN ACCORDANCE WITH DIAGRAM 8 OF THE BUILDING REGULATIONS.
7. DRAINAGE TO BE 150 CONCRETE ENCASED WHERE COVER IS LESS THAN 1200mm.
8. THE PIPE EMBEDMENTS INDICATE MIN TRENCH DIMENSIONS WHICH SHOULD BE ASSUMED FOR INITIAL DESIGN, THE MIN TRENCH WIDTHS SHOWN WILL USUALLY BE SUFFICIENT TO ALLOW ADEQUATE COMPACTION OF THE EMBEDMENT MATERIAL. ALL PIPE WORK TO BE DESIGNED TO BS EN 1295-1
9. GEN3 CONCRETE SHALL BE USED IN NON AGGRESSIVE GROUND ELSEWHERE THE CEMENT TYPE & MIX DESIGN SHOULD BE SELECTED TO SUIT SULPHATE CONTENT & PH OF THE GROUND & GROUND WATER
10. GROUND COVER TO ALL PLANT TO BE STRICTLY IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS.

REV	DATE	AUTHOR	NOTES
DRAWING STATUS			PRELIMINARY

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CLIENT
THOMAS GRAHAM LTD

TITLE
THOMAS GRAHAM, EGREMONT
PROPOSED DRAINAGE PLAN 1 OF 3

DRAWN	DATE	SCALE
PA	JAN 23	1:200 @A1

DRAWING NO. 21-C-16080-007 -

DRAINAGE NOTES

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7. DRAINAGE TO BE 150 CONCRETE ENCASED WHERE COVER IS LESS THAN 1200mm.
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10. GROUND COVER TO ALL PLANT TO BE STRICTLY IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS.

PERMEABLE PAVING WITH UNDERDRAINS
FFL 55.500
SW28 ø600 CL 55.350 IL 54.400
FW04 ø450 CL 55.350m IL 54.800m
SW26 ø600 CL 55.350 IL 54.400
SW17 ø600 CL 52.500 IL 48.485
KLARGESTER AQUA OIL FORECOURT SEPERATOR SW33 ø1200 CL 55.350 IL 54.150
KINGSPAN AQUATREAT SEPERATOR SWT010 SW24 ø1200 CL 55.350 IL 54.200
FW03 ø450 CL 55.350m IL 54.600m
KINGSPAN AQUATREAT SEPERATOR SWT010 SW34 ø1500 CL 56.850 IL 55.500
SW07 ø1200 CL 57.400 IL 55.225
16m ø300 PIPE @ 1 in 53
SW06 ø1200 CL 57.200 IL 55.195
10.8m ø300 PIPE @ 1 in 540
52m ø150 PIPE @ 1 in 11
ø60 RISING MAIN (5.4m LIFT)
SW08 ø1200 CL 56.000 IL 53.500
23m ø150 PIPE @ 1 in 14
SW05 ø1200 HYDROBRAKE OPTIMUM MD–SHE–0091–3400–0800–3400 CL 56.975 IL 55.165 DESIGN FLOW 3.4 l/s DESIGN HEAD 0.8m
52m ø300 PIPE @ 1 in 26
SW13 ø1200 CL 53.000 IL 52.000
SW23 ø1200 CL 54.000 IL 53.000
SW25 ø1200 CL 56.000 IL 55.000
DUAL SEWAGE PUMPING STATION 1000l – 6m LIFT FW02 ø1000 CL 51.000m IL 49.200m
SW16 ø1200 HYDROBRAKE OPTIMUM MD–SHE–0144–1000–1150–1000 CL 51.000 IL 49.200 DESIGN FLOW 10 l/s DESIGN HEAD 1.15m
52m ø300 PIPE @ 1 in 28
SW09 ø1200 HYDROBRAKE OPTIMUM MD–SHE–0148–1200–1700–1200 CL 55.900 IL 53.660 DESIGN FLOW 12 l/s DESIGN HEAD 1.7m
FFL 51.000
SW22 ø600 CL 51.000 IL 49.700
56m ø300 PIPE @ 1 in 550
SW04 ø1200 CL 57.975 IL 55.265
GRAF ECOBLOCK INSPECT FLEX GEOCELLULAR ATTENUATION CRATES 20 x 32.5 x 0.96m (924m³ STORAGE) IL 53.660
26m ø300 PIPE @ 1 in 520
GRAF ECOBLOCK INSPECT FLEX GEOCELLULAR ATTENUATION CRATES 10 x 50 x 0.96m (480m³ STORAGE) IL 49.200
ACO V SEPTOR SW10 ø1200 CL 55.850 IL 53.670
48m ø225PIPE @ 1 in 240
67m ø150 PIPE @ 1 in 86
SW03 ø1200 CL 57.980 IL 55.335
SW14 ø1200 CL 51.000 IL 49.500
KLARGESTER AQUA OIL FORECOURT SEPERATOR SW18 ø1200 CL 51.000 IL 49.400
KINGSPAN AQUATREAT SEPERATOR SWT010 SW15 ø1200 CL 51.000 IL 49.300
FFL 56.000
KINGSPAN AQUATREAT SEPERATOR SWT010 SW30 ø1500 CL 56.850 IL 55.500
PERMEABLE PAVING WITH UNDERDRAINS
46.5m ø450 PIPE @ 1 in 132
75m ø300 PIPE @ 1 in 500
KLARGESTER AQUA OIL FORECOURT SEPERATOR SW31 ø1200 CL 56.850 IL 55.600
SW20 ø600 CL 51.000 IL 49.500
FW01 ø450 CL 51.000m IL 50.000m
19.5m ø225PIPE
SW32 ø600 CL 57.100 IL 55.700
FFL 51.000
TP
TP
Mh Cl 62.530
Te Cl 62.635
Gy Cl 62.185
Gy Cl 62.218
LP
Gy Cl 62.260
Gy Cl 62.270
A595
Gy Cl 62.321

REV	DATE	AUTHOR	NOTES
DRAWING STATUS			PRELIMINARY

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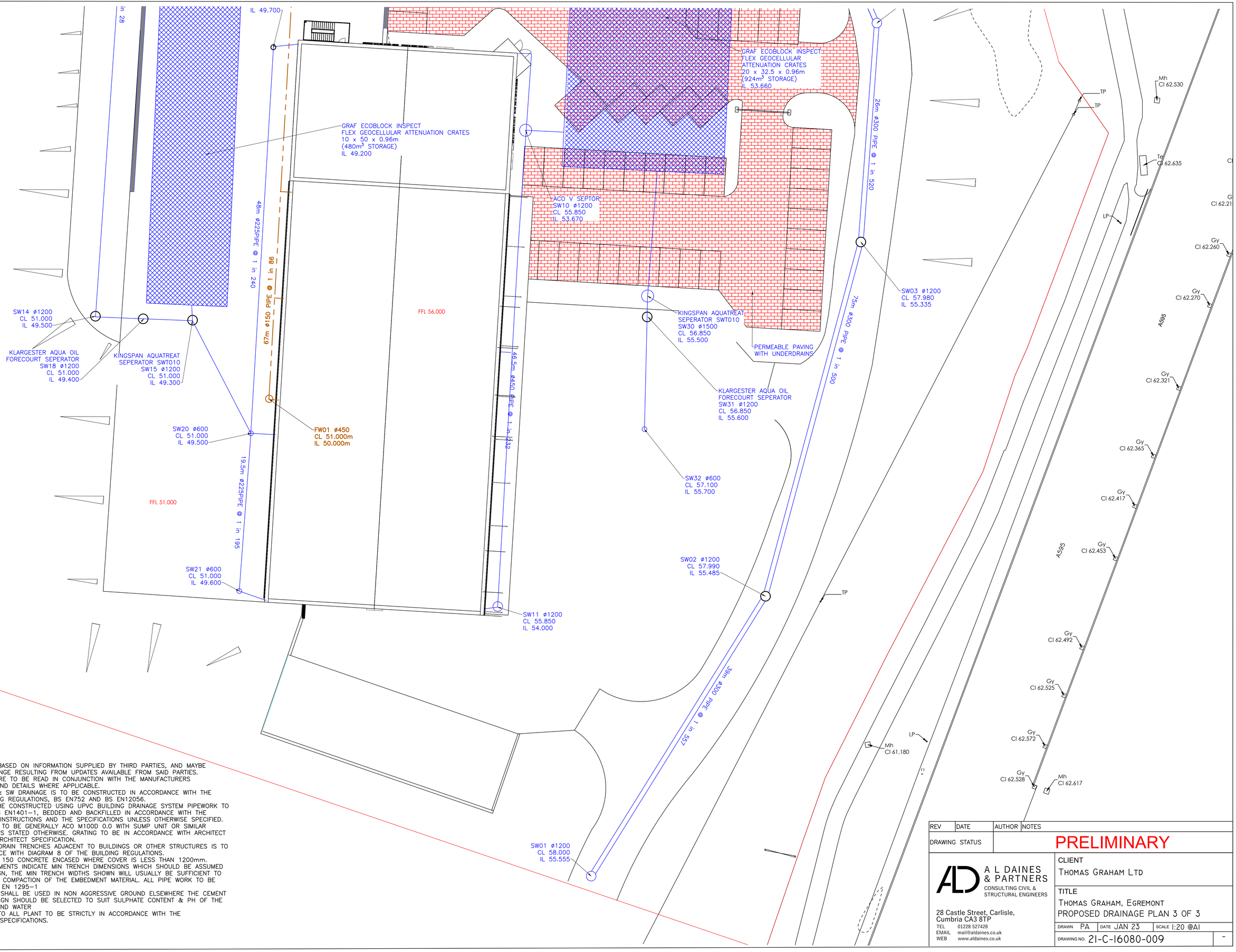
CLIENT
THOMAS GRAHAM LTD

TITLE
THOMAS GRAHAM, EGREMONT
PROPOSED DRAINAGE PLAN 2 OF 3

DRAWN	DATE	SCALE
PA	JAN 23	1:200 @A1

DRAWING NO. 21-C-16080-008 -



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9. GEN3 CONCRETE SHALL BE USED IN NON AGGRESSIVE GROUND ELSEWHERE THE CEMENT TYPE & MIX DESIGN SHOULD BE SELECTED TO SUIT SULPHATE CONTENT & PH OF THE GROUND & GROUND WATER
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REV	DATE	AUTHOR	NOTES
DRAWING STATUS			PRELIMINARY

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CLIENT
THOMAS GRAHAM LTD

TITLE
THOMAS GRAHAM, EGREMONT
PROPOSED DRAINAGE PLAN 3 OF 3

DRAWN	DATE	SCALE
PA	JAN 23	1:20 @A1

DRAWING NO. 21-C-16080-009 -

Appendix II

- Exploratory Hole Logs

GEO Environmental Engineering

GEO2023-5823: St Thomas Cross Roundabout, Vale View, Egremont – TP27

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.05	TOPSOIL: Dark brown sandy gravelly LOAM.		
0.05	0.47	MADE GROUND: Grey brown and red brown angular GRAVEL, COBBLES and BOULDERS of aggregate within a loamy clay matrix.		0.20 - J
0.47	1.10	Brown very silty/clayey sandy fine to coarse sub-rounded GRAVEL of mixed lithology.		
		End of trial hole at 1.10m. Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		

Engineer: J.Brock
Site Works Date: 13/04/2023
Plant: Tracked 360 Excavator

Log Notes:
HSV = Hand Shear Vane (kN/m^2)
LP = Limited Penetration (HSV/CBR)
B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub

Website: www.geoenvironmentalengineering.com
Email: info@geoenvironmentalengineering.com
Telephone: 07883 440 186

GEO Environmental Engineering

GEO2023-5823: St Thomas Cross Roundabout, Vale View, Egremont – TP28

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.62	MADE GROUND: Dark red brown very silty/clayey fine to coarse angular GRAVEL, COBBLES and BOULDERS of aggregate.		0.30 – J+T
0.47	1.17	Stiff brown very gravelly clay with occasional cobbles.		
		End of trial hole at 1.17m. Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		

Engineer: J.Brock
Site Works Date: 13/04/2023
Plant: Tracked 360 Excavator

Log Notes:
HSV = Hand Shear Vane (kN/m^2)
LP = Limited Penetration (HSV/CBR)
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GEO Environmental Engineering

GEO2023-5823: St Thomas Cross Roundabout, Vale View, Egremont – TP29

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.10	TOPSOIL: Dark brown sandy gravelly LOAM.		
0.10	0.80	MADE GROUND: Dark grey and red brown fine to coarse angular GRAVEL of shale, aggregate, clinker and occasional ash. Occasional angular cobbles and boulders of aggregate.		0.30 – J+T
0.80	1.00	MADE GROUND: Soft to firm reworked gravelly CLAY.		
1.00	1.40	MADE GROUND: Firm reworked dark grey gravelly CLAY with occasional organic matter.		
1.40	1.70	Grey brown very silty fine to coarse sub-rounded to sub-angular COBBLES.		
		End of trial hole at 1.70m. Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		

Engineer: J.Brock
Site Works Date: 13/04/2023
Plant: Tracked 360 Excavator

Log Notes:
HSV = Hand Shear Vane (kN/m^2)
LP = Limited Penetration (HSV/CBR)
B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub

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Telephone: 07883 440 186

GEO Environmental Engineering

GEO2023-5823: St Thomas Cross Roundabout, Vale View, Egremont – TP30

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.05	TOPSOIL: Dark brown sandy gravelly LOAM.		
0.05	0.53	MADE GROUND: Dark grey and red brown silty/clayey fine to coarse angular GRAVEL and COBBLES of clinker, shale, aggregate, clinker and ash.		0.30 – J+T
0.53	1.10	Red brown very clayey fine to coarse sub-rounded GRAVEL and COBBLES of mixed lithology.		
		End of trial hole at 1.10m. Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		

Engineer: J.Brock
Site Works Date: 13/04/2023
Plant: Tracked 360 Excavator

Log Notes:
HSV = Hand Shear Vane (kN/m^2)
LP = Limited Penetration (HSV/CBR)
B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub

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Email: info@geoenvironmentalengineering.com
Telephone: 07883 440 186

GEO Environmental Engineering

GEO2023-5823: St Thomas Cross Roundabout, Vale View, Egremont – TP31

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.22	TOPSOIL: Dark brown sandy gravelly LOAM.		
0.22	1.30	MADE GROUND: Firm reworked dark grey brown very gravelly CLAY with occasional clinker, shale and coal.		0.70 – J+T
		End of trial hole at 1.30m. Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		

Engineer: J.Brock
Site Works Date: 13/04/2023
Plant: Tracked 360 Excavator

Log Notes:
HSV = Hand Shear Vane (kN/m^2)
LP = Limited Penetration (HSV/CBR)
B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub

Website: www.geoenvironmentalengineering.com
Email: info@geoenvironmentalengineering.com
Telephone: 07883 440 186

GEO Environmental Engineering

GEO2023-5823: St Thomas Cross Roundabout, Vale View, Egremont – TP32

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.05	TOPSOIL: Dark brown sandy gravelly LOAM.		
0.05	0.37	MADE GROUND: Dark grey angular GRAVEL of clinker, ash, aggregate and shale.		0.30 – J+T
0.37	0.80	MADE GROUND: Dark brown very clayey fine to coarse angular GRAVEL, COBBLES and BOULDERS of aggregate.		
0.80	1.00	Firm to stiff brown gravelly CLAY.		
		End of trial hole at 1.00m. Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		

Engineer: J.Brock
Site Works Date: 13/04/2023
Plant: Tracked 360 Excavator

Log Notes:
HSV = Hand Shear Vane (kN/m²)
LP = Limited Penetration (HSV/CBR)
B = Bulk Bag, J = Amber Glass Jar, T = Plastic Tub

Website: www.geoenvironmentalengineering.com
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Telephone: 07883 440 186

GEO Environmental Engineering

GEO2023-5823: St Thomas Cross Roundabout, Vale View, Egremont – TP33

Depth From (m)	Depth To (m)	Strata Description	Legend	Testing / Samples
0.00	0.20	TOPSOIL: Dark brown sandy gravelly LOAM.		
0.20	0.70	MADE GROUND: Dark grey brown very clayey fine to coarse angular GRAVEL of shale with occasional clinker and coal.		0.30 – J+T
0.70	1.00	Firm to stiff brown gravelly CLAY.		
		End of trial hole at 1.00m. Trial hole remained open and dry on completion. Trial hole backfilled with arisings on completion.		

Engineer: J.Brock
Site Works Date: 13/04/2023
Plant: Tracked 360 Excavator

Log Notes:
HSV = Hand Shear Vane (kN/m^2)
LP = Limited Penetration (HSV/CBR)
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Appendix III

- Laboratory Test Results

2531

ANALYTICAL TEST REPORT

Contract no:	121657
Contract name:	Vale View, Egremont
Client reference:	GEO2023-5823
Clients name:	Geo Environmental Engineering
Clients address:	4 Culgarth Avenue Cockermouth Cumbria CA13 9PL
Samples received:	17 April 2023
Analysis started:	17 April 2023
Analysis completed:	26 April 2023
Report issued:	26 April 2023

Key		
	U	UKAS accredited test
	M	MCERTS & UKAS accredited test
	$	Test carried out by an approved subcontractor
	I/S	Insufficient sample to carry out test
	N/S	Sample not suitable for testing

Approved by:

Abbie Neasham-Bourn
Senior Reporting Administrator

Unit 6 Parkhead, Greencroft Industrial Park, Stanley, County Durham, DH9 7YB
Tel 01207 528578 Email customerservices@chemtech-env.co.uk
Vat Reg No. 772 5703 18 Registered in England number 4284013

Chemtech Environmental Limited

PREPARED LEACHATES

Lab number			121657-1	121657-2	121657-3	121657-4	121657-5	121657-6
Sample id			TP28	TP29	TP30	TP31	TP32	TP33
Depth (m)			0.30	0.30	0.30	0.70	0.30	0.40
Test	Method	Units						
Arsenic (dissolved)	CE128 U	µg/l As	4.41	3.39	3.07	1.62	6.19	11.44
Boron (dissolved)	CE128 U	µg/l B	<6	<6	<6	<6	<6	10
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Chromium (dissolved)	CE128 U	µg/l Cr	<0.2	0.5	<0.2	0.2	0.5	0.3
Copper (dissolved)	CE128 U	µg/l Cu	1.0	5.7	2.9	1.0	4.3	9.3
Lead (dissolved)	CE128 U	µg/l Pb	0.2	1.1	<0.2	<0.2	1.2	0.5
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	0.011	0.044	<0.008	0.023	0.128
Nickel (dissolved)	CE128 U	µg/l Ni	<0.5	3.2	<0.5	<0.5	3.4	2.0
Selenium (dissolved)	CE128 U	µg/l Se	0.72	0.24	0.36	0.33	0.27	0.30
Zinc (dissolved)	CE128 U	µg/l Zn	<1	<1	<1	<1	<1	<1
Hardness (by calculation)	CE121	mg/l $CaCO_3$	197	682	575	242	914	725
pH	CE213 U	units	8.3	7.6	7.4	7.9	7.9	7.6
Sulphate	CE049 U	mg/l SO_4	<1.7	<1.7	3.4	5.9	<1.7	<1.7
Cyanide (total)	CE147	µg/l CN	<5	<5	<5	<5	<5	<5
PAH								
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE051	µg/l	<0.1	0.3	<0.1	<0.1	0.2	<0.1
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
BTEX & TPH								
MTBE	CE057 U	µg/l	<2	<2	<2	<2	<2	<2
Benzene	CE057 U	µg/l	<1	<1	<1	<1	<1	<1
Toluene	CE057 U	µg/l	<1	<1	<1	<1	<1	<1
Ethylbenzene	CE057 U	µg/l	<1	<1	<1	<1	<1	<1
m & p-Xylene	CE057 U	µg/l	<2	<2	<2	<2	<2	<2
o-Xylene	CE057 U	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC5-EC7)	CE175	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC7-EC8)	CE175	µg/l	<1	<1	<1	<1	<1	<1
VPH Aromatic (>EC8-EC10)	CE175	µg/l	<1	<1	<1	<1	<1	<1

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PREPARED LEACHATES

Lab number			121657-1	121657-2	121657-3	121657-4	121657-5	121657-6
Sample id			TP28	TP29	TP30	TP31	TP32	TP33
Depth (m)			0.30	0.30	0.30	0.70	0.30	0.40
Test	Method	Units						
EPH Aromatic (>EC10-EC12)	CE251	µg/l	<1	<1	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE251	µg/l	<1	4	8	7	7	<1
EPH Aromatic (>EC16-EC21)	CE251	µg/l	<1	12	<1	7	10	<1
EPH Aromatic (>EC21-EC35)	CE251	µg/l	<1	25	<1	<1	<1	<1
EPH Aromatic (>EC35-EC44)	CE251	µg/l	<1	4	28	<1	25	<1
VPH Aliphatic (>C5-C6)	CE175	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C6-C8)	CE175	µg/l	<1	<1	<1	<1	<1	<1
VPH Aliphatic (>C8-C10)	CE175	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C10-C12)	CE251	µg/l	<1	<1	<1	<1	<1	<1
EPH Aliphatic (>C12-C16)	CE251	µg/l	<1	<1	<1	1	1	<1
EPH Aliphatic (>C16-C35)	CE251	µg/l	4	9	5	<1	<1	4
EPH Aliphatic (>C35-C44)	CE251	µg/l	<1	2	<1	<1	2	3

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GROUNDWATERS

Lab number			121657-7	121657-8	121657-9	121657-10
Sample id			N.Stream	N.Stream	S.Stream	S.Stream
Depth (m)			-	-	-	-
Date sampled			13/04/2023	13/04/2023	13/04/2023	13/04/2023
Time sampled			-	-	-	-
Test	Method	Units				
Arsenic (dissolved)	CE128 U	µg/l As	0.62	0.65	0.57	0.55
Boron (dissolved)	CE128 U	µg/l B	13	14	10	9
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07	<0.07
Chromium (dissolved)	CE128 U	µg/l Cr	<0.2	<0.2	0.3	0.3
Copper (dissolved)	CE128 U	µg/l Cu	1.5	1.4	2.7	2.7
Lead (dissolved)	CE128 U	µg/l Pb	<0.2	<0.2	<0.2	<0.2
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	<0.008	<0.008	<0.008
Nickel (dissolved)	CE128 U	µg/l Ni	<0.5	<0.5	<0.5	<0.5
Selenium (dissolved)	CE128 U	µg/l Se	0.72	0.81	0.33	0.34
Zinc (dissolved)	CE128 U	µg/l Zn	<1	<1	<1	<1
Hardness (by calculation)	CE121	mg/l $CaCO_3$	134	144	93	94
pH	CE213 U	units	8.4	8.4	8.3	8.3
Sulphate	CE049 U	mg/l SO_4	14	16	11	10
Cyanide (total)	CE147	µg/l CN	<5	<5	<5	<5
PAH						
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1
Phenanthrene	CE051	µg/l	<0.1	<0.1	0.4	<0.1
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1	1.4	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1	1.2	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	0.5	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1	0.8	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	0.8	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	0.3	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	0.7	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	0.4	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	0.3	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	6.8	<1.6
BTEX & TPH						
MTBE	CE057 U	µg/l	<2	<2	<2	<2
Benzene	CE057 U	µg/l	<1	<1	<1	<1
Toluene	CE057 U	µg/l	<1	<1	<1	<1
Ethylbenzene	CE057 U	µg/l	<1	<1	<1	<1
m & p-Xylene	CE057 U	µg/l	<2	<2	<2	<2
o-Xylene	CE057 U	µg/l	<1	<1	<1	<1
VPH Aromatic (>EC5-EC7)	CE175	µg/l	<1	<1	<1	<1

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GROUNDWATERS

Lab number			121657-7	121657-8	121657-9	121657-10
Sample id			N.Stream	N.Stream	S.Stream	S.Stream
Depth (m)			Upstream	Downstream	Upstream	Downstream
Date sampled			13/04/2023	13/04/2023	13/04/2023	13/04/2023
Time sampled			-	-	-	-
Test	Method	Units				
VPH Aromatic (>EC7-EC8)	CE175	µg/l	<1	<1	<1	<1
VPH Aromatic (>EC8-EC10)	CE175	µg/l	<1	<1	<1	<1
EPH Aromatic (>EC10-EC12)	CE251	µg/l	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE251	µg/l	15	8	6	19
EPH Aromatic (>EC16-EC21)	CE251	µg/l	16	2	<1	13
EPH Aromatic (>EC21-EC35)	CE251	µg/l	<1	<1	<1	<1
EPH Aromatic (>EC35-EC44)	CE251	µg/l	<1	<1	<1	<1
VPH Aliphatic (>C5-C6)	CE175	µg/l	<1	<1	<1	<1
VPH Aliphatic (>C6-C8)	CE175	µg/l	<1	<1	<1	<1
VPH Aliphatic (>C8-C10)	CE175	µg/l	<1	<1	<1	<1
EPH Aliphatic (>C10-C12)	CE251	µg/l	<1	<1	<1	<1
EPH Aliphatic (>C12-C16)	CE251	µg/l	<1	<1	<1	1
EPH Aliphatic (>C16-C35)	CE251	µg/l	6	4	<1	6
EPH Aliphatic (>C35-C44)	CE251	µg/l	<1	<1	<1	<1

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METHOD DETAILS

METHOD	PREPARED LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE002	Leachate preparation (EA)	L:S 10:1		-	-
CE128	Arsenic (dissolved)	ICP-MS	U	0.06	µg/l As
CE128	Boron (dissolved)	ICP-MS	U	8	µg/l B
CE128	Cadmium (dissolved)	ICP-MS	U	0.07	µg/l Cd
CE128	Chromium (dissolved)	ICP-MS	U	0.2	µg/l Cr
CE128	Copper (dissolved)	ICP-MS	U	0.4	µg/l Cu
CE128	Lead (dissolved)	ICP-MS	U	0.2	µg/l Pb
CE128	Mercury (dissolved)	ICP-MS	U	0.008	µg/l Hg
CE128	Nickel (dissolved)	ICP-MS	U	0.5	µg/l Ni
CE128	Selenium (dissolved)	ICP-MS	U	0.07	µg/l Se
CE128	Zinc (dissolved)	ICP-MS	U	1	µg/l Zn
CE121	Hardness (by calculation)	Calculation from Ca (dissolved) & Mg (dissolved)		1	mg/l $CaCO_3$
CE213	pH	Based on BS 1377, pH Meter	U	-	units
CE049	Sulphate	Ion Chromatography	U	1.7	mg/l SO_4
CE147	Cyanide (total)	Continuous Flow Colorimetry		5	µg/l CN
CE051	Naphthalene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Acenaphthylene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Acenaphthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Fluorene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Phenanthrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(a)anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Chrysene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(b)fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(k)fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(a)pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Indeno(123cd)pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Dibenz(ah)anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(ghi)perylene	Solvent extraction, GC-MS		0.1	µg/l
CE051	PAH (total of USEPA 16)	Solvent extraction, GC-MS		1.6	µg/l
CE057	MTBE	Headspace GC-FID	U	2	µg/l
CE057	Benzene	Headspace GC-FID	U	1	µg/l
CE057	Toluene	Headspace GC-FID	U	1	µg/l
CE057	Ethylbenzene	Headspace GC-FID	U	1	µg/l
CE057	m & p-Xylene	Headspace GC-FID	U	2	µg/l
CE057	o-Xylene	Headspace GC-FID	U	1	µg/l
CE175	VPH Aromatic (>EC5-EC7)	Headspace GC-FID		1	µg/l
CE175	VPH Aromatic (>EC7-EC8)	Headspace GC-FID		1	µg/l
CE175	VPH Aromatic (>EC8-EC10)	Headspace GC-FID		1	µg/l
CE251	EPH Aromatic (>EC10-EC12)	Solvent extraction, GCxGC-FID		1	µg/l
CE251	EPH Aromatic (>EC12-EC16)	Solvent extraction, GCxGC-FID		1	µg/l
CE251	EPH Aromatic (>EC16-EC21)	Solvent extraction, GCxGC-FID		1	µg/l

Chemtech Environmental Limited

METHOD DETAILS

METHOD	PREPARED LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE251	EPH Aromatic (>EC21-EC35)	Solvent extraction, GCxGC-FID		1	µg/l
CE251	EPH Aromatic (>EC35-EC44)	Solvent extraction, GCxGC-FID		1	µg/l
CE175	VPH Aliphatic (>C5-C6)	Headspace GC-FID		1	µg/l
CE175	VPH Aliphatic (>C6-C8)	Headspace GC-FID		1	µg/l
CE175	VPH Aliphatic (>C8-C10)	Headspace GC-FID		1	µg/l
CE251	EPH Aliphatic (>C10-C12)	Solvent extraction, GCxGC-FID		1	µg/l
CE251	EPH Aliphatic (>C12-C16)	Solvent extraction, GCxGC-FID		1	µg/l
CE251	EPH Aliphatic (>C16-C35)	Solvent extraction, GCxGC-FID		1	µg/l
CE251	EPH Aliphatic (>C35-C44)	Solvent extraction, GCxGC-FID		1	µg/l

Chemtech Environmental Limited

METHOD DETAILS

METHOD	GROUNDWATERS	METHOD SUMMARY	STATUS	LOD	UNITS
CE128	Arsenic (dissolved)	ICP-MS	U	0.06	µg/l As
CE128	Boron (dissolved)	ICP-MS	U	8	µg/l B
CE128	Cadmium (dissolved)	ICP-MS	U	0.07	µg/l Cd
CE128	Chromium (dissolved)	ICP-MS	U	0.2	µg/l Cr
CE128	Copper (dissolved)	ICP-MS	U	0.4	µg/l Cu
CE128	Lead (dissolved)	ICP-MS	U	0.2	µg/l Pb
CE128	Mercury (dissolved)	ICP-MS	U	0.008	µg/l Hg
CE128	Nickel (dissolved)	ICP-MS	U	0.5	µg/l Ni
CE128	Selenium (dissolved)	ICP-MS	U	0.07	µg/l Se
CE128	Zinc (dissolved)	ICP-MS	U	1	µg/l Zn
CE121	Hardness (by calculation)	Calculation from Ca (dissolved) & Mg (dissolved)		1	mg/l $CaCO_3$
CE213	pH	Based on BS 1377, pH Meter	U	-	units
CE049	Sulphate	Ion Chromatography	U	1.7	mg/l SO_4
CE147	Cyanide (total)	Continuous Flow Colorimetry		5	µg/l CN
CE051	Naphthalene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Acenaphthylene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Acenaphthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Fluorene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Phenanthrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(a)anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Chrysene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(b)fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(k)fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(a)pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Indeno(123cd)pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Dibenz(ah)anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(ghi)perylene	Solvent extraction, GC-MS		0.1	µg/l
CE051	PAH (total of USEPA 16)	Solvent extraction, GC-MS		1.6	µg/l
CE057	MTBE	Headspace GC-FID	U	2	µg/l
CE057	Benzene	Headspace GC-FID	U	1	µg/l
CE057	Toluene	Headspace GC-FID	U	1	µg/l
CE057	Ethylbenzene	Headspace GC-FID	U	1	µg/l
CE057	m & p-Xylene	Headspace GC-FID	U	2	µg/l
CE057	o-Xylene	Headspace GC-FID	U	1	µg/l
CE175	VPH Aromatic (>EC5-EC7)	Headspace GC-FID		1	µg/l
CE175	VPH Aromatic (>EC7-EC8)	Headspace GC-FID		1	µg/l
CE175	VPH Aromatic (>EC8-EC10)	Headspace GC-FID		1	µg/l
CE251	EPH Aromatic (>EC10-EC12)	Solvent extraction, GCxGC-FID		1	µg/l
CE251	EPH Aromatic (>EC12-EC16)	Solvent extraction, GCxGC-FID		1	µg/l
CE251	EPH Aromatic (>EC16-EC21)	Solvent extraction, GCxGC-FID		1	µg/l
CE251	EPH Aromatic (>EC21-EC35)	Solvent extraction, GCxGC-FID		1	µg/l

Chemtech Environmental Limited

METHOD DETAILS

METHOD	GROUNDWATERS	METHOD SUMMARY	STATUS	LOD	UNITS
CE251	EPH Aromatic (>EC35-EC44)	Solvent extraction, GCxGC-FID		1	µg/l
CE175	VPH Aliphatic (>C5-C6)	Headspace GC-FID		1	µg/l
CE175	VPH Aliphatic (>C6-C8)	Headspace GC-FID		1	µg/l
CE175	VPH Aliphatic (>C8-C10)	Headspace GC-FID		1	µg/l
CE251	EPH Aliphatic (>C10-C12)	Solvent extraction, GCxGC-FID		1	µg/l
CE251	EPH Aliphatic (>C12-C16)	Solvent extraction, GCxGC-FID		1	µg/l
CE251	EPH Aliphatic (>C16-C35)	Solvent extraction, GCxGC-FID		1	µg/l
CE251	EPH Aliphatic (>C35-C44)	Solvent extraction, GCxGC-FID		1	µg/l

Chemtech Environmental Limited

ADDITIONAL INFORMATION

Notes

Opinions and interpretations expressed herein are outside the UKAS accreditation scope.

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

This report shall not be reproduced except in full, without prior written approval.

Samples will be disposed of 4 weeks from initial receipt unless otherwise instructed.

Appendix IV

- GEO Chemical Assessment Sheet (Leachates and Surface Waters)

Geo Environmental Engineering Ltd

Chemical Assessment Sheet - Surface Waters

Lab number			121657-7	121657-8	121657-9	121657-10	GAC Value	GAC Exceeded?	GAC Ref
Sample id			N.Stream	N.Stream	S.Stream	S.Stream			
Depth (m)			Upstream	Downstream	Upstream	Downstream			
Date sampled			13/04/2023	13/04/2023	13/04/2023	13/04/2023			
Time sampled			-	-	-	-			
Test	Method	Units							
Arsenic (dissolved)	CE128 U	µg/l As	0.62	0.65	0.57	0.55	50.0	No	WFD
Boron (dissolved)	CE128 U	µg/l B	13	14	10	9	1000	No	EQS Fresh
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07	<0.07	5	No	EQS Fresh
Chromium (dissolved)	CE128 U	µg/l Cr	<0.2	<0.2	0.3	0.3	50	No	UK DWS
Copper (dissolved)	CE128 U	µg/l Cu	1.5	1.4	2.7	2.7	10	No	EQS Fresh
Lead (dissolved)	CE128 U	µg/l Pb	<0.2	<0.2	<0.2	<0.2	25	No	UK DWS
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	<0.008	<0.008	<0.008	1	No	EQS Fresh
Nickel (dissolved)	CE128 U	µg/l Ni	<0.5	<0.5	<0.5	<0.5	20	No	UK DWS
Selenium (dissolved)	CE128 U	µg/l Se	0.72	0.81	0.33	0.34	10	No	UK DWS
Zinc (dissolved)	CE128 U	µg/l Zn	<1	<1	<1	<1	30	No	EQS Fresh
Hardness (by calculation)	CE121	mg/l CaCO3	134	144	93	94	N/A	N/A	N/A
pH	CE213 U	units	8.4	8.4	8.3	8.3	N/A	N/A	N/A
Sulphate	CE049 U	mg/l SO4	14	16	11	10	250	No	UK DWS
Cyanide (total)	CE147	µg/l CN	<5	<5	<5	<5	20	No	TDL
PAH									
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	2.0	No	EU EQS
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Phenanthrene	CE051	µg/l	<0.1	<0.1	0.4	<0.1	1.9	No	ERL
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Fluoranthene	CE051	µg/l	<0.1	<0.1	1.4	<0.1	0.1	YES	UK DWS
Pyrene	CE051	µg/l	<0.1	<0.1	1.2	<0.1	0.1	YES	UK DWS
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	0.5	<0.1	0.1	YES	UK DWS
Chrysene	CE051	µg/l	<0.1	<0.1	0.8	<0.1	0.1	YES	UK DWS
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	0.8	<0.1	0.1	YES	UK DWS
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	0.3	<0.1	0.17	YES	EU EQS
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	0.7	<0.1	0.17	YES	EU EQS
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	0.4	<0.1	0.17	YES	EU EQS
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	0.3	<0.1	0.17	YES	EU EQS
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	6.8	<1.6	-	-	-
BTEX & TPH									
MTBE	CE057 U	µg/l	<2	<2	<2	<2	2	No	TDL
Benzene	CE057 U	µg/l	<1	<1	<1	<1	1	No	TDL
Toluene	CE057 U	µg/l	<1	<1	<1	<1	1	No	TDL
Ethylbenzene	CE057 U	µg/l	<1	<1	<1	<1	1	No	TDL
m & p-Xylene	CE057 U	µg/l	<2	<2	<2	<2	2	No	TDL
o-Xylene	CE057 U	µg/l	<1	<1	<1	<1	1	No	TDL
VPH Aromatic (>EC5-EC7)	CE175	µg/l	<1	<1	<1	<1	10	No	UK DWS
VPH Aromatic (>EC7-EC8)	CE175	µg/l	<1	<1	<1	<1	10	No	UK DWS
VPH Aromatic (>EC8-EC10)	CE175	µg/l	<1	<1	<1	<1	10	No	UK DWS
EPH Aromatic (>EC10-EC12)	CE251	µg/l	<1	<1	<1	<1	10	No	UK DWS
EPH Aromatic (>EC12-EC16)	CE251	µg/l	15	8	6	19	10	YES	UK DWS
EPH Aromatic (>EC16-EC21)	CE251	µg/l	16	2	<1	13	10	No	UK DWS
EPH Aromatic (>EC21-EC35)	CE251	µg/l	<1	<1	<1	<1	10	No	UK DWS
EPH Aromatic (>EC35-EC44)	CE251	µg/l	<1	<1	<1	<1	10	No	UK DWS
VPH Aliphatic (>C5-C6)	CE175	µg/l	<1	<1	<1	<1	10	No	UK DWS
VPH Aliphatic (>C6-C8)	CE175	µg/l	<1	<1	<1	<1	10	No	UK DWS
VPH Aliphatic (>C8-C10)	CE175	µg/l	<1	<1	<1	<1	10	No	UK DWS
EPH Aliphatic (>C10-C12)	CE251	µg/l	<1	<1	<1	<1	10	No	UK DWS
EPH Aliphatic (>C12-C16)	CE251	µg/l	<1	<1	<1	1	10	No	UK DWS
EPH Aliphatic (>C16-C35)	CE251	µg/l	6	4	<1	6	10	No	UK DWS
EPH Aliphatic (>C35-C44)	CE251	µg/l	<1	<1	<1	<1	10	No	UK DWS

EQS Fresh = Environmental Quality Standards for Freshwater
EU EQS - EU Environmental Quality Standards for Freshwater
WFD = Water Framework Directive 2014: standards to protect the water environment
UK DWS = UK Drinking Water Standards
TDL - Test Detection Limits
ERL - Envrionmental Risk Limits (Netherlands National Institute for Public Health and the Environment).

Geo Environmental Engineering Ltd

Chemical Assessment Sheet - Soil Leachate

Lab number			121657-1	121657-2	121657-3	121657-4	121657-5	121657-6	GAC Value	GAC Exceeded?	GAC Ref
Sample id			TP28	TP29	TP30	TP31	TP32	TP33			
Depth (m)			0.30	0.30	0.30	0.70	0.30	0.40			
Test	Method	Units	***MG***	***MG***	***MG***	***MG***	***MG***	***MG***			
Arsenic (dissolved)	CE128 U	µg/l As	4.41	3.39	3.07	1.62	6.19	11.44	50.0	No	WFD
Boron (dissolved)	CE128 U	µg/l B	<6	<6	<6	<6	<6	10	1000	No	EQS Fresh
Cadmium (dissolved)	CE128 U	µg/l Cd	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	5	No	EQS Fresh
Chromium (dissolved)	CE128 U	µg/l Cr	<0.2	0.5	<0.2	0.2	0.5	0.3	50	No	UK DWS
Copper (dissolved)	CE128 U	µg/l Cu	1.0	5.7	2.9	1.0	4.3	9.3	10	No	EQS Fresh
Lead (dissolved)	CE128 U	µg/l Pb	0.2	1.1	<0.2	<0.2	1.2	0.5	25	No	UK DWS
Mercury (dissolved)	CE128 U	µg/l Hg	<0.008	0.011	0.044	<0.008	0.023	0.128	1	No	EQS Fresh
Nickel (dissolved)	CE128 U	µg/l Ni	<0.5	3.2	<0.5	<0.5	3.4	2.0	20	No	UK DWS
Selenium (dissolved)	CE128 U	µg/l Se	0.72	0.24	0.36	0.33	0.27	0.30	10	No	UK DWS
Zinc (dissolved)	CE128 U	µg/l Zn	<1	<1	<1	<1	<1	<1	30	No	EQS Fresh
Hardness (by calculation)	CE121	mg/l CaCO3	197	682	575	242	914	725	N/A	N/A	N/A
pH	CE213 U	units	8.3	7.6	7.4	7.9	7.9	7.6	N/A	N/A	N/A
Sulphate	CE049 U	mg/l SO4	<1.7	<1.7	3.4	5.9	<1.7	<1.7	250	No	UK DWS
Cyanide (total)	CE147	µg/l CN	<5	<5	<5	<5	<5	<5	20	No	TDL
PAH											
Naphthalene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2.0	No	EU EQS
Acenaphthylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Acenaphthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Fluorene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Phenanthrene	CE051	µg/l	<0.1	0.3	<0.1	<0.1	0.2	<0.1	1.9	No	ERL
Anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Chrysene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.17	No	EU EQS
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.17	No	EU EQS
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.17	No	EU EQS
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	No	UK DWS
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.17	No	EU EQS
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	-	-	-
BTEX & TPH											
MTBE	CE057 U	µg/l	<2	<2	<2	<2	<2	<2	2	No	TDL
Benzene	CE057 U	µg/l	<1	<1	<1	<1	<1	<1	1	No	TDL
Toluene	CE057 U	µg/l	<1	<1	<1	<1	<1	<1	1	No	TDL
Ethylbenzene	CE057 U	µg/l	<1	<1	<1	<1	<1	<1	1	No	TDL
m & p-Xylene	CE057 U	µg/l	<2	<2	<2	<2	<2	<2	2	No	TDL
o-Xylene	CE057 U	µg/l	<1	<1	<1	<1	<1	<1	1	No	TDL
VPH Aromatic (>EC5-EC7)	CE175	µg/l	<1	<1	<1	<1	<1	<1	10	No	UK DWS
VPH Aromatic (>EC7-EC8)	CE175	µg/l	<1	<1	<1	<1	<1	<1	10	No	UK DWS
VPH Aromatic (>EC8-EC10)	CE175	µg/l	<1	<1	<1	<1	<1	<1	10	No	UK DWS
EPH Aromatic (>EC10-EC12)	CE251	µg/l	<1	<1	<1	<1	<1	<1	10	No	UK DWS
EPH Aromatic (>EC12-EC16)	CE251	µg/l	<1	4	8	7	7	<1	10	No	UK DWS
EPH Aromatic (>EC16-EC21)	CE251	µg/l	<1	12	<1	7	10	<1	10	YES	UK DWS
EPH Aromatic (>EC21-EC35)	CE251	µg/l	<1	25	<1	<1	<1	<1	10	YES	UK DWS
EPH Aromatic (>EC35-EC44)	CE251	µg/l	<1	4	28	<1	25	<1	10	YES	UK DWS
VPH Aliphatic (>C5-C6)	CE175	µg/l	<1	<1	<1	<1	<1	<1	10	No	UK DWS
VPH Aliphatic (>C6-C8)	CE175	µg/l	<1	<1	<1	<1	<1	<1	10	No	UK DWS
VPH Aliphatic (>C8-C10)	CE175	µg/l	<1	<1	<1	<1	<1	<1	10	No	UK DWS
EPH Aliphatic (>C10-C12)	CE251	µg/l	<1	<1	<1	<1	<1	<1	10	No	UK DWS
EPH Aliphatic (>C12-C16)	CE251	µg/l	<1	<1	<1	1	1	<1	10	No	UK DWS
EPH Aliphatic (>C16-C35)	CE251	µg/l	4	9	5	<1	<1	4	10	No	UK DWS
EPH Aliphatic (>C35-C44)	CE251	µg/l	<1	2	<1	<1	2	3	10	No	UK DWS

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TDL - Test Detection Limits
ERL - Envrionmental Risk Limits (Netherlands National Institute for Public Health and the Environment).

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