Caulmert Limited

Engineering, Environmental & Planning Consultancy Services

Maw Green Landfill Soils Treatment Facility

3C Waste Limited

Environmental Permit Variation Application

Treatment Process Description & BAT Review

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Treatment Process Description & BAT Review

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1.0 INTRODUCTION

1.1 Application Context

1.1.1 3C Waste Limited (a wholly owned subsidiary of FCC Environment (UK) Limited) have appointed Caulmert Limited to prepare an environmental permit variation application to vary the existing Maw Green Landfill permit ref. EPR/BS7722ID to add a Section 5.3A(1)(a)(ii) activity to include for the treatment and storage of asbestos contaminated soils. The treatment of soils will be by 3-way screen and handpicking of bound asbestos and is to include an additional area for the storage of solely asbestos contaminated wastes, separate to the current STF area. The proposed area for asbestos handling is located to the west of the current STF, however is within the existing Maw Green Landfill permit boundary, with a small portion of the new treatment area to be located on top of the permanently capped landfill mass.

1.1.2 This activity is currently being undertaken under a mobile plant permit deployment by Provectus at Maw Green STF for the treatment of asbestos in soils, and asbestos monitoring is undertaken of airborne asbestos fibres at the site.

1.1.3 Therefore, it is now proposed to undertake the treatment of asbestos in soils on a permanent basis and so to be included as a permitted activity at the STF within the existing permit boundary.

1.1.4 The monitoring of operations undertaken the mobile plant deployment indicates airborne emissions consistently below the detection limit of <0.0005 f/ml.

1.1.5 Soil suitable for restoration will be retained on site for restoration of the landfill. Unsuitable material will be removed from the site.

1.1.6 The bioremediation process at the existing STF will not change. The treated soils are used primarily in the restoration of Maw Green Landfill Site. The storage of hazardous waste at the site is already covered by listed activity within the permit: Section 5.6 Part A (1)(a) temporary storage of hazardous waste with a total capacity exceeding 50 tonnes.

1.1.7 The operator has recently applied to vary their permit to remove the 30,000 tonnes per annum restriction for hazardous waste to allow an overall tonnage limit of 50,000 tonnes per annum (tpa) of hazardous or non-hazardous waste.

1.2 Background

1.2.1 This report is an assessment of compliance of the treatment and storage activities, including an update to include for the addition of treating soils contaminated by asbestos. at the soils treatment facility at Maw Green Landfill Site, in line with:

- ‘Best Available Techniques (BAT) Conclusions for Waste Treatment Industries’ (BREF), under Directive 2010/75/EU, from the Official Journal of the EU; and,

- Environment Agency Guidance 'Sector Guidance Note S5.06: recovery and disposal of hazardous and non-hazardous waste'.

1.2.2 A general process description for the treatment and storage activities, which has been updated to include the treatment and storage of asbestos contaminated soils, is provided in Section 2 of this report.

1.2.3 Indicative BAT standards are laid out in the BAT Conclusions (updated August 2018) for setting permit conditions for installations covered by Chapter II of Directive 2010/75/EU and their set emissions limit values, to ensure that under normal operation conditions emissions do not exceed emissions levels associated the with best available techniques as laid down by the BAT conclusions. The technical standards for Maw Green STF against BAT Conclusions are detailed within Section 9 of this report.

1.3 Requirements to demonstrate compliance with BAT Conclusions techniques

1.3.1 As part of this permit variation application a Best Available Techniques (BAT) assessment has been produced (see Section 9.0) which details all relevant BAT conclusions as described in the Industrial Emissions Directive (IED) 2010/75/EU 'Establishing Best Available Techniques (BAT) Conclusions for Waste Treatment' (2018) and BAT Reference Document for Waste Treatment (the BREF). This document demonstrates compliance with the Best Available Techniques (BAT) for the relevant aspects of the proposed asbestos contaminated waste treatment activities at the Maw Green Soils Treatment Facility (STF).

1.4 Principle of Operation

1.4.1 The facility will be limited to accepting wastes that can be treated so that they are suitable for landfill restoration in accordance with the approved restoration plan. This will not change with addition of the activity at the STF for the treatment of soil containing bound asbestos.

1.4.2 The new treatment activity is to be in a separate area to the west of the existing STF area for bioremediation, partly constructed on top of the permanently capped landfill mass. The treatment of the asbestos in soils will be by three-way screening and handpicking of bound asbestos and the storage will be solely for asbestos contaminated wastes in a separate area.

1.4.3 Once the asbestos is removed, the soils will then be used in the restoration of the landfill, or if necessary, treated in the bioremediation process at the existing STF, prior to use in restoration.

1.4.4 The bioremediation process at the STF will not change as a result of this permit variation and will continue to utilise industry standard biopile technology and will operate through the use of biopiles and moisture control; addition of suitable nutrients to the soil and forced air extraction to encourage micro-organism growth leading to the breakdown of hydrocarbons into by products such as carbon dioxide and water vapour. Soils will typically be treated over an 8-16-week period, with the material being turned infrequently, typically once every 4-8 weeks. The bioremediation plant will operate continuously. The bioremediation process is already permitted.

2.0 PROCESS DESCRIPTION

2.1 Overview

2.1.1 The Soil Treatment Facility is permitted to accept and process up to 50,000 tonnes per annum of hazardous soils and non-hazardous soils. The soils treated are used for the restoration of the wider Maw Green Landfill Site. The total storage capacity of the STF site is 38,000 tonnes. The STF area for the bioremediation of soils consists of treatment, quarantine and storage areas as shown in drawing ref: 5193-CAU-XX-XX-DR-V-1805. The exact layout within the area will vary over time dependent upon inputs and treatment timescales. The STF Effluent Pipeline route is shown under drawing ref: 5193-CAU-XX-XX-DR-V-1803. The proposed treatment and storage areas for the soils contaminated with asbestos are also shown on drawing ref. 5193-CAU-XX-XX-DR-V-1805.

2.1.2 Demarcation of the areas will be managed via suitable signage. All soils received at site are subject to reception testing irrespective of the amount of prior testing received, soils are effectively held in quarantine prior to being formally accepted. Soils are only formally accepted upon the receipt of the soil analytical results to confirm compliance with the original waste description and treatability to meet the restoration/non-hazardous re-use criteria.

2.1.3 There will be no change to the bioremediation process, which utilises industry standard biopile technology to breakdown hydrocarbons into by products such as carbon dioxide and water vapour.

2.1.4 The new bound asbestos-contaminated soils treatment activity will be in an area to the west of the existing STF area. The treatment of the bound asbestos in soils will be by three-way screener and handpicking of bound asbestos fragments, in an additional area including for the storage of solely asbestos contaminated wastes. Once the soils are treated, they no longer pose a risk to human health from asbestos emissions; these soils will be tested and then moved to the soil storage area awaiting reuse in the restoration scheme. Only rarely will the soils require further treatment is visible bonded asbestos is still present or elevated TPH concentrations are found. Incoming soils that are found to contain asbestos fibre concentrations in excess of <0.1% chrysotile fibres, or <0.01% for other forms of asbestos once tested will be rejected from site and not treated.

2.1.5 A flow diagram showing the proposed treatment activities for asbestos-impacted soils at Maw Green STF is shown in Figure 1 below:

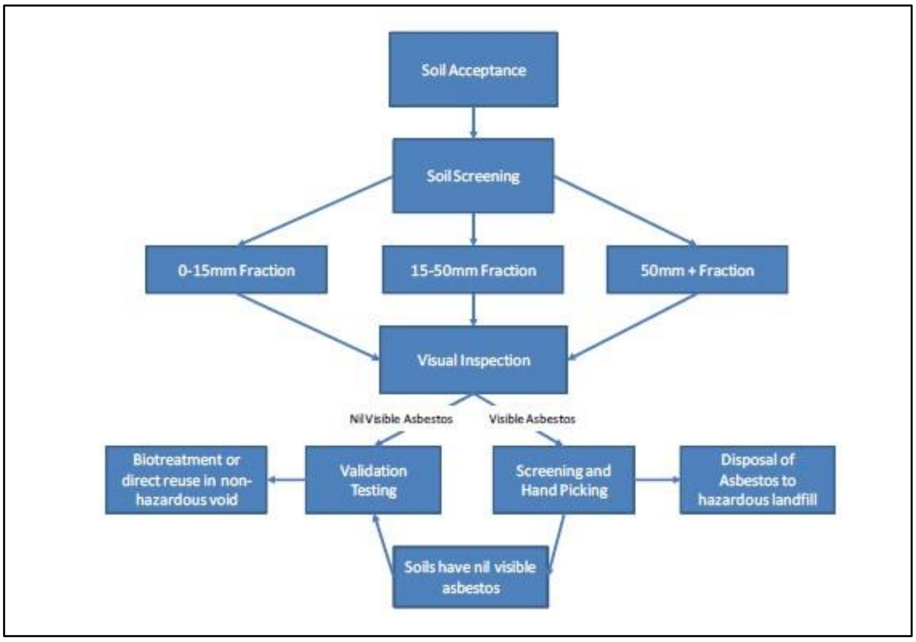


Figure 1 – Soil Treatment Overview

2.1.6 The following procedures will be applied at Maw Green STF for the treatment and storage of asbestos contaminated soils and are referenced throughout this BAT Review document, included under Appendix 1:

- STC WI 002 Soil Reception Procedure
- STC WI 003 Soil Characterisation Procedure
- STC WI 004 Soil Treatment and Monitoring Procedure
- STC WI 006 Soil Analysis
- STC WI 007 Environmental Monitoring
- STC WI 010 Pad and Equipment Maintenance
- STC WI 011 Processing of Asbestos Contaminated Soils
- STC WI 012 Soil Rejection Procedures
- STC WI 013 Soil Disposal Procedure
- STC WI 014 GCL Pad Maintenance
- Decontamination Procedures

2.2 Asbestos Treatment Pad

2.2.1 The new hazardous asbestos soils storage and treatment pad will be constructed from crushed concrete with underlying geo-composite clay liner (GCL). Treatment pads are designed to have a fall towards a main water collection drain to ensure that water is continually drained from the pads. Water is unable to leave the downgradient periphery of the pads by lateral flow due to the presence of a containment bund of 300mm height. Water is unable to migrate to underlying controlled waters due to the presence of an engineered pad with a geosynthetic clay liner that will have a design permeability of 1 x 10^{-9} m/s as a minimum. The sealed drainage will ensure all surface waters will fall and be collected, treated, and discharged to sewer via the existing discharge consent.

2.2.2 There will be no changes to the existing STF bioremediation area as a result of this permit variation. The bioremediation STF is situated on the former compost pad at Maw Green STF constructed of an impermeable pavement to prevent run-off, the pad measures at 6,800m^2. The entire site is kerbed with a sealed drainage system to the north-eastern corner of the site. The existing STF site layout and drainage detail of the bioremediation treatment pad is included in drawing ref. 5193-CAU-XX-XX-DR-V-1805. The drainage system at the site lead to sealed sumps and a treatment plant, and so there is no surface water run-off to the environment. The STF Effluent Pipeline Route is shown in drawing ref. 5193-CAU-XX-XX-DR-V-1803.

2.2.3 The treatment pad undergoes maintenance as part of the remit of Provectus quality control system as detailed in the operating procedures contained in Appendix 1.

2.3 Pre-Assessment

2.3.1 Pre-acceptance procedures are undertaken to confirm the suitability of materials for treatment to subsequently achieve the reuse criteria. Pre-acceptance procedures are undertaken by Provectus Limited. A set of Terms and Conditions for acceptance are sent to the Waste Producer including a clear statement of any waste characterisation samples that are deemed unsuitable for treatment. These are agreed in writing between the Waste Producer and FCC prior to an authorisation number (contract line) being issued by FCC at the weighbridge for deposit at the Soil Treatment Facility. The set of terms and conditions will include the following:

- Maximum soil contaminant concentrations for reuse of material in the restoration area or disposal within the landfill (re-use criteria);
- Limitations on physical and chemical characteristics of the soils (e.g. particle size, pH, moisture content); and,
- Statement from the waste producer confirming that soils containing tars, free oils, invasive species (e.g. Japanese Knotweed), heavy metals and high moisture content will not be accepted to site.

2.3.2 If any variations or discrepancies should be found regarding the suitability of source origin materials, Provectus or FCC can attend the site of origin to undertaken pre-acceptance checks and visual inspections. This will enable the operator to identify any issues which could be affecting the conformity of the source materials and rectify any issues.

2.3.3 Hazardous soils containing bound asbestos will undergo a preassessment to confirm that there are no chrysotile fibres >0.1%, other forms of asbestos >0.01%, and also to ensure the soils are within the agreed background reference levels for asbestos fibres. The site will not accept soils for treatment if there are asbestos fibres detected at >0.1% for chrysotile and >0.01% for other forms of asbestos within the soils. Upon satisfactory results, the soils will then undergo pre-screening to remove larger fractions (e.g. lumps of concrete) and hand-picking of bound asbestos before being used in restoration of the landfill.

2.3.4 In the event that moisture content of the waste is within the range of 25-30% or above, then the potential for free water or oil will be further reviewed. Where moisture contents are at this level (or higher) and the material does not behave as a liquid however considered suitable for site infrastructure, then it will be accepted on a case by case basis.

2.3.5 If insufficient information is provided to adequately characterise the waste or determine its suitability for treatment, the operator will undertake a pre-acceptance testing at the source site to establish an initial waste description. This pre-acceptance will include a visual inspection. Waste soils will be tested in accordance with a general suite of analysis for soils based on the potential substances present from the site history and any existing chemical data. Sampling of waste soils will be undertaken by a technically competent person, using the sampling frequency utilised at the STF site for soil reception as a minimum. Samples will be clearly identified using labels and recorded on chain of custody forms for transfer to a soils laboratory. All testing and analysis will be undertaken using an UKAS/MCERT accredited laboratory and accredited methods. Measures to be undertaken for the testing of soils treated are detailed in Appendix 1 are STC WI 006 Soil Analysis, STC WI 003 Soil Characterisation Procedure and STC WI 004 Soil Treatment and Process Monitoring Procedure.

2.3.6 Should FCC determine that there is the high potential for material to contain untreatable materials or properties where the waste materials behave as a liquid or containing free water or oil then, the waste will not be quoted for acceptance and/or will be rejected.

2.4 Waste Acceptance

1.1.1 The full waste list is contained in the permit for the bioremediation process. As part of this permit variation this application proposes new hazardous waste codes to be included in the permit for the STF for the acceptance of asbestos contaminated soils:

- 17 05 03* soil and stones containing hazardous substances.
- 17 06 05* construction materials containing asbestos.

2.4.1 Waste code 17 05 03* will be restricted to those wastes which contain identifiable pieces of bonded asbestos – any particle size that can be identified as potentially being asbestos by a competent person if examined by the naked eye. Waste code 17 06 05* will be restricted to wastes containing discrete pieces of bonded asbestos within the soil matrix only.

2.4.2 All wastes received to site will be subject to the Waste Acceptance Procedures as detailed in the operating procedures in Appendix 1.

2.4.3 On arrival to site, vehicles entering will be weighed at the weighbridge and all appropriate documentation checked and referenced by the weighbridge clerk. The weighbridge clerk will direct the delivery vehicles to the designated soil reception area.

2.4.4 For soils containing bound asbestos, following satisfactory results from pre-assessment (confirmation of soil matrix and not containing any asbestos fibres above 0.1% for chrysotile asbestos and 0.01% for all other forms of asbestos) soils will be directed to the soils asbestos storage area awaiting treatment. This is an external storage area with an impermeable base.

2.4.5 If in the circumstance that a load is tipped and upon inspection is identified as non-conforming, (for example deleterious inclusions, unbound asbestos/insulation) the waste materials will be reloaded immediately and rejected. A record of the waste material rejection will be reported to the manager on duty who will record the event. If in the event of a non-conformity that takes place later e.g. chemical data shows inconsistencies against the data originally provided as a waste description by the producer. In this scenario, the waste producer will be contacted, and the waste rejection procedure implemented where required.

2.4.6 All wastes received to Maw Green Soils Treatment Facility will be in accordance with general BAT requirements as detailed in BAT 1-2 which at pre-acceptance stage ensures that:

- All assessment of waste is undertaken by a suitability competent person.
- Testing is undertaken at a laboratory with UKAS/MCERTS accreditation.
- All wastes on site is validated through chemical analysis and visual inspection.
- Checks are undertaken to ensure that the method of treatment will allow re-use on site prior to any acceptance on site.

2.5 Waste Rejection

2.5.1 In the event of any non-conforming wastes, a waste rejection notification will be issued informing that the waste is not suitable for treatment. Waste not deemed acceptable will be rejected as per the written procedures (Appendix 1). Written records will be maintained which will include information on the waste type, quantity, how the materials were stored and how they were disposed of. Rejected waste will be stored within the designated quarantine area pending removal from site and a note will be made of the waste type, quantity, hazardous properties and storage requirements. The quarantine area is segregated from the storage areas for other permitted wastes to reduce the risk of cross contamination.

2.6 On Site Verification

2.6.1 On-site verification procedures will be carried out to ensure soils received at the Soils Treatment Facility (STF) are visually, structurally and chemically similar to those described during the pre-acceptance procedures and confirm compliance with the Environmental Permit and suitability for treatment.

2.6.2 Soil sampling will be performed by the STF technician or project manager in line with composite sampling methods as detailed in the British Standards BS812. Measures to be undertaken for the testing of soils treated are detailed in the operating procedures contained in Appendix 1 'STC WI 006 Soil Analysis' and 'STC WI O03 Soil Characterisation Procedure'.

2.6.3 A minimum of at least one composite sample must be taken from each job (unique authorisation code) and in accordance with the sampling frequency highlighted in Table 1 below. The Project Manager shall assess based on; visual, high risk job, knowledge of the client, materials variation etc. to determine which sample will be sent to the laboratory for reception compliance testing. Chemical testing is undertaken to ensure that the materials being tipped are consistent with the analysis and description provided by the client at the waste description stage.

2.6.4 Sampling requirements for soil samples are detailed within Table 1 below:

Table 1. Sampling requirements for Soil Samples

Volume of soil (tonnes)	No. of samples needed (before or during acceptance at STF)
< 100	1
100 - 500	2
500 +	2 + 1 for every 500t

2.6.5 The general suite of analysis for soils shall include:

- pH
- CLEA Metals
- Total TPH
- Total PAHs
- Total Cyanide (where required)
- Phenols (where required)
- SVOCs and VOCs (where required)
- PCBs (where required)
- Moisture content
- Asbestos ID/quantification

2.6.6 Soils deemed unsuitable for treatment will be removed from site and either returned to the waste producer or taken to a suitable permitted facility for final treatment/disposal.

2.6.7 From experience at other similar FCC sites, a low proportion of soils with asbestos accepted at other facilities are also impacted with hydrocarbons. Approximately 15% of inputs into the other permitted facilities also contained hydrocarbons above 0.1%, albeit this changes year by year, but has remained as a relatively low percentage of total inputs. These soils were all sent to the biotreatment area at the end of the asbestos treatment phase and validation testing to confirm that asbestos fibres could not be liberated from soils.

2.7 Waste Storage

2.7.1 Wastes are stored as per the updated Proposed Site Layout Plan drawing ref. 5193-CAU-XX-XX-DR-V-1805 showing the new hazardous soils treatment and storage areas for asbestos contaminated soils.

2.7.2 Segregation of the accepted waste types will be required on-site to ensure waste soils intended to be sent directly into the bioremediation process are not mixed with those containing asbestos. The separation of wastes in the bioremediation process is not necessary as they are not considered to be reactive. In the event of any non-conforming wastes accepted at the site, a waste rejection notification will be issued informing the waste carrier that the waste is not suitable for treatment.

2.7.3 Upon satisfactory pre-acceptance and waste acceptance checks, on arrival to site, the soils will be weighed and directed from the weighbridge to the soils reception area and undergo an inspection and sampling for analytical testing. Soils will be stored on impermeable surfacing provided with bunded edges and sealed drainage.

2.7.4 After placement on the storage area, the soils will be sheeted to reduce the potential for air borne emissions. The pre-assessment testing is carried out to confirm the soil matrix and not containing any asbestos fibres above 0.1% for chrysotile asbestos and 0.01% for all other forms of asbestos. Until the testing has been completed, the soils will remain sheeted. Soils can be un-sheeted at any point once the reception testing is complete; this is required during the reception of additional soils or prior to treatment.

2.7.5 Following satisfactory results from pre-assessment confirming that the soils are compliant with the acceptance criteria, the soil can be stored externally, un-sheeted and will undergo pre-screening and handpicking for bonded asbestos fragments. Asbestos containing soils with fibre concentrations that have the potential to become airborne at concentrations above the air monitoring detection limit will be rejected from site. Soils that meet all waste acceptance checks will be formally accepted for treatment.

2.7.6 Rejected wastes will be stored within a designated quarantine area pending removal from site and a note will be made of the waste type, quantity, hazardous properties and storage requirements. The quarantine area is segregated from the storage areas for other permitted wastes to reduce the risk of cross contamination.

2.8 Screening/Processing Treatment of Soils

Pre-screening and Hand-picking of asbestos-containing soils

Screening Operations

2.8.1 A mechanical screener will be used to remove oversize material from asbestos containing soils. Soils will be screened using a three-way screener. The screened material is then passed through the picking station to allow the removal of any bound asbestos debris. This is to remove larger items (e.g. lumps of concrete) to reduce the potential of damage to the picking station and make hand picking of asbestos debris more effective.

2.8.2 The screener currently being used under the mobile plant deployment at Maw Green is unmodified. Trials on enclosed screeners with a HEPA filter and uncovered screeners with general dust suppression have shown no difference in emissions as they all meet the method detection limit of <0.0005f/ml. However, the use of enclosed screeners is far slower, prone to significant downtime and uses significantly more energy due to reduced throughput for no environmental benefit. The use of standard dust suppression with a propriety surfactant has been shown to be entirely effective as secondary mitigation to the waste acceptance criteria. Where SEM testing is undertaken this will ensure that the asbestos concentrations in air are below 0.0005f/ml. This approach and reduced detection limit for the asbestos monitoring meets the well-established principle of reducing emissions to be as low as reasonably practicable.

2.8.3 Daily monitoring will be undertaken to ensure that emissions meet <0.01f/ml or <0.0005f/ml as required. As secondary containment, continuous dust suppression in the form of misting systems is also provided around the screening operations to reduce the potential for any fugitive emission release. Materials moved from the screener to the picking station will be a continuous process where soils are directly fed from the screener to the picking station via a conveyor.

Asbestos Picking Station

2.8.4 The asbestos picking station will be a mobile enclosed unit (see example in Appendix 6) and will be identical to the type approved for use under an environmental permit at the operator's other sites.

2.8.5 Airborne asbestos concentrations have been monitored both within, and directly adjacent to the picking station at the operator's other sites. There is no increase in asbestos concentrations above the method detection limit of either <0.01f/ml or <0.0005f/ml within the internal atmosphere of the soil screeners/picking stations monitored, nor ambient air immediately outside of the screener/picking station. This monitoring has been undertaken since the operator commenced the treatment of bound asbestos contaminated soils. All air monitoring data has been submitted to the Environment Agency and approved as being compliant with the site's permit for each site. This is enclosed in Appendices 3 & 4 (Maw Green Landfill Mobile Plant and Edwin Richards Quarry Mobile Plant).

2.8.6 Notwithstanding the evidence that there are no elevated airborne asbestos emissions within the screening plant/picking stations of the above sites, as an additional control measure, there will be a series of spray rails on the incoming and outgoing conveyor to effectively capture and contain particulate emissions. This would act as secondary containment for any particulate emissions.

2.8.7 The out-going conveyor will drop the hand-picked picked processed soils, and the drop height will be minimised to reduce any agitation of the soils. A dust suppression system (using a water and proprietary asbestos surfactant solution) will be in place at the site that will consist of misting sprays with overlapping spray arcs, identical to the approved suppression system on the operator's other sites that can be used to continually dampen stockpiles during loading and unloading activities.

2.8.8 The process in the picking station will involve a manual sorting process by trained operatives who will remove visible fragments of asbestos from the materials from the conveyor. Asbestos picked from the conveyor will be placed by hand in individual polythene bags located inside the picking station beside the trained operatives. When the bags are either full, or the end of the working day is achieved, the polythene bag will be placed into a second bag and sealed using a taped swan neck. The double bagged asbestos will be taken outside and placed by hand into the on-site enclosed lockable asbestos skip. Used PPE from the picking station and direct working areas will be double bagged using the same approach as asbestos containing material (ACM) debris and placed into the enclosed lockable asbestos skip.

2.8.9 A Category B trained supervisor will regularly check the labelled, lockable asbestos waste skip and will arrange for the collection and delivery of new asbestos skips when the existing skip has reached 75% capacity. This is to ensure that there is no risk of the skip becoming over capacity and unable to accept further bagged asbestos. This will form part of the daily site checks.

2.9 Storage of handpicked asbestos soils (post-treatment)

2.9.1 The out-going conveyor from the asbestos picking station will deposit the hand processed soils into a separate stockpile labelled as treated soils. The stockpile within this designated area will then undergo further visual inspection by the suitably trained/qualified member of staff for any residual bonded asbestos containing fragments. If any bonded asbestos fragments are encountered, the materials will be re-loaded into the asbestos picking station and processed until no visible bonded asbestos fragments are observed through visual inspection.

2.9.2 The materials will then undergo 'Post Treatment Verification Sampling' (See Section 2.11) testing and sampling will confirm that treated soils meet the restoration soil quality targets to enable their use in the restoration area of Maw Green Landfill Site. If, after the receipt of laboratory analysis results, the soils do not meet the acceptance criteria, the soils will either be treated further or removed from site to an alternative disposal facility.

2.9.3 Following screening, the soils will be stockpiled for use in recovery at the landfill site, this may also include soils that have undergone bioremediation.

2.10 Decontamination Procedures

2.10.1 The decontamination provisions for the asbestos area are implemented at the operator's other sites where asbestos contaminated soils are treated and stored, and are appropriate with the provisions for notifiable works and include the following:

- Access restrictions to asbestos treatment areas.
- Provision of clean and dirty areas within a dedicated decontamination unit.
- Disposal area for used overalls and masks/overshoes/cleaning materials etc for bagging and subsequent disposal as asbestos waste.
- Contained washing provisions for personnel decontamination prior to leaving the clean area of the decontamination unit.
- Decontamination of plant is undertaken under the supervision of a Category B trained person. Any visible contamination is removed manually, then plant is wet cleaned externally. Cabins will be vacuumed with a H Class vacuum cleaner and all debris/cleaning materials will be bagged and placed in the locked asbestos skip. A clearance air test within the any internal operator's cabins would require undertaking prior to leaving the working area.

2.11 Post Treatment Verification Sampling

2.11.1 Post Treatment Verification Sampling will be carried out to ensure soils treated at the Soil Treatment Facility (STF) meet the waste acceptance criteria to enable their use for the restoration of the landfill.

2.11.2 The sampling of soils will be performed by the STF technician or project manager. The procedure uses composite sampling methods as provided in BS812. For batches where treatment has been completed the sampling frequency will be 1/500t of treated soil.

2.11.3 Soils that do not meet the acceptance criteria will be treated further (if deemed viable) or removed from site for treatment/disposal at a suitable permitted facility.

2.11.4 The work instruction in soil analysis STC WI006 provides the analysis suite for soil batches that are being validated for reuse. The sampling frequency used is 1/500t. The reason for this is that the soils that are treated at the site are from a number of sources and once reception sampling is completed these are combined into batches to form a heterogenous stockpile. Treatment is deemed completed when all samples in a batch meet the reuse criteria.

2.11.5 The treated soils are sampled on a 1/500t frequency. This sampling frequency is chosen so that it meets the general principles contained within EA guidance document 'dispose of waste to landfill' April 2021 (https://www.gov.uk/guidance/dispose-of-waste-to-landfill).

2.11.6 The site-specific risk assessment for the restoration area where treated soils are to be reused, including appropriate soil treatment targets has been completed and agreed with the Environment Agency for the reuse of treated soils at the site.

2.12 Transfer – Landfill Restoration

2.12.1 Treated soils will be transferred onto the landfill for reuse in accordance with the approved restoration plan for Maw Green Landfill Site.

3.0 PLANT & EQUIPMENT

3.1 Mobile Plant

3.1.1 Soils will be handled using tracked 360^{o} excavators from reception through the treatment process. Treated soils will be moved onto the landfill restoration area using dump trucks.

3.1.2 A mechanical three-way screener and an enclosed mobile picking station will be provided for the hand-picking removal of bonded asbestos fragments from hazardous soils. The same screening equipment will not be used for different waste types and so no cross contamination will occur.

3.2 Fixed Plant

3.2.1 Fixed plant includes the following items:

- Weighbridge
- Site Office
- Bunded process/surface water storage tank
- Air Blower and containerised control panel/transfer pumps
- Biofilter
- Process water treatment vessels & pumping chamber
- Storage Container
- Picking Station
- Soil Screener
- Asbestos Decontamination Unit

4.0 CONTROL OF EMISSIONS

4.1 Surface Water drainage from treatment pads

4.1.1 Details of the site drainage system for leachate in the treatment pads (both the bioremediation and asbestos contaminated soil areas) and site designs for each of the two areas are shown in drawing referenced 5193-CAU-XX-XX-DR-V-1805. The STF Pipeline Route from the treatment facility is shown in drawing ref: 5193-CAU-XX-XX-DR-V-1803.

4.1.2 Surface water is collected within the process pipework from where it is pumped into the small treatment plant prior to discharge to sewer or redirected via a pipeline to humidify the biofilter. Valves can be switched to use treated water to irrigate the biofilter and then reverse back to discharge the water to sewer. There is the option to irrigate the biopile if required however this not usually required for the typical British climate.

4.1.3 The treatment plant comprises:

- 50m^3 settlement tank with transfer pump and level detectors
- Oil Water separator with transfer pump and level detectors
- 10m^3/hr sand filter
- 10m^3/hr granular activated carbon filter

4.1.4 The capacity of the treatment plant is <50tonnes/day.

4.2 Discharge Consent

4.2.1 Effluent from the treatment plant will be discharged to sewer under the current trade effluent consent for Maw Green Soil Treatment Facility. A summary of the discharge limits are included in Table 2 below:

Table 2. Summary of Maw Green STF Trade effluent discharge limits:

Parameter	Limit (and unit)
Maximum volume of discharge	20m^3
Maximum rate of discharge	2 litres/sec
Ammonia and its compounds as N	250 mg/l
Cyanides and cyanogen compounds which produce hydrogen cyanide on acidification	1 mg/l
Separable grease and oil	100 mg/l
Sulphates as SO_4	1,000 mg/l
Sulphides, hydrosulphides, polysulphides and substances producing hydrogen sulphide on acidification	1 mg/l
Total suspended solids	1000 mg/l
Toxic Metals	10,000 µg/l
Temperature	43°C
pH	6-10

4.2.2 A separate H1 Surface Waste Assessment was also submitted previously as part of an improvement condition relating to the soil treatment facility (bioremediation area). A review of the chemical analysis monitoring data from the point of discharge at the soil treatment facility was undertaken alongside the H1 assessment using the Environment Agency's Surface Water Pollution Risk Assessment. The results of the monitoring data for the discharge point at the Soil Treatment Facility indicated concentrations released are significantly lower than the existing trade effluent consent limit provided by United Utilities.

4.2.3 It is not anticipated there will be any significant change in the quality of the discharge to sewer from the STF due to accepting the asbestos contaminated soils as per the proposed activity in this permit variation. Non-conforming wastes exceeding asbestos fibre limits will be rejected from site. Monitoring of the existing effluent from asbestos treatment areas has revealed that asbestos fibres are absent in surface run-off waters (examples of data from existing FCC sites that treat the same asbestos contaminated soils – Edwin Richards Quarry in Rowley Regis – see Appendix 5). This is due to the acceptance of bound asbestos only and the absence of mobile asbestos fibres that could enter the water treatment system. Asbestos monitoring will be continued to be undertaken on each batch of water that requires disposal to ensure the correct waste description is provided to any liquid effluent disposal contractor and that there is no cross contamination of the receiving disposal facility for the treated water.

4.3 STF Dust Control

4.3.1 Dampening and dust suppression will be conducted around the asbestos storage and processing areas, with high flow rate dust suppression systems that will consist of misting sprays with overlapping spray arcs, and bowser dust suppression systems. The suppression system that will be used in the asbestos soils processing and storage area will provide a fully encompassed suppression system with overlapping arcs between misting units which has been designed to contain any potential emissions and provided suppression for the activities carried out on site:

- **a)** Dampening and suppression on stockpiles and around processing area.
- **b)** Spray line on the asbestos picking station feed conveyors.
- **c)** Provision on site of a water bowser equipped with a misting suppression system and adequate year-round water supply.
- **d)** Use of uncontaminated water for dust suppression, to avoid re-circulating fine material.
- **e)** High standards of housekeeping to minimise track-out and windblown dust/fibres.
- **f)** Dampening and sheeting of asbestos containing material stockpiles, designated reception area and separate designated post-treatment storage area.

4.3.2 Air sampling on the conveyors of the picking station (even without dust suppression) at other sites has always resulted in monitored concentrations <0.0005f/ml or <0.01f/ml depending on the sampling and analysis method chosen.

4.3.3 For further information on dust and asbestos fibre control measures to be implemented at the site, please see the updated Maw Green Dust & Emissions Management Plan (DEMP) under document ref 5193-CAU-XX-XX-RP-V-0313.

4.4 Asbestos Fibres

4.4.1 Maw Green Soils Treatment Facility is proposing to accept waste soils containing mixed forms of asbestos with an asbestos fibrous content at concentrations of lower than <0.1% for chrysotile asbestos, and fibre concentration of <0.01% for all other asbestos. These fibre contents will be validated at the pre-acceptance testing stage to remove the potential for airborne emissions of asbestos fibres above the detection limit. Air monitoring for asbestos and particulate testing will be undertaken at numerous locations on site, and their locations are detailed on drawing ref: 5193-CAU-XX-XX-DR-V-1806.

4.5 Cross-contamination and clean down procedures

4.5.1 To control and prevent cross-contamination of asbestos fibres, only asbestos soils will undergo physical treatment and hand-picking of bonded asbestos fragments at any one time.

4.5.2 Pre-acceptance testing of asbestos waste prior to screening and hand-picking will validate that soils undergoing this physical process do not contain unacceptable concentrations of asbestos fibres (results detected above those detailed above will be rejected). Therefore, the accumulation and build-up of asbestos fibres on mobile plant/machinery is not anticipated. Where decontamination procedures are required when mobile equipment/plant is to be removed from site. Cleaning down procedures will be carried out using wet cleaning techniques; any cleaning residues/sludges generated will be placed into one of the storage areas available to accept contaminated soils. In addition, air monitoring will be undertaken to ensure that the concentration of any potential airborne asbestos fibres is below the detection limit of 0.01f/ml or <0.0005f/ml as required.

4.5.3 Any contaminated waters from cleaning will be pumped to the on-site holding tanks which will be tankered off for disposal at a suitable facility. Any PPE/RPE used will be bagged and disposed of with any asbestos wastes and classed as hazardous for disposal at a suitable facility.

5.0 MONITORING

5.1 Overview

5.1.1 Monitoring will be undertaken in accordance with STC WI 007 Environmental Monitoring (detailed within the operating procedures in Appendix 1) to ensure that all emission points are regularly monitored to ensure that the operation is in compliance with the conditions of the permit. Visual monitoring of equipment, including plant, and soil biopiles shall be undertaken on a daily basis. Equipment modules will be inspected every morning and evening upon module opening and closing respectively. Noise, vibration and heat observations of equipment shall also be executed at these times. Monitoring of emissions/nuisance relevant to the new activity is included in the following management plans:

- Updated Dust & Emissions Management Plan (DEMP), under document ref: 5193-CAU-XX-XX-RP-V-0313 (included within this application); and,

- Updated Odour Management Plan (OMP), under document ref: 5193-CAU-XX-XX-RP-V-0314 (there were only minor changes to the introductory wording of this document and the risks to receptors and control measures remain the same and so this has not been submitted as part of this variation).

5.1.2 The Activities and Operating Techniques report details the monitoring parameters and requirements for the following:

- Water emissions from the water discharge point at the STF.
- Dust concentrations in air at the STF.
- Airborne asbestos fibre monitoring in air.
- Noise assessment.
- Odour assessment.

5.2 Asbestos Baseline Background Monitoring

5.2.1 It is an established procedure to attain pre-operational baseline monitoring for asbestos to form the basis when determining the air quality prior to any treatment activities and the issue of the permit. The operator will obtain baseline background monitoring prior to the commencement of operations where 3 rounds of monitoring will be taken at locations shown on drawing ref: 5193-CAU-XX-XX-DR-V-1806.

5.2.2 Following issue of the permit, the operator will be able to compare the monitoring results against reference background levels obtained from baseline monitoring. The background reference levels will be used as an action level should there be any soils with elevated asbestos fibres above the detection limit (0.01f/ml) or reference background level which has a detection limit of <0.0005f/ml.

5.2.3 Detail of the frequency and thresholds of monitoring are included in the updated Dust & Emissions Management Plant (DEMP), document ref: 5193-CAU-XX-XX-RP-V-0313.

5.3 Process Emissions

5.3.1 The point source emissions from the STF include process water, surface water collection and air emissions from the biofilter as well as dust and odour from general site works. The monitoring for these processes includes:

- Biofilter sampling (from exhaust vents).
- Process water sampling.
- Visual and olfactive daily assessment for dust and odour on site.
- Dust and asbestos fibre monitoring.

5.3.2 Monitoring at the site for dust and asbestos fibres and further control measures is covered in the Dust & Emissions Management Plan ref. 5193-CAU-XX-XX-RP-V-0313.

5.4 Biofilter Monitoring

5.4.1 No changes are proposed to biofilter monitoring as a result of this application.

5.5 Process Water Monitoring

5.5.1 The water quality in the water collection tank will be monitored on a monthly basis. A sample will be obtained from the point of discharge and analysed for parameters stated in the discharge consent. Regular checks will be made to ensure no visible oil or grease is present in the tanks.

5.5.2 See the Activities and Operating Techniques Report (document ref: 5193-CAU-XX-XX-RP-V-0306) for details of monitoring parameters and requirements.

5.5.3 Asbestos is only accepted in a bound form. This means that it is encapsulated in a cement matrix. The presence of a bound matrix in soil has previously been expected to prevent the release of asbestos fibres into soil porewater. Fibre concentrations in soil are generally not detected at or below the detection limit of <0.001% in received soils. Water monitoring from asbestos process areas at other sites operated by FCC has not detected asbestos fibres to be present in effluent from asbestos processing areas. Therefore, no abatement of asbestos in effluent is required.

5.6 Air Quality (asbestos) Monitoring

5.6.1 If during air quality monitoring, asbestos fibre concentrations exceed 0.01f/ml or the agreed background reference value, then all work operations will cease to allow for dampening down measures to limit the amount of airborne asbestos fibres. Dust suppression and potentially covering of soils will be carried out.

5.6.2 An exceedance of 0.01f/ml will be followed with an immediate investigation; a sample will be submitted for electron microscopy to confirm the measured concentration of asbestos present. Until results are received, soils will remain covered and untreated. The EA will be notified of any exceedance. It is considered that the likelihood of an exceedance occurring is very low, this is due to the pre-acceptance testing which is carried out on every hazardous soil to confirm the asbestos fibrous content of that sample prior to any processing and screening. No exceedances of detection limits using either Phase Contrast Microscopy (PCM) or Scanning Electron Microscopy (SEM) methodologies have ever occurred in the Operator's experience of undertaking this treatment method on other sites.

5.6.3 Airborne asbestos fibre monitoring is already undertaken for the existing mobile plant deployment at Maw Green for the treatment of asbestos-contaminated soils with uncovered screener. Airborne dust samples were supplied on gridded MCE membrane filters and were tested in a laboratory using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS). The test results are contained within Appendix 3. The Maw Green monitoring results provided by the operator from between August and November 2022 shows no discernible asbestos fibre emissions detected, with all results at or below the 0.0005f/ml limit of detection, with a few anomalous results still well below the 0.01 f/ml permit threshold limit.

5.6.4 Similarly, the same mobile plant operation is being undertaken as a licenced deployment by Provectus at Edwin Richards Quarry soils treatment facility, for the physico-chemical treatment of hazardous asbestos-impacted soils using a screener plant and hand-picking of bonded asbestos (see Appendix 4). This operation is undertaken within a building, and airborne dust and asbestos fibre monitoring is undertaken inside the building, with samples tested at the laboratory for the presence of asbestos fibres. The monitoring results obtained from both within the building and at the screener deck, using either covered or uncovered screener, were similar and were significantly below the permit threshold of <0.01 f/ml and SEM detection limit of <0.0005f/ml. It was concluded the absence of measurable asbestos emissions from the soil screening operation meant that a review of abatement measures could not be made other than to conclude that the waste acceptance approach at the site is entirely successful in preventing airborne asbestos emissions exceeding permit thresholds.

5.6.5 With reference to the above monitoring results obtained from the Maw Green current deployment operations and those at Edwin Richards Quarry soil treatment facility, it can be concluded that provided the operator undertakes the same stringent waste acceptance procedures and operational procedures as currently at Maw Green and also as shown at Edwin Richards, then the risk of airborne asbestos emissions being produced at the site is negligible. This will ensure both the environment and human health of workers and nearby sensitive receptors is protected.

5.6.6 In order to further validate the results of the monitoring undertaken to date an independent review of asbestos treatment and storage of asbestos contaminated soils, is being undertaken at the Maw Green and Edwin Richards sites. This will be forwarded to the Environment Agency following publication.

5.6.7 Detail of the frequency and thresholds of monitoring are included in the updated Dust & Emissions Management Plan (DEMP), document ref: 5193-CAU-XX-XX-RP-V-0313.

5.7 STF Dust Monitoring

5.7.1 Visual dust monitoring shall be undertaken on a daily visual basis during periods of dry weather or following a complaint. Monthly onsite monitoring will be carried out using a hand-held dust detector in the form of a nephelometer (e.g. Dustmate http://dustmonitor.co.uk/ or similar) as well as fixed Frisbee gauges. Details of dust monitoring in included within the updated Dust & Emissions Management Plan (DEMP), document ref: 5193-CAU-XX-XX-RP-V-0313.

5.8 Noise Measurements

5.8.1 Observations relating to excessive noise incidents shall be recorded in the database system.

5.9 STF Odour Control

5.9.1 Regular daily checks will take place for odours on and around the treatment area. If excessive odours are identified, the source of odour will be assessed by the operator. It will be dealt with, for example, by a cessation of soil movement if required or covering of odorous soils with a tarpaulin etc. Observations shall be logged in the database system. Details of odour monitoring and procedures are detailed within the updated Odour Management Plan (OMP), document ref: 5193-CAU-XX-XX-RP-V-0314.

5.10 Recording of Results

5.10.1 All analytical results and monitoring results shall be stored onto the STF database under the relevant environmental batches location. Any changes made to the type of monitoring or adjustment to the biofilter shall also be recorded on the STF database.

6.0 ENERGY REQUIREMENTS

6.1.1 The energy requirements of the facility are low with the main energy consumption associated with the treatment processes with the majority of energy use from the air extraction blower.

6.1.2 As the energy requirements of the facility in general are low and no alternatives are available with lower energy use, no improvements are considered necessary. Basic energy saving measures will be adopted and continually reviewed. This includes measures such as:

- Efficient use of plant and machinery to avoid unnecessary ignition;
- Plant and machinery to be switched off when not in use;
- Regular maintenance of all plant and machinery; and,
- Use of HVO fuel as an alternative to diesel to reduce the carbon footprint of the operations.

7.0 RESOURCE USE - RAW MATERIALS

7.1.1 The activities on site require amounts of resources and raw materials as part of the treatment processes.

7.1.2 A water bowser may be used at the site during dry conditions to control the generation of dust. The water will be used only when necessary, and the minimum amount will be used. Water collected in the sealed drainage system from the non-hazardous storage/treatment areas can be used in place of freshwater.

7.1.3 Fuels and chemicals associated with on-site plant will be appropriately stored and bunded; use of diesel will be undertaken in accordance with the site's EMS.

7.1.4 An asbestos surfactant may be added to the dust suppression misting sprays for the treatment and storage area of the STF for asbestos contaminated soils. The Material Safety Data Sheet for the asbestos surfactant is provided in Appendix 2.

8.0 EMERGENCY PROCEDURES

8.1.1 FCC operates a Near Miss, Incident and Emergency Management System, and specific emergency procedures for this facility will cover:

- Spillages of waste and/or reagents;
- Fire;
- Injury to staff or visitor;
- Incidents.

8.1.2 FCC has ISO14001, 18001 and 45001 accreditation and this will be extended to this facility.

9.0 REVIEW AGAINST INDICATIVE BAT STANDARD

	Overall Environmental Performance
BAT 1	*In order to improve the overall environmental performance, BAT is to implement and adhere to an environment management system (EMS) that incorporates all of the following features:* *Commitment of the management, including senior management;* *Definition, by the management, of an environmental policy that includes the continuous improvement of the environmental performance of the installation;* *Planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment;* *The implementation of procedures;* *Checking performative and taking corrective action;* *Review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness;* *Following the development of cleaner technologies;* *Consideration for the environmental impacts from the eventual decommission of the plant at the stage of designing a new plant, and throughout its operating life;* *Application of sectoral benchmarking on a regular basis;* *Waste stream management;* *An inventory of waste water and waste gas streams;* *Residues management plan;* *Accident management plan;* *Odour management plan;* *Noise and vibration management plan.*
	The company operates under an ISO14001 accredited environmental management system, audits of the performance of key plant, and all maintenance that has been undertaken will be undertaken and reviewed as part of the company's management system. The company management system is audited externally as part of the ISO 9001 and 14001 accreditation.

	Further information is provided within the management plan summary contained in this application under document ref: 5193-CAU-XX-XX-RP-V-0315, however in summary the site will have: - A full maintenance schedule for all machinery and equipment on site; Documented procedures to control all aspects of the operation that may have an impact on the environment, including for the minimisation and control of asbestos fibre emissions to air and water, including contingency and operational methods which are to be undertaken in the event that there is a plant breakdown, or activities could lead to an unacceptable emission; Well documented procedures for monitoring emissions and impacts including the use of a daily site log. All monitoring will occur in accordance with the Environmental Management plans including the updated Dust & Emissions Management Plan ref. 5193-CAU-XX-XX-RP-V-0313 and Odour Management Plan ref. 5193-CAU-XX-XX-RP-V-0314. The site will undertake a preventative maintenance programme where site plant, and infrastructure will be inspected on a daily, weekly and monthly basis in accordance with written procedures. Training systems are in place and all employees which will include: - Relevant treatment activities undertaken on site; Management techniques to be employed for all aspects of waste treatment which are relevant to their position; Reporting any abnormal events; Contingency measures in place to prevent breaches of the Environmental Permit in the event of abnormal weather conditions; and contingency measures to be taken in the event that accidental emissions are released to the environment. The operator will only appoint suitably qualified contractors, and all purchasing of equipment and materials will be undertaken in accordance with the management system.
BAT 2	*In order to improve the overall environmental performance of the plant, BAT is to use all of the techniques detailed in 'BAT 2 Table 'best available techniques (BAT) conclusions for waste treatment industries (BREF), under Directive 2010/75/EU, from the Official Journal of the EU' summarised below:* *Pre-acceptance procedures* *Waste Acceptance procedures* *Waste tracking and inventory*

	Output quality management system *Ensure waste segregation* *Waste compatibility prior to mixing or blending of waste* *Sorting of incoming solid waste*
	<u>Pre-acceptance and Waste Acceptance procedures</u> Waste pre-acceptance and Waste acceptance procedures will be in place to ensure that only waste types permitted are accepted for treatment, procedures are outlined in Section 2.3-2.6 and contained within Appendix 1 of this document. No liquid wastes, drummed wastes or laboratory smalls will be accepted. The Operator has in place Waste Acceptance Procedures and STF WI O03 'Soil Characterisation Procedure' which includes an assessment of waste prior to their acceptance to site and the sampling to ensure their suitability. During pre-acceptance checks, the type of contamination of each waste load will be established as will the end use of the waste (after it has been treated). The waste will only be accepted if it is compliant with the permitted waste types and if the site is able to treat the waste. The treatment method is determined prior to the waste being delivered to the facility. In the event of any non-conforming wastes a waste rejection notification will be issued informing that the waste is not suitable for treatment Waste deemed not acceptable will be rejected as per written procedures (see Appendix 1). Rejected wastes will be stored within a designated quarantine area pending removal from site and a note will be made of the waste type, quantity, hazardous properties and storage requirements. The quarantine area is segregated from the storage areas for other permitted wastes to reduce the risk of cross contamination. <u>Waste tracking and inventory</u> Waste tracking system will be used as detailed in written procedures contained in Appendix 1. Written records will be maintained which will include information on the waste type, quantity, how the materials were stored and how they were subsequently disposed of. A daily assessment of the current capacity of the site is undertaken and waste is only accepted if there is sufficient capacity. A spreadsheet calculating how much waste is on site will be updated daily to account for waste received on site where waste tonnages have been dedicated (e.g. pre-storage, bioremediation treatment, wastes treated, and wastes removed from site). Written records will be maintained which will include information on the waste type, quantity, how the materials were stored and how they were subsequently disposed of.

	Output Quality Management System The Operator has a technically competent manager who is qualified to 'Level 4 in Waste Management Operations – Managing', and 'Treatment of Hazardous Waste (Remediation HROC6 or equivalent)'. The roles of sales and technical staff are clearly defined within the procedures and staff will only undertake activities for which they have received suitable training. All staff undertaking waste acceptance procedures will receive suitable training in the waste acceptance procedures, as well as in waste handling and the relevant health and safety and environmental procedures in place. The site will be manned by a minimum of two staff under normal circumstances, during waste reception periods, the operations manager to be qualified to at least HNC Chemistry or equivalent. Ensure waste segregation Segregation of the accepted waste types is not necessary as they are not considered to be reactive, however asbestos contaminated wastes will be separated, stored and treated separately. In the event of any non-conforming wastes, a waste rejection notification will be issued informing that the waste is not suitable for treatment. Waste deemed not acceptable will be rejected as per written procedures (see Appendix 1). Rejected wastes will be stored within a designated quarantine area pending removal from site and a note will be made of the waste type, quantity, hazardous properties and storage requirements. The quarantine area is segregated from the storage areas for other permitted wastes to reduce the risk of cross contamination. See the Proposed Site Layout Plan for the STF (bioremediation area and asbestos contaminated soils area) in drawing ref. 5193-CAU-XX-XX-DR-V-1805. Waste Compatibility Waste pre-acceptance and Waste acceptance procedures, soil testing and analysis will be in place to ensure that only waste types permitted are accepted for treatment, procedures are outlined in Section 2.2-2.6 and contained within Appendix 1 of this document. Section 2.6 details on-site verification, Reception and Compliance testing will be undertaken in accordance with written procedures (see Appendix 1). Testing will be performed to ensure that the materials accepted are consistent with the analysis and description supplied at the pre-characterisation stage. All external lab analysis will be carried out by MCerts and UKAS-accredited laboratories as detailed within the procedures. Samples shall be retained on site for a minimum of two days following sampling, the accredited laboratory will retain samples for 30 days.

	<u>Sorting of Incoming waste</u> As per Sections 2.3-2.6, following acceptance and valid-pre-acceptance testing result (dependant on the waste stream) wastes will undergo the following acceptance, sorting screening and storage. The treatment pads are used as reception/quarantine areas as shown in drawing ref. 5193-CAU-XX-XX-DR-V-1805, however the exact layouts will vary over time, dependent upon inputs and treatment timescales. The STF pipeline route from the treatment facility is shown in drawing ref: 5193-CAU-XX-XX-DR-V-1803. Demarcation of the areas will be managed via suitable signage. The waste storage area is impermeable concrete pavement with sealed drainage system any runoff will be treated and then either stored for reuse or discharged to sewer. All vehicles delivering waste travel over a calibrated weighbridge and a ticket is printed for a record. The driver is then directed to the designated unloading area by the site operation staff. The site is always manned during operational hours. Following pre-acceptance testing results and confirmation waste can be processed, asbestos wastes will undergo the following: • Three-way screening of asbestos-contaminated soils; • Handpicking of bonded asbestos fragments from soils; • Post-treatment validation testing; • Further treatment if visible asbestos still present, or hydrocarbons present; • Transfer of treated soils (once validated) to landfill for restoration; and, • Storage of asbestos materials after screening/hand-picking for asbestos for disposal in lockable skip. There is no change proposed to the bioremediation treatment processes at the existing STF.
BAT 3	*In order to facilitate the reduction of emissions to water and air, BAT is to establish and to maintain an inventory of waste water and waste gas streams as part of the environmental management system.*
	Water usage is minimal for the bioremediation process. Rainfall derived drainage water will be used for moisture control where required. Use of mains water restricted to washing plant etc. There is no change proposed for the water use in the bioremediation process. Water use in the asbestos processing and storage areas will be by continuous misting sprays with overlapping spray arcs for effective coverage of the area. Surfactant may be added to the sprays to better capture asbestos fibres. The Material Safety Data Sheet is included in Appendix 2. The wastewater discharge areas comprise of an impermeable concrete slab in the bioremediation area and a crushed concrete surface with geo-composite clay liner for the asbestos treatment area, which both drain to a collection pipework so that any runoff will be contained. The water will

	either be used within the biopile process to maintain optimum moisture levels or discharged to sewer. Basic treatment of this potentially contaminated surface/process water will be undertaken prior to discharge to sewer. The discharge of effluent to sewer is already regulated by the existing permit for the soil treatment facility. Emissions to sewer have been assessed as part of the trade effluent/discharge consent and emission limit values have been set. The parameters detailed in the discharge consent are listed below:

Parameter	Limit (and unit)
Maximum volume of discharge	$20m^3$
Maximum rate of discharge	2 litres/sec
Ammonia and its compounds as N	250 mg/l
Cyanides and cyanogen compounds which produce hydrogen cyanide on acidification	1 mg/l
Separable grease and oil	100 mg/l
Sulphates as SO_4	1,000 mg/l
Sulphides, hydrosulphides, polysulphides and substances producing hydrogen suphide on acidification	1 mg/l
Total suspended solids	1000 mg/l
Toxic Metals	10,000 µg/l
Temperature	43°C
pH	6-10

It is not anticipated there will be any significant change in the quality of the discharge to sewer from the STF due to accepting the asbestos contaminated soils as per the proposed activity in this permit variation. Non-conforming wastes exceeding asbestos fibre limits will be rejected from site. Monitoring of the existing effluent from asbestos treatment areas on similar sites operated by FCC (Edwin Richards Quarry in Rowley Regis) has revealed that asbestos fibres are absent in surface run-off waters (examples of data from existing FCC sites that treat the same asbestos contaminated soils – Edwin Richards Quarry in Rowley Regis – see Appendix 5). This is due to the acceptance of bound asbestos only and the

	absence of mobile asbestos fibres that could enter the water treatment system. Therefore, further abatement measures are not considered necessary.
BAT 4	*In order to reduce the environmental risk associated the with storage of waste, BAT is to use all of the techniques given below* *Optimised storage location* *Adequate storage capacity* *Safe storage operations* *Separate area for storage and handling of packaged hazardous waste*
	See BAT 2 'Ensure waste segregation'. Waste Acceptance procedures, Waste Rejection Procedures outlined in Section 2.3-2.6 of this document and contained within Appendix 1. Waste storage is outlined in Section 2.7 of this report. A daily assessment of the current capacity of the site is undertaken and waste is only accepted if there is sufficient capacity. The waste storage area is impermeable concrete pavement for existing STF bioremediation area with sealed drainage system, and crushed concrete hardstanding with impermeable geo-composite clay membrane for the asbestos contaminated wastes area. Any runoff will be treated and then either stored for re-use or discharged to sewer. All vehicles delivering waste to site travel over a calibrated weighbridge and a ticket is printed for a record. The driver is then directed to the designated unloading area by the site operation staff. The site is always manned during operational hours. See the Site Layout Plan, drawing ref. 5193-CAU-XX-XX-DR-V-1805 for further detail on waste stockpile locations. The STF effluent pipeline route is shown in drawing ref. 5193-CAU-XX-XX-DR-V-1803. The site layout has been designed to ensure that treatment and storage areas are separate from the rest of the site so as to ensure segregation of activities, particularly separation of the proposed new asbestos contaminated soils storage and treatment area, to the west of the current STF. The facility is located within a predominantly rural setting, the closest residential receptors are located some 210m east of the site, with local highways or minor roads located within 150 m of the site. Materials are stored in in such a way as to avoid double handling i.e. wastes are received, stored, treated and moved to the post treatment area. Wastes will only be removed from the storage area if sufficient capacity is available for them to be treated. All areas will be clearly marked using signage.

	Storage vessels and containment systems for hazardous liquids will be in line with the CIRIA 'Containment systems for the prevention of pollution: Secondary, tertiary and other measures for industrial and commercial premises (C736;2014). Bunding will be provided to a minimum of 110% capacity. Treatment of wastes will normally occur within 10 working days of the material being accepted on site. once treated, the material is stored on the and used to restore the landfill in accordance with the approved restoration plan. A spreadsheet calculating how much waste is on site will be updated daily to account for waste received on site where waste tonnages have been dedicated (e.g. pre-storage, bioremediation treatment, wastes treated, and wastes removed from site).
BAT 5	*In order to reduce the environmental risk associated with the handling and transfer of waste, BAT is to set up and implement handling and transfer procedures.* *Handling and transfer procedures aim to ensure that wastes are safely handled and transferred to the respective storage or treatment. Including the following elements:* *Handling and transfer of waste are carried out by competent staff;* *Handling and transfer of waste are duly documented;* *Measures are taken to prevent, detect and mitigate spills;* *Operation and design precautions are taken when mixing or blending wastes;*
	The operator will have a technically competent manager who is qualified to 'Level 4 in Waste Management Operations – Managing', and 'Treatment of Hazardous Waste (Remediation HROC6 or equivalent)'. The roles of sales and technical staff are clearly defined within the procedures and staff will only undertake activities for which they have received suitable training. All staff undertaking waste acceptance procedures will receive suitable training in the waste acceptance procedures, as well as in waste handling and the relevant health and safety and environmental procedures in place. The site will be manned by a minimum of two staff under normal circumstances, during waste reception periods, the operations manager to be qualified to at least HNC Chemistry or equivalent. The following procedures are in place for the proposed activity (See Appendix 1) to reduce the environmental risk associated with the handling and transfer of waste: STC WI 002 Soil Reception Procedure STC WI 003 Soil Characterisation Procedure

	STC WI 004 Soil Treatment and Monitoring Procedure STC WI 006 Soil Analysis STC WI 007 Environmental Monitoring STC WI 010 Pad and Equipment Maintenance STC WI 011 Processing of Asbestos Contaminated Soils STC WI 012 Soil Rejection Procedure STC WI 013 Soil Disposal Procedure STC WI 014 GCL Pad Maintenance Decontamination Procedures In addition, environmental risks are assessed in detail in the updated Amenity and Accidents Risk Assessment, document ref: 5193-CAU-XX-XX-RP-V-0310 which includes risk management, control and mitigation for site activities and potential accidents i.e. leaks and spills. Storage vessels and containment systems will be in line with the CIRIA 'Containment systems for the prevention of pollution: Secondary, tertiary and other measures for industrial and commercial premises (C736;2014). Bunding will be provided to a minimum of 110% capacity.
	Monitoring
BAT 6	*For relevant emissions to water as identified by the inventory of waste water stream, BAT is to monitor key process parameters at key locations (e.g. at inlet and/or outlet of the pre-treatment, at the inlet to the final treatment, at the point where the emission leaves the installation)*
	Monitoring and reporting of emissions currently undertaken as a requirement of the permit. See the Activities and Operating Techniques report, document ref: 5193-CAU-XX-XX-RP-V-0311 for monitoring requirements and parameters.
BAT 7	*BAT is to monitor emissions to water with at least the frequency detailed in BAT 7 'best available techniques (BAT) conclusions for waste treatment industries (BREF), under Directive 2010/75/EU, from the Official Journal of the EU'*
	See response to BAT 6 and Section 5.5 of this document. Monitoring and reporting of emissions is currently undertaken as a requirement of the permit. There will be no groundwater monitoring required as part of the proposed operations. The waste discharge areas comprise of impermeable pads which drains to a collection pipework so that any runoff will be contained. The water is either be used within the process to maintain optimum moisture levels or discharged to sewer. Basic treatment of this potentially contaminated surface/process water will be undertaken prior to discharge to sewer. The discharge of effluent to sewer is already regulated by the existing permit

	with regards to the treatment of leachate. Emissions to sewer have been assessed as part of the trade effluent/discharge consent and emission limit values have been agreed in the discharge consent. Water monitoring from asbestos soils processing and storage areas at Edwin Richards Quarry in Rowley Regis Mobile Plant operation, a similar site operated by FCC, has not detected asbestos fibres to be present in effluent from asbestos processing areas (see Appendix 5) and therefore, no abatement of asbestos in effluent is proposed for the asbestos in soils treatment pad.
BAT 8	*BAT is to monitor channelled emissions to air with at least the frequency detailed in BAT 8 'best available techniques (BAT) conclusions for waste treatment industries (BREF), under Directive 20/10/75/EU, from the Official Journal of the EU' and in accordance with EN Standards. If EN standard are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.*
	See Section 5 of this document for Monitoring information. Daily visual monitoring to air for dust, litter and olfactory odour monitoring will be carried out on site. Monitoring is undertaken as per the Operating Techniques and requirements of the management system and operational procedures. Given the rural nature of this activity and the existing similar operations on site that have not given rise to complaints (in particular the existing mobile plant deployment at Maw Green STF for the treatment of asbestos in soils), noise modelling is not considered to be required. Noise management has been addressed within the Amenity and Accidents Report, document ref: 5193-CAU-XX-XX-RP-V-0310. Olfactory odour checks are also undertaken daily. Management plans are in place for odour, dust and emissions.
BAT 9	*BAT is to monitor diffuse emission or organic compounds to air from the regeneration of spent solvents, the decontamination of equipment containing POPS with solvents, and the physico-chemical treatment of solvents for the recovery of their calorific value, at least once per year using one or a combination of the techniques given below.*
	N/A
BAT 10	*BAT is to periodically monitor odour emissions*
	Monitoring is undertaken as per the requirements of the management plan, system and operational procedures. The wastes to be accepted are not inherently malodorous although hydrocarbons may produce slight odour - see Amenity and Accidents Risk Assessment (document ref. 5193-CAU-XX-XX-RP-V-0310). As none of the waste is putrescible, odour modelling is not deemed to be required for this installation. The waste types and treatment is not expected to cause odour at levels that will cause a nuisance outside of the permit boundary. An updated Amenity and Accidents Risk Assessment

	(included with the permit variation application under document ref: 5193-CAU-XX-XX-RP-V-0310) outline the techniques that will be employed to control odour. Given the nature of the activity and the odour control techniques that will be in place, the installation is not expected to generate high levels of odour. A suitability qualified person will do a perimeter walk on a daily basis, if the daily walk identifies high levels of odour at the site boundary, the operator will investigate what activities were occurring on site at the time. If the odour proves to be coming from the site, the operator may investigate further operating techniques to control/diminish the odour levels. See Amenity and Accident Risk Assessment (document ref. 5193-CAU-XX-XX-RP-V-0310). The facility will operate in accordance with the odour management techniques in this document and in the existing updated odour management plan already in place at Maw Green STF. All abatement equipment will be in place prior to operations commencing. The operator will operate the facility in accordance with BAT for the sector and will review the operating techniques on an annual basis, upon changes to regulations/guidance or after a substantiated complaint as verified by the Environment Agency. All waste will be thoroughly screened through pre-acceptance checks. Any waste which is likely to cause unacceptable odour will be rejected at this stage. If, upon arrival of waste at the site, the visual checks identify the odour content of waste may cause problems at the site, the waste will either be rejected, or if there is sufficient capacity to immediately treat or safely store the waste, the waste may be accepted. There will be no scrubber liquors associated with the site operations, therefore odours and their controls is not applicable. Regular daily checks will take place for odours on and around the treatment area. If excessive odours are identified, the source of odour will be assessed by the operator. It will be dealt with, for example, by a cessation of soil movement if required or covering of odorous soils with a tarpaulin etc. Observations shall be logged in the database system. Details of odour monitoring parameters are detailed within the existing Odour Management Plan already in place at Maw Green STF and referenced in the Activities and Operating Techniques Report, document ref: 5193-CAU-XX-XX-RP-V-0311.

BAT 11	*BAT is to monitor the annual consumption of waste, energy and raw materials as well as the annual generation of residue and wastewater, with a frequency of at least once per year.*
	Monitoring is undertaken as per the requirements of the management system and operational procedures. The annual consumption of waste, energy, raw materials and the generation of wastewater will be reported on an annual basis. It is considered however that the energy requirements of the operation are not considered to be significant, Specific Energy Consumption (SEC) information is not applicable to the site operations. FCC Environment shows its commitment to energy management through BSI certification to ISO50001. ISO 50001 enables FCC Environment to meet statutory energy efficiency requirements including cutting carbon emissions, lowering energy costs and demonstrating best practice in energy management to customers, employees and other stakeholders. The use of Raw Materials is detailed further in Section 7 of this document. The proposed activity will utilise the following raw materials: • Oil and fuels • Water for misting/suppression system. • Asbestos surfactant additive may be used in water misting system (see Appendix 2 of the Treatment Process Description & BAT Review report ref. 5193-CAU-XX-XX-RP-V-0312). • Sand and activated carbon used as part of the water treatment process. Datasheets for the raw materials will be kept on site. A regular review of raw materials will be carried out as per requirements of ISO14001 environmental management system, this will include quality-assurance procedures, waste minimisation and substitutions for less polluting options. Water requirements for the bioremediation process operations are minimal, rainfall derived drainage water will be used for moisture control where required. Use of mains water or other source of clean water will be used for the misting system around the asbestos process and storage areas. Other areas water use will be restricted to washing plant etc. Usage will be reported on a yearly basis within the annual report submitted to the Environment Agency. Water efficiency objectives will be identified and reported on in an annual basis with an annual report including investigations into water saving technologies. Techniques to minimise water usage will be employed as per requirements of ISO14001 environmental management system.

	Emissions to air
Bat 12	*In order to prevent, or where that is not practicable, to reduce odour emissions, BAT is set up, implement and regularly review an odour management plan, as part of the environmental management system, that includes all of the following elements:* *Protocol for containing actions and timelines;* *Protocol for conducting odour monitoring as set out in BAT 10;* *Protocol for response to identified odour incidents, e.g. complaints* *An odour prevention and reduction programme designed to identify the source(s); to characterise the contributions of the sources; and to implement prevention and/or reduction measures.*
	See response to BAT 10
BAT 13	*In order to prevent or, where that it not practicable, to reduce odour emissions, BAT is to use one of more a combination of the following techniques:* *minimise residence time* *of potentially odorous waste in storage on in handling systems (e.g., pipe, tank containers) in particular in anaerobic conditions* *Using chemical treatment* *Optimising aerobic treatment*
	See response to BAT 10
BAT 14	*In order to prevent or, where that is not practicable, to reduce emissions to air, in particular of dust, organic compounds and odour. BAT is to use an appropriate combination of the techniques given below:* *Minimizing the number of potential diffuse emissions sources* *Selection and use of high integrity equipment* *Corrosion prevention* *Containment, collection and treatment of diffuse emissions* *Dampening* *Maintenance* *Cleaning of waste treatment and storage areas* *Leaks detection and repair (LDAR) programme*
	Dust management will contain the following measures: - • Daily visual monitoring to air and litter.

	• Olfactory odour checks undertaken daily; • Air forced down through the biopiles via the extraction pipework system will pass through a biofilter before being discharged to air; • The waste acceptance procedures and strict contaminant limits in soils will eliminate fugitive emissions of elevated asbestos fibres; • Biofilter emissions to be tested monthly to ensure process parameter are within optimal range; • Provision on site of a water bowser equipped with rain gun, misting and adequate year-round water supply and dust suppression by regular spraying in dry conditions; • Mobile picking station an enclosed unit; • Continuous misting sprays with overlapping spray arcs fitted in the asbestos soils treatment and storage areas of the STF (surfactant may be added to water, see Material Safety Data Sheet in Appendix 2); • Use of uncontaminated water for dust suppression, to avoid re-circulating fine material; • High standards of housekeeping to minimise track-out and windblown dust; • A preventative maintenance programme, including readily available spares, to ensure the efficient operation of plant and equipment; • Minimisation of drop heights during tipping; • Clear delineation of stockpiles to deter vehicles from running over edges; • Effective staff training in respect of the causes and prevention of dust; • Inspection and maintenance of all trafficked surfaces; • Regular compaction, grading and maintenance of haul routes and unsurfaced routes; • Setting an appropriate speed limit; • Fitting all site vehicles and plant with upswept exhausts and radiator fan shields where practical; • Even loading of vehicles to avoid spillages; • Sheeting of haulage loads; • Regular removal of spilled material from site routes. For fugitive, dust and odour emissions, see the existing updated Odour Management Plan already in place at Maw Green STF and the Amenity & Accidents Risk Assessment (document ref: 5193-CAU-XX-XX-RP-V-0310) which assess the risk and mitigation measures in place to reduce emissions to air. As per the company EMS and detailed in the Amenity & Accidents Risk Assessment, maintenance of mobile plant/equipment will be in line with manufacturers specification.

	Plant and machinery will be selected to meet all legislation and statutory guidance on dust/fugitive emission levels and to minimise these from selected equipment and maintained to reduce dust/fugitive emissions where possible. If an equipment is found to generate unacceptable dust/fugitive emission levels, consideration will be given to modifying equipment to incorporate additional dust/fugitive suppression. A LDAR programme is not applicable to the proposed operations at Maw Green STF.
BAT 15	*BAT is to use flaring only for safety reasons or for non-routine operation conditions (e.g. start-ups, shut downs) by using techniques below* *correct plant design* *Plant management*
	N/A to the proposed operations.
BAT 16	*In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use the techniques detailed below:* *Correct design of flaring devices* *Monitoring and recording as part of flare management*
	N/A to the proposed operations.
	Noise and Vibrations
BAT 17	*In order to prevent, or where that is not practicable, to reduce noise and vibration emissions, BAT is to set up, implement and regularly review a noise and vibration management plan as part of the environmental management system.*
	Given the rural nature of this activity and the existing similar operations on site that have not given rise to complaints, noise modelling is not considered to be required. Noise management has been addressed within the Amenity and Accident Assessment, document ref: 5193-CAU-XX-XX-RP-V-0310 of this application. Noise management techniques are employed at the facility as set out in the Environmental Risk Assessment. In summary the site will employ the following BAT recognized techniques: - • Ensuring site roads and surfaces are kept in good working order; • Acoustic dampening of noise generating equipment; • Low level reversing alarms;

	• Plant and machinery will be selected to meet all legislation and statutory guidance on noise levels and to minimise noise levels from selected equipment and maintained to reduce noise emissions where possible; • If an item of plant is found to generate unacceptable noise levels, consideration will be given to modifying the equipment to incorporate noise suppression; • All plant and equipment in use will be regularly maintained to minimise noise resulting from their operation; • Deliveries and pickups from the site will only take place within the stipulated operational hours; and, • Minimizing drop heights when handling material.
BAT 18	*In order to prevent or where that is not practicable, to reduce noise and vibration emissions, BAT is to use of or a combination of the techniques given below.* *Appropriate location of equipment and buildings* *Operational measures* *Low-noise equipment* *Noise and vibration control equipment* *Noise Attenuation*
	See Response to BAT 17
	Emissions to Water
BAT 19	*In order to optimise water consumption, to reduce the volume of waste water generated and to prevent or, where that it not practicable, to reduce emissions to soil and water, BAT is to use an appropriate combination of the techniques given below.*
	There are no emissions to groundwater. The bioremediation operation will not have a dedicated water supply. The wastewater discharge area comprises of an impermeable concrete slab which drains to a collection pipework so that any run off will be contained. This water will either be used within the process to maintain optimum moisture levels or discharged to sewer. Basic treatment of this potentially contaminated surface/process water will be undertaken prior to discharge to sewer. The discharge of effluent to sewer is regulated by a discharge consent for the Maw Green Soil Treatment Facility Emissions to sewer have been assessed as part of the trade effluent/discharge consent and emission limit values have been set. The existing surface water storage tank (installed for composting operation) is used when required for storage prior to treatment plant. All site holding tanks are bunded to 110% and its condition monitored regularly.

	Water monitoring from asbestos soils processing and storage areas at Edwin Richards Quarry in Rowley Regis Mobile Plant operation, a similar site operated by FCC, has not detected asbestos fibres to be present in effluent from asbestos processing areas (see Appendix 5) and therefore, no abatement of asbestos in effluent is proposed for the asbestos in soils treatment pad. Further details of water treatment and discharge monitoring are outlined in Sections 5.4 of this document and in the Activities and Operating Techniques Report, 5193-CAU-XX-XX-RP-V-0311.
BAT 20	*In order to reduce emissions to water, BAT is to treat waste water using an appropriate combination of techniques.*
	See response to BAT 19
	Emissions from accidents and incidents
BAT 21	*In order to prevent or limit the environmental consequences of accidents and incidents, BAT is to use all for the techniques given below, as part of the accident management plan (See BAT 1)* *Protection measures* *Management of incidental/accidental emissions* *Incident/accident registration and assessment system*
	An existing Accident Management Plan is already in place at Maw Green STF. See Section 8 of this document, 'Emergency Procedures' that identifies: - • The likely causes of accidents; • The consequences of such accidents; • Prevention measures in place to reduce the likelihood of accidents; and • How any accidents that do occur will be managed. The potential for accidents and incidents hazards have been assessed and management techniques put in place as per: • Dust & Emissions Management Plan (document ref.5193-CAU-XX-XX-RP-V-0313); • Odour Management Plan (document ref. 5193-CAU-XX-XX-RP-V-0314); • BAT Review (this document); and,

	• Amenity and Accident Risk Assessment (document ref.5193-CAU-XX-XX-RP-V-0310). These documents have been prepared in support of this application, to ensure that in the unlikeliness of the any accidents or incidents occurring, the operator has sufficient contingency plans and management techniques to ensure they will not lead to an impact on the environment. The company Management system includes written procedures dealing with noncompliance. Any non-compliance will be reported to the site manager or foreman immediately. The site manager or their deputy will determine the course of action to be taken in accordance with the procedure. The company Management system includes written procedures for handling, investigating, communicating and reporting environmental complaints and implementation of appropriate actions. These are included in the BSI certification for 'Occupational Health & Safety Management System' (ISO45001) and 'Occupational Health and Safety certificate' (OHSAS 18001).
	Material Efficiency
BAT 22	*In order to use materials efficiently, BAT is to substitute materials with waste*
	The activities on site requires of resources and raw materials as part of the treatment process, See Section 7 'Resources Use – Raw Materials'. There is no change to the resources and raw materials required for the bioremediation process. The following raw materials are required for the asbestos soils treatment process: • Oil and fuels, and use of HVO fuel if possible. • Water for misting/suppression system. • Asbestos surfactant additive may be used in water misting system (see Appendix 2 of the Treatment Process Description & BAT Review report ref. 5193-CAU-XX-XX-RP-V-0312). • Sand and activated carbon used as part of the water treatment process. The operator has in place as per requirement of the ISO140001 Environmental Management system: Procedures for the regular review of new developments in raw materials and any suitable replacements with an improved profile; Quality assurance procedures for controlling the impurity content; and, Waste minimization and less polluting options favoured.
	Energy Efficiency

BAT 23	*In order to use energy efficiently, BAT is to use both of the techniques given below:* *Energy Efficiency plan* *Energy balance record*
	See BAT 11. Energy requirements of the operation are not considered to be significant and there are no buildings proposed that would require energy-efficient services. FCC Environment shows its commitment to energy management through BSI certification to ISO50001. ISO 50001 enables FCC Environment to meet statutory energy efficiency requirements including cutting carbon emissions, lowering energy costs and demonstrating best practice in energy management to customers, employees and other stakeholders. The energy efficiency plan relating to techniques relevant to the installation including operating, maintenance and housekeeping measure are in place and covered under an Environmental Management System. Housekeeping measures including maintenance and operational procedures are in place for all areas of the site where the breakdown of machinery could lead to an impact upon the environment or compromise the operator's ability to undertake normal site activities. These measures will be reviewed every year to determine if additional energy savings could be made and will include: - Switching off equipment when not in use; Careful operation and maintenance of plant & equipment; and, Regular cleaning of plant & equipment.
	General BAT Conclusion for the mechanical treatment of wastes **Emissions to air**
BAT 25	*In order to reduce emissions to air of dust, and of particulate-bound metals*
	See BAT 14
	BAT Conclusions for the mechanical treatment in shredders of metal waste
	BAT Conclusions 26-28
	N/A
	BAT Conclusions for the treatment of WEE containing VFCs and/or VHCs

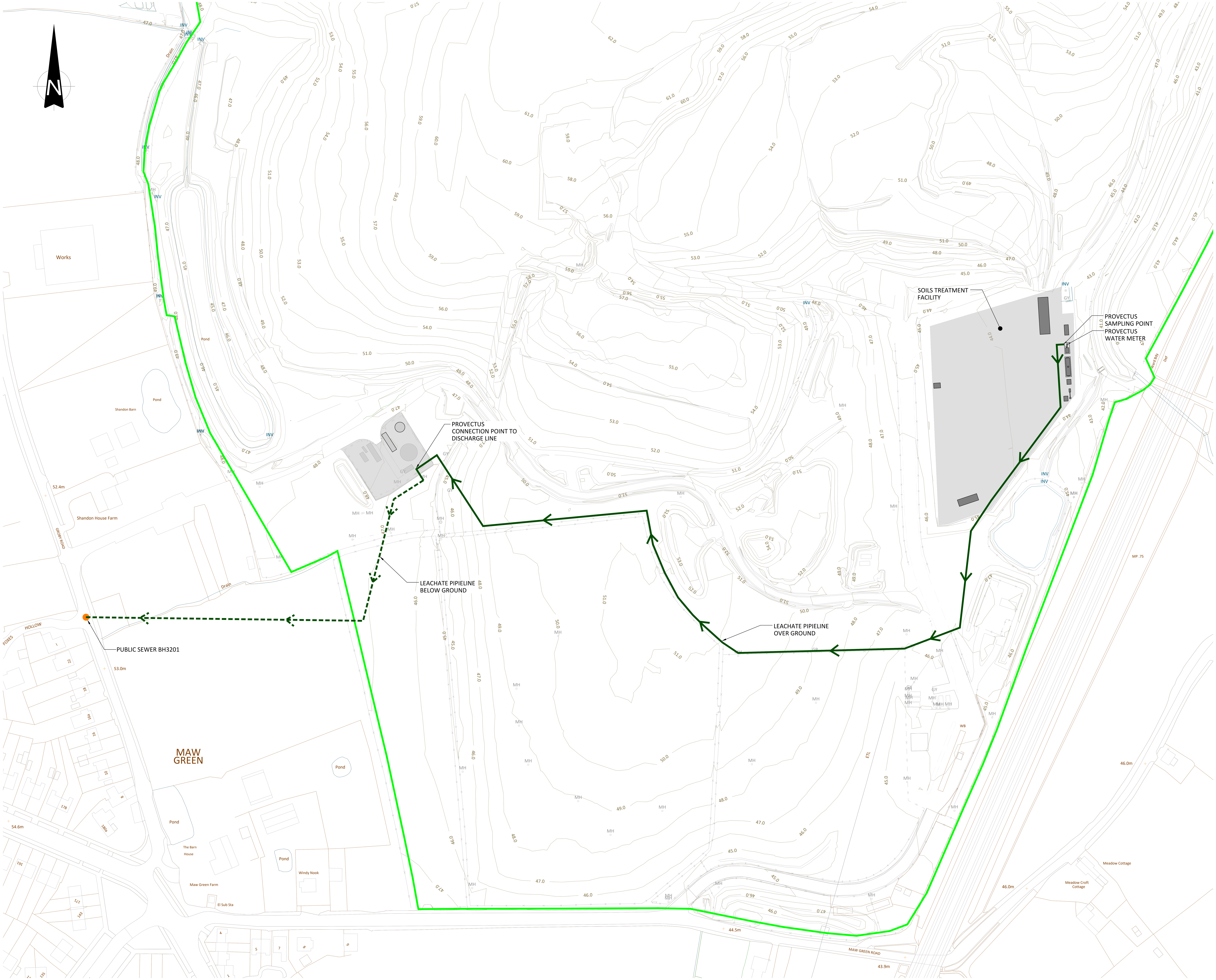
	BAT Conclusions 29-30
	N/A
	BAT Conclusions for the mechanical treatment of waste with calorific value
	BAT Conclusions 31
	N/A
	BAT Conclusions for the mechanical treatment of WEEE containing mercury
	BAT Conclusions 32
	N/A
	BAT Conclusions for the biological treatment of waste
BAT 33	*In order to reduce odour emissions and to improve the overall performance, NAT is to select the waste input.*
	See BAT 2 regarding the pre-acceptance, acceptance and sorting of waste. The existing Odour Management Plan provides detail on odour source inventory – these remain unchanged as part of the variation proposals.
BAT 34	*Emissions to air* *In order to reduce channelled emissions to air of dust, organic compounds and odorous compounds, including H2S and NH3, BAT is to use one or a combination of the techniques given below:* *Adsorption* *Biofilter* *Fabric filter* *Thermal oxidation* *Wet scrubbing*
	See Section 4.1 'Control of emissions' and BAT 8 & 10 regarding the use of biofilter to reduce emissions to air.
BAT 35	*Emissions to water and water usage* *In order to reduce the generation of waste water and reduce water usage, BAT is required to use all of the techniques given below:* *Segregation of water streams* *Water circulation* *Minimisation of the generation of leachate*

	See BAT 3 and BAT 19 Water usage is minimal. Rainfall derived drainage water will be used for moisture control where required. Use of mains water restricted to washing plant etc. The waste water discharge areas comprise of impermeable concrete slabs which drains to a collection pipework so that any run off will be contained. This water will either be used within the process to maintain optimum moisture levels or discharged to sewer. Basic treatment of this potentially contaminated surface/ process water will be undertaken prior to discharge to sewer- a discharge consent is in place for the Soil Treatment Facility, a copy is contained in Appendix 3.
	BAT Conclusions for the aerobic treatment of waste
BAT 36	*In order to reduce emission to air and to improve the overall performance, BAT is to monitor and/or control the key waste and process parameters.*
	For emissions to air see Section 2.0 'Process Description', Section 4 'Control of Emissions'. For detail on monitoring, see Section 5 'Monitoring' and BAT: 6, 7, 8 and 10.
BAT 37	*Odour and diffuse emission to air* *In order to reduce the diffuse emissions to air of dust, odour and bioaerosols from open-air treatment steps, BAT is to use one or both of the techniques given below:* *Use of semipermeable membrane covers* *Adaption of operations to the meteorological conditions.*
	See BAT 10 and BAT 15. See Activities and Operating Techniques Report, document ref: 5193-CAU-XX-XX-RP-V-0311. For fugitive, dust and odour emissions, see the Amenity & Accidents Risk Assessment (document ref: 3982-CAU-XX-XX-RP-V-0310. An existing Odour Management Plan is already in place at Maw Green STF which has been updated. Meteorological conditions will be considered before site activities are carried out, where relevant, operational activities should be minimised during unfavourable wind conditions i.e. wind blowing towards sensitive receptors.
	BAT Conclusions for the anaerobic treatment of waste
	BAT 38
	N/A

	BAT Conclusions for the mechanical biological treatment (BMT) of waste
	BAT 39
	N/A
	BAT Conclusions for the physico-chemical treatment of solid and/or pasty waste
	BAT 40-41
	See BAT 1 and BAT 2. For emissions to air see Section 2.0‘Process Description’, Section 4 ‘Control of Emissions’, Section 5 ‘Monitoring’ and responses detailed in BAT 6, 7, 8 and 10.
	BAT Conclusions for the re-refining of waste oil
	BAT 42-44
	N/A
	BAT Conclusions for the physico-chemical treatment of waste with a calorific value
	BAT 45-47
	N/A
	BAT Conclusions for the thermal treatment of spent activated carbon, waste catalysts and excavated contaminated soil
	BAT 48-49
	N/A
	BAT Conclusions for the water washing of excavated contaminated soil
	BAT 50
	N/A
	BAT Conclusions for the decontamination of equipment containing PCB’s
	BAT 51
	N/A
	BAT Conclusions for the treatment of waste-based liquid waste
	BAT 52-53
	N/A

DRAWINGS

5193-CAU-XX-XX-DR-V-1803	STF Effluent Pipeline
5193-CAU-XX-XX-DR-V-1805	Proposed Site Layout Plan
5193-CAU-XX-XX-DR-V-1806	Dust and Asbestos Monitoring Plan



LEGEND

- PERMIT BOUNDARY
- EFFLUENT PIPELINE ROUTE - OVER GROUND
- EFFLUENT PIPELINE ROUTE - BELOW GROUND
- PUBLIC SEWER BH3201

REV	MODIFICATIONS	BY	RE	AP	DATE
P01	ISSUED FOR INFORMATION	EJD	KB	KB	22.11.21

PURPOSE OF ISSUE: FOR INFORMATION

STATUS: S2

CLIENT: FCC Environment

PROJECT: MAW GREEN LANDFILL

TITLE: STF EFFLUENT PIPELINE ROUTE

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
AS	EJD	KB	KB

DATE	SCALE @ A1	JOB REF:	REVISION
03.11.2021	1:1000	5193	P01

DRAWING NUMBER: 5193-CAU-XX-XX-DR-V-1803

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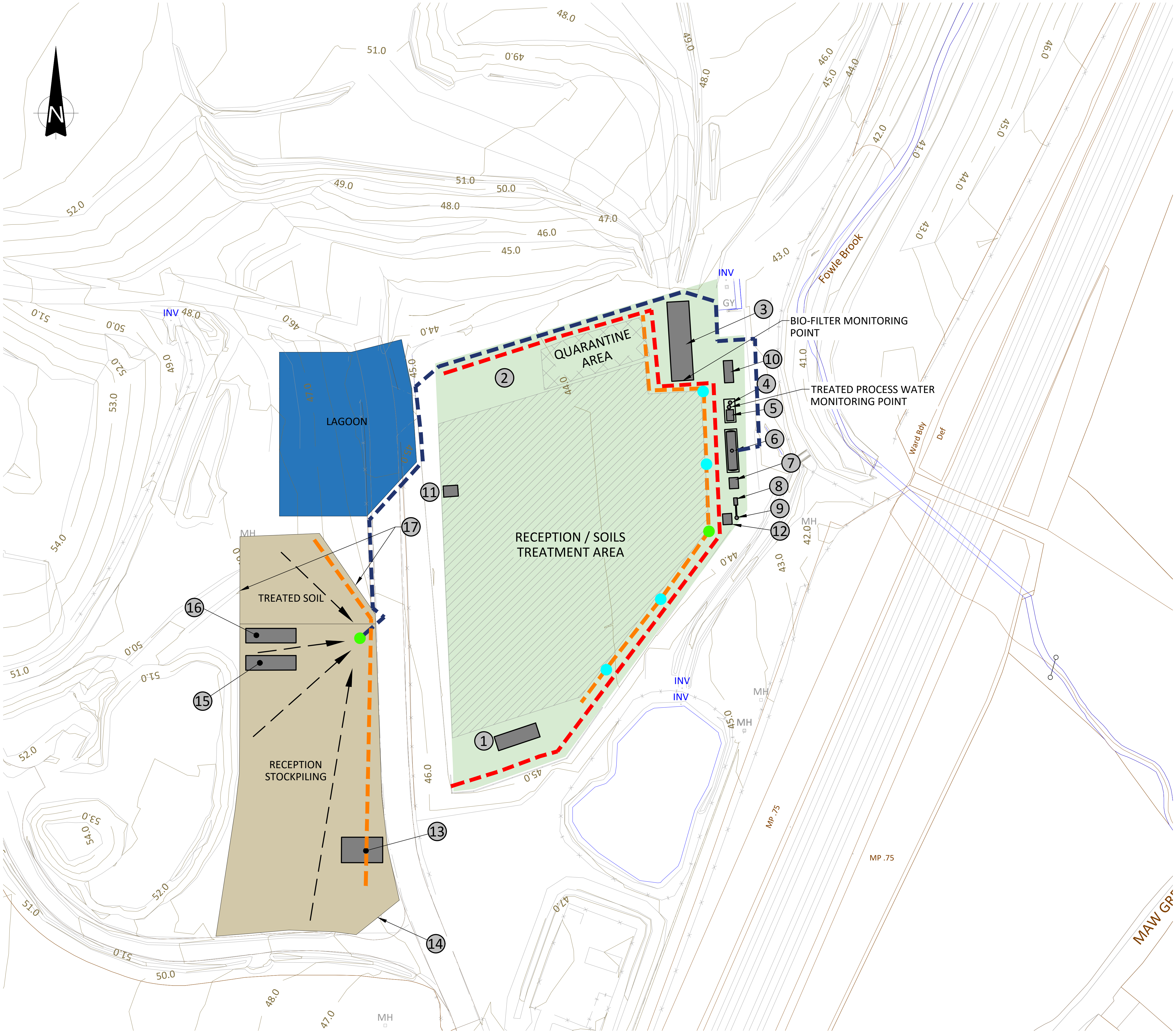

LEGEND

- CONCRETE IMPERMEABLE PAVING
- CRUSHED CONCRETE SITE SURFACING WITH GEO-COMPOSITE CLAY LINER (GCL)
- BOUNDARY KERB LINE
- WATER DRAINAGE PIPE
- DISCHARGE LINE
- FALL OF PAD
- DRAINAGE GULLY
- PUMPING CHAMBER

1. SITE OFFICE
2. NUTRIENT STORAGE
3. BIOFILTER
4. GRANULAR ACTIVATED CARBON FILTERS
5. TRANSFER TANK
6. PROCESS WATER SETTLEMENT TANK
7. 10ft CONTAINER WITH CONTROL PANEL
8. BLOWER
9. AIR WATER SEPERATOR
10. 20ft TOOL STORE
11. FUEL STORAGE
12. 3WV
13. DECONTAMINATION UNIT
14. RECEPTION ENTRANCE AND EXIT
15. SOIL SCREENER
16. PICKING STATION
17. PLANT ENTRANCE AND EXIT

REV	MODIFICATIONS	BY	RE	AP	DATE
P02	UPDATED TO CLIENT INSTRUCTION	EJD	SH	SH	13.12.22
P01	ISSUED FOR INFORMATION	EJD	SH	SH	20.10.22

PURPOSE OF ISSUE: FOR INFORMATION

STATUS: S2

CLIENT: 3C WASTE LIMITED

PROJECT: MAW GREEN SOILS TREATMENT FACILITY PERMIT VARIATION

TITLE: PROPOSED SITE LAYOUT PLAN

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
EJD	EJD	SH	SH

DATE	SCALE @ A3	JOB REF:	REVISION
19.10.2022	1:1000	5193	P02

DRAWING NUMBER: 5193-CAU-XX-XX-DR-V-1805

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LEGEND

- CRUSHED CONCRETE SITE SURFACING WITH GEO-COMPOSITE CLAY LINER (GCL)
- MONITORING POINT

REV	MODIFICATIONS	BY	RE	AP	DATE
P01	ISSUED FOR INFORMATION	EJD	SH	SH	20.10.22

PURPOSE OF ISSUE	STATUS
FOR INFORMATION	S2

CLIENT:
3C WASTE LIMITED

PROJECT:
MAW GREEN
SOILS TREATMENT FACILITY
PERMIT VARIATION

TITLE:
PROPOSED MONITORING PLAN

DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY
EJD	EJD	SH	SH
DATE	SCALE @ A3	JOB REF:	REVISION
19.10.2022	1:500	5193	P01

DRAWING NUMBER
5193-CAU-XX-XX-DR-V-1806

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APPENDIX 1

Operating Procedures

STC – WI001 – QUOTE GENERATION PROCEDURE

Author:	Andy Clee – Ops Man	**Approved By:**	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	**Summary of Changes - Date**	**Date**
6	Slight change in wording	14.12.2022

Introduction

This procedure relates to the measures to be undertaken for the assessment of data from clients and the subsequent generation of quotes for acceptable soils into the Soil Treatment Centre (STC).

A separate User Guide for using the SKYNET software to create a quote is also available.

Principle of Operation

The receipt of enquiries will result in the generation of a quote if the soil meets the acceptance conditions for treatment and subsequently for reuse. In the event that there are samples which contain untreatable contaminants that do not meet the reuse criteria then these will be highlighted on the quote or no quote will be issued to the waste producer.

The STC manager or FCC are to be consulted in the event of any queries relating to the acceptance criteria for waste soils.

Procedure

Pre-Acceptance Assessment

This is undertaken by the Provectus sales manager or project co-ordinator to confirm treatability to meet the reuse criteria. Each job is assessed individually for treatability. Consideration of contaminant concentrations, volumes and soil type are needed to determine the overall impact that the incoming material has on the batch of soil it is to be placed into. Degradation rates for hydrocarbon impacted soils vary depending on their oil ranges, but are typically between 40-95%, batch average concentrations should aim, but are not limited, to be within these limits to allow for effective treatment of materials.
Hazardous and non-hazardous materials are to ideally be treated separately, although on occasion it is more beneficial for the treatment process to mix these materials, for example, using 20 03 03 material as a form of amendment in a hazardous batch of soil.

The concentrations for the reuse of soils is determined by the specific FCC site risk assessment and must be deemed non-hazardous by the FCC compliance team in order to be reused on site.

A set of standard terms and conditions for acceptance are contained within the formal quote sent to the client. Any site-specific terms and conditions need to be included within the notes section of the quote.

The analysis and any accompanying information is to be stored on SKYNET alongside each quote.

Quote Issue and Acceptance

The quote is issued to the client within 24hrs of receiving the enquiry. The price per tonne is to be determined by the sales manager. Any jobs priced lower than £25/t need to be discussed with other senior STC employees. Lower prices may be required to secure soils from larger projects or sites that are a significant distance from the treatment site.

Quotes issued to different clients for the same project shall be recorded as ‘multiple’ quotes on SKYNET to ensure that potential soil volumes in the pipelines are not overestimated.

Quotes raised from FCC client enquiries and any subsequent inputs via FCC will be marked as ‘non-billable’ to ensure invoices are not incorrectly raised for these clients.

After issuing the enquiry the sales manager will undertake a follow up within 3 days to ensure the quote meets the client expectations.

Once the quote has been signed and formally accepted by the client, the sales manager will notify FCC with the following information supplied by the client:

- Site Address:
- Site History
- Contamination:
- EWC:
- Hazardous Property:
- SIC Code:
- Tonnage:
- Price per tonne:
- Site visit attended:

Once this has been approved by FCC internally, they will issue a Waste Summary Form and an authorisation number (DW number) that is to be referenced on all consignment notes relating to that particular job.

Supporting data will be made available to the site manager with the corresponding DW number (provided by FCC) as a basis for compliance checks on loads.

STC – WI 002 - SOIL RECEPTION PROCEDURE

Author:	Andy Clee – Ops Man	**Approved By:**	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	**Summary of Changes**	**Date**
5	Incorporates asbestos reception procedure	16.12.2022

Introduction

This procedure relates to the measures to be undertaken for the assessment of data and inspection of waste received at the soil treatment facility. It allows rejection of non-conforming waste to ensure no contaminated soils are accepted which cannot be treated by the treatment facility to a standard suitable for reuse, or which breach the list of permitted wastes as shown in the site's Environmental permit.

Principle of Operation

The inspection will allow the following to be assessed prior to acceptance:

1. Presence of untreatable and hazardous materials (e.g. tars, clinker, asbestos insulation etc.) in the contaminated soil.
2. Presence of excessive litter/debris in the contaminated soil.
3. Compliance with the previously supplied chemical/physical analysis information (supplied by waste producer).
4. Potential for the waste to behave as a liquid or have free water/oil in the waste

If the waste material is not compliant with the agreed conditions of the Environmental Permit and pre-acceptance assessment, then the waste will be declined/rejected. As a note, if the STC is permitted to accept asbestos the forms of untreatable asbestos described in point 1 are predominantly insulation products as follows in Table 1.

Table 1. Unacceptable Forms of Asbestos Insulation Products

Form of asbestos	Example
Asbestos pipe lagging	
Loose asbestos fill	

Asbestos insulation board (AIB)	

Procedure

Pre-Acceptance Assessment

Pre-acceptance is undertaken by Provectus to confirm treatability to meet the reuse criteria. A set of Terms and Conditions for acceptance are sent to the Waste Producer/client including a clear statement of any waste characterisation samples that are deemed untreatable. These are agreed in writing between the Waste Producer/client and Provectus prior to an authorisation number (contract line) being issued by FCC at the weighbridge for deposit at the Soil Treatment Facility.

Where data gaps exist or queries remain about the suitability of material for treatment, Provectus or FCC will offer to attend the site of origin to undertake pre-acceptance analysis and visually inspect the material and obtain further information about the waste description. Alternatively, the material may be quarantined on arrival at the STF and subject to further testing.

If the moisture content of the material is >30% then the potential for free water or oil will be further reviewed. Where moisture contents are at this level and the material does not behave as a liquid, have the potential for releasing water/oil etc and is suitable for the site infrastructure then it would be accepted on a case by case basis. Material must be able to support its own weight and ideally be able to be formed into a larger batch.

Should either Provectus, or after consultation, FCC determine that there is the high potential for material to contain untreatable inclusions or to behave as a liquid or contain free water or oil then the waste will be rejected for acceptance.

Duty of Care Documentation

No tipping on the STC will be permitted without relevant duty of care documentation from the waste producer. With this information, the job can be set up with FCC and a DW number issued to the client. All loads must be accompanied wit the correct paperwork which must be checked on-site at the STC to ensure that the load is indeed destined for the STC, and that the documents are correctly completed. The consignee section of Consignment notes, for hazardous waste, and waste transfer notes for non-hazardous waste, shall be completed by Provectus at the STC once the load has been deemed acceptable by the STC site manager.

Health and Safety

The STC manager is to provide guidance on where the soil is to be tipped, and any relevant safety information prior to tipping of soil. On STC’s where asbestos is permitted, it is crucial that loads are placed in the correct tipping areas.

Technicians and site personnel are to stand well away from the lorry when tipping to avoid any crush injuries/incidents as a result of being in close proximity to the tipping lorry. Any drivers must be informed of the requirement to wear a hard hat and high visibility vest when outside of the lorry cabin.

Lorries shall be informed to check that any waste/debris is removed from their lorry prior to leaving the STF.

If loads are to be tipped into the asbestos area, then additional site-specific driver rules apply and must be adhered too.

Visual Inspection: Waste Input

The following locations will be used for accepting wastes:

- Hydrocarbons only: biopile treatment area
- Asbestos only, or asbestos and hydrocarbons: designated asbestos processing area

The following plant and personnel are required as part of this procedure:

- Provectus STC manager
- Excavator

Each load of soil for inspection (new jobs) will be tipped onto the designated area. The STC manager will inform the tipper lorry driver to remain at the tipping area until the inspection has been completed.

<u>In the event of the material containing free water or oil, the load will be immediately rejected.</u>

<u>In the event of untreatable forms of asbestos being present, the load will be immediately rejected</u>

<u>If the STC is not permitted to accept asbestos, any asbestos found will result in a rejection</u>

The excavator will be used to expose any unsuitable materials and allow a comprehensive visual assessment. The technician will determine the next action when this has been completed, this will comprise of the following:

- Waste is accepted and tipper lorry is permitted to leave the STF with the accompanying paperwork, or;
- Waste is not accepted and the unsuitable element of waste load, either partial or complete load is removed by excavator and placed back into the tipper lorry. A rejection form is filled in on-site and both Landfill Manager (LM) and Sales Manager (SM) are informed. It is the duty of FCC to inform the Environment Agency of any rejected loads.

At the end of the formal waste acceptance procedure the soil will be prepared for processing or biotreatment. Coordination of further treatment/processing events is to be decided by the STC Manager.

Continual visual inspections are to be made by the trained excavator operator who is to inform the STC manager of any material that may be deemed unsuitable.

Chemical Analysis: Waste Input

Based on visual inspection, sampling frequency will be considered; this is in relation to the volume from each hazardous waste production site. Sampling will be undertaken on soils using composite sampling methods described in BS812.

The chemical analysis of soils generally takes 5-7 days to complete, therefore limited storage times are required. Materials will be placed into treatment as soon as practicable from the receipt of chemical analysis and formal acceptance of the waste.

The range of contaminants for analysis will be based upon the original contaminating substances. A copy of the analysis shall be checked by the STC operations manager for verification against the original client data. In the event of non-conformity, the STC operations manager shall liaise with the STC sales manager, and a decision on the next course of action will be taken.

For avoidance of doubt, the limits for asbestos from laboratory testing will be as follows:

- Chrysotile only: 0.1%
- Other forms of asbestos (or chrysotile and others): 0.01%
- Asbestos debris limited to those which can be removed as Notifiable Non-Licensed Works (NNLW) if the site is permitted to accept asbestos.

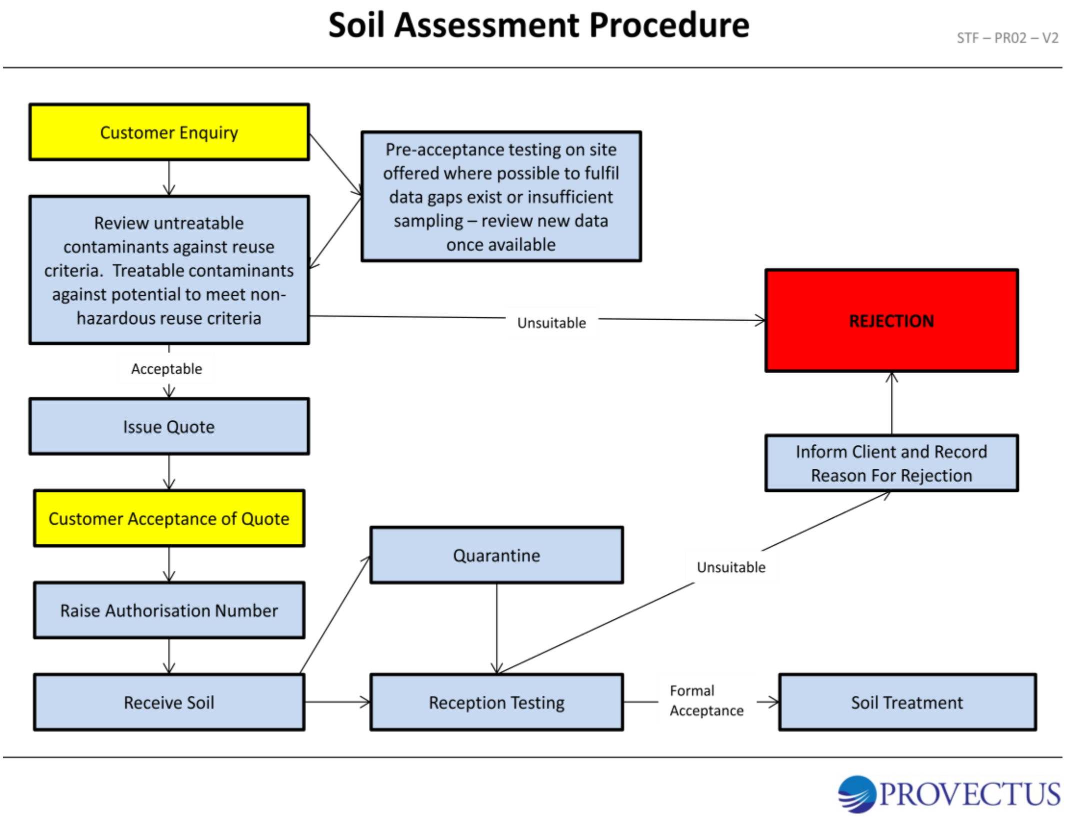
The waste will only be formally accepted once reception analyses are received and approved in accordance with Soil Assessment Procedure illustrated in STC-PR02-V2 (Figure 1) below.

Summary of Waste Reception

Figure 1 is a flow diagram for the waste reception procedure. The procedure is implemented to ensure that the waste is only formally accepted once visual inspections and chemical analysis of received wastes have been successfully completed. This ensures that any soils that are formally accepted are suitable for further soil processing/treatment. All non-compliant wastes will be rejected.

Figure 1. Summary of Waste Acceptance Procedure

STC-PR02-V2



STC-PR02-V2

STC – WI 003 - SOIL CHARACTERISATION PROCEDURE

Author:	Andy Clee – Ops Man	**Approved By:**	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	Summary of Changes	Date
8	Slight change in wording	14.12.22

Introduction

This procedure relates to the measures to be undertaken for the sampling of soils received at the STC. See procedure STC – WI 002 Soil Reception for background information.

Objectives

The main objective of the operation is to ensure soils received at the Soil Treatment Centre (STC) are visually, structurally, and chemically similar to those described by the waste producer/client during pre-acceptance, and therefore compliant with the Environmental permit and suitable for treatment and reuse. This will allow any non-conforming waste to be rejected.

Procedure

The sampling of soils will be performed by the STC technician or STC site manager. The procedure follows composite sampling methods as described in BS812.

A minimum of at least one composite sample must be taken from each job (unique authorisation code/DW number) and at the frequency highlighted in Table 1 below.
Chemical testing is undertaken to ensure that the material being tipped is consistent with the analysis and description provided by the client at the pre-characterisation stage. It also checks to see if the material remains consistent throughout the project.

Table 1: Requirements for sampling:

Volume of soil (t)	No. of samples needed (before or during acceptance at STC)
< 100	1
100 - 500	2
500 +	2 + 1 for every 500t

The general suite of analysis for soils shall include:

- pH
- CLEA Metals
- Total TPH
- Total PAHs
- Total Cyanide

- Phenols
- SVOCs and VOCs (where required)
- PCBs (where required)
- Asbestos (screen and quantification where asbestos is identified)
- Moisture content

These parameters may be adapted by the STC operations manager or FCC compliance due to prior knowledge of contaminants derived from client waste description, history and data.

Liquid oil phase wastes are not permitted for treatment at the site.

All analysis will be undertaken by a UKAS/MCERTS accredited laboratory using accredited methods.

Once the analysis results are received, they will be assessed by a suitably qualified and experienced STC manager to confirm they meet the requirements for treatment. These results are to be stored electronically onto the STC server.

Where possible, the soils are to be placed into a batch with similar contamination level. The receiving batch has contaminant limits (these are not contaminant limits for soil inputs which can vary and exceed the average batch limits). The hydrocarbons in the batches will be limited to an average as shown in Table 2.

Concentrations for inorganics to be reviewed in accordance with WM3 (Jan 2021).

Asbestos concentrations to be assessed using criteria in Table 3.

Should the results not conform to the requirements for treatment the waste will be rejected following the formal rejection procedure.

Table 2. Maximum Average Contaminant Concentrations for Receiving Batch

Substance	Carbon Range	Lower Elimination Rate	Upper Elimination Rate	Maximum average batch concentration (lower level) - mg/kg	Maximum average batch concentration upper level) - mg/kg	Comments
Petrol range organics	C6-C10	95%	99%	20,000	100,000	Limited by odour potential
Diesel	C10-C25	60%	90%	2,500	10,000	Target of below 1,000mg/kg for reuse even though diesel is only hazardous at 1% (10,000mg/kg)
Lube Oils	C25+	40%	65%	1,667	2,857	Review age of spill and soil type before assessing which elimination rate to use
Unknown Oil	C10+	40%	80%	1,667	5,000	Review age of spill, source and soil type before assessing which elimination rate to use
PAHs	C10+	30%	90%	1,429	10,000	Limited by odour potential
Phenols	C6+	90%	99%	10,000	100,000	Limited by odour potential
Solvents	C2+	95%	99%	20,000	100,000	Limited by odour potential
VOCs	C2+	99%	99%	100,000	100,000	Limited by odour potential

Table 3. Maximum Asbestos Contaminant Concentrations for Treatment

Substance	Maximum concentration (%)	Comments
Chrysotile	<0.1%	Bound forms of ACM only
Amphibole ACM Types	<0.01%	Bound forms of ACM only
Asbestos insulation/unbound asbestos	Absent	No acceptance of any form of asbestos in friable/insulation form

STC – WI 004 - SOIL TREATMENT AND MONITORING PROCEDURE

Author:	Andy Clee – Ops Man	**Approved By:**	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	**Summary of Changes**	**Date**
5	Wording changes	14.12.2022

Introduction

This procedure relates to the monitoring of the soil treatment process undertaken by Provectus. The purpose of the treatment is to reduce concentrations of certain contaminants within a soil, prior to its reuse by FCC. This shall form, in conjunction with other routine observations, the monitoring programme for the soil treatment process.

Principle of Operation

Certain process parameters are vital for Provectus' soil treatment system to operate successfully; hence regular and frequent inspection and assessments must be made of these process parameters, in order to monitor the performance efficiency of the soil treatment process and allow for alterations to be made as required.

Procedure

A weekly equipment follow-up sheet shall be filled in by the Soil Treatment Centre (STC) technician or site manager. This record shall be entered on the STC server and/or site files and compared to previous follow-up sheets, by the STC site manager, to highlight any significant short-term changes in the operational parameters. Additionally, the long-term performance efficiency can be monitored. Any necessary re-adjustments can be discussed and agreed with the STC operations manager, this advice/instruction at the earliest possible time or at the agreed time to improve efficiency.

"In-process" soil sampling of batches, in accordance with procedure STC WI 003, shall be undertaken. The location and frequency of this "in-process" sampling is decided at the discretion of the STC site manager. This soil analysis shall provide information relating to concentrations of pollutants and nutrient availability within the soil batch. From this information, the degradation of contaminants over time may be observed and any follow up actions, such as additional amendments or "turnovers" (as per STC WI 005) or further testing, can be made by the STC operations manager and STC site manager. All operations undertaken on the batch of soil shall be recorded for future reference.

In process samples should be submitted for the following analytical tests:

- Moisture content
- pH
- Ammoniacal nitrogen
- Nitrate
- TPH
- Other analytical tests may be scheduled by the site operations manager or site manager of case by case basis

Analysis results shall be entered on to the STC server and thus electronically recorded as part of the quality control procedure.

On a daily basis, visual monitoring of equipment, including plant, and soil biopiles shall be undertaken. Equipment modules will be inspected every morning and evening upon module opening and closing respectively. Noise, vibration and temperature observations of equipment shall also be executed at these times.

Daily site walk-overs shall be conducted by the STC site manager in order to monitor for potential leaks in pipework and water conduits. Weekly checks of airflow in secondary pipes for flowrates and temperature (plus any other site specific requirements) shall be undertaken by the STC site technician. Water filters/strainers shall be cleaned once weekly or as required.

STC – WI 005 - SOIL TURNOVER

Author:	Andy Clee – Ops Man	Approved By:	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	Summary of Changes	Date
5	Minor alteration to wording	14.12.2022

Introduction

This procedure relates to the periodic process referred to as 'turnover', which is an important and necessary undertaking for the treatment of soils at the Soil Treatment Centre (STC). The process improves air flow through the soil by decompaction and allows soils to be inspected as part of the overall treatment programme. It consists of moving soil sections in a batch/biopile, using an excavator, to an adjacent piping section of the biopile. Occasionally a turnover is conducted *in-situ*, *i.e.* - the soil is moved around within the section it already occupies. This is typically done when there is no spare room to relocate the soil. The biopile is also effectively inverted in order to perform a more homogeneous treatment.

Principle of Operation

There is no set pattern of frequency for a turnover, since it is usually dependent upon soil-specific characteristics, and will often follow the receipt of 'in-process/interim' chemical analysis undertaken on soil sampled from the biopile. The programme for the soil turnover events shall be determined by the STC manager, in conjunction with the STC operations manager. A turnover may involve the addition of one or more types of amendments into the soil and will usually entail movement along the treatment pad to form a new similarly shaped biopile.

Procedure

The operation shall only be carried out by trained and competent excavator drivers, under the supervision of Provectus personnel. Before any soil is moved on to new secondary pipes, the new pipe must be covered with gravel, typically, though not exclusively 20-40mm clean gravel; formed into an apex above the centre line of the secondary pipe, giving a triangular profile. This is to allow for even flow of air and to prevent holes from blocking up.

Trenches created during the turnover shall be always made safe with a 1 in 1 batter (45° slope) and regular checks will be undertaken by the STC manager to ensure this is occurring.

During the turnover, underlying secondary pipes may be damaged, when this occurs the area around the damage must be made safe to allow access by STC site technicians so repairs can be made. The STC manager is to be informed prior to the repair taking place to ensure it is safe to do so. The damaged section of pipe shall be removed, disposed of and replaced; it must not be left in the biopile. Gravel will be reinstated on the new pipe section prior to continuing with the soil turnover. During any pipe repairs the excavator driver shall act as a top man on top of the biopile to ensure no access is permitted to the pipe repair area by unauthorised personnel.

Any operation, turnover or amendment added to the batch shall be recorded electronically onto the SKYNET system, in compliance with Provectus' quality control system.

STC – WI 006 - SOIL ANALYSIS

Author:	Andy Clee – Ops Man	**Approved By:**	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	Summary of Changes	Date
5	Minor alteration to wording	14.12.2022

Introduction

This procedure relates to the measures to be undertaken for the testing of soils treated at the Soil Treatment Centre (STC). This ensures that soils are suitable when received, maintained in optimal treatment ranges, and are validated in accordance with the permit. Once treatment is complete soils may be reused in several ways depending on the site. This includes quarry backfill works or restoration soil for the landfill site.

Principle of Operation

The main objective is to ensure, in accordance with the Environmental Permit, that any soil treated by Provectus is reused in a safe and environmentally acceptable manner. Quality control measures are implemented in order to prevent the reuse of soils to destinations either unintended, or unsuitable for the receipt of such soils. This operation is performed in conjunction with FCC, who operate the sites where the soils shall be reused.

In-treatment batches of soil are monitored periodically as described in STC WI 004. When a batch of treated soil displays strong chemical evidence of meeting a non-hazardous reuse standard, a 'validation' sample is to be taken and used to generate a data report. This is to be reviewed by the STC operations manager and can then be sent to FCC to be formally approved for disposal.

Validation sampling is to be carried out by the STC site technician or site manager, using a grid formation sampling plan. As a general rule one composite sample should be taken for every 500t.

The reception and validation samples should be submitted for the following analytical tests –

- Metals (As, B, Cd, Cr, Cu, Pb, Hg, Ni, Se & Zn)
- pH
- Speciated TPH (including BTEX)
- Speciated PAHs
- Phenols
- Total Sulphate
- Elemental sulphur
- Free Cyanide
- Total Cyanide
- Asbestos screen

Dependent on the contaminants of concern it may be necessary to request further parameters for testing on validation. Leachate analyses are required for reuse of soils in the restoration part of the landfill in accordance with the agreed risk assessment.

Procedure

Once the soil batch has been analysed by an accredited laboratory, and the results reviewed by the STC operations manager; a validation report shall be complied with information regarding soil volumes, validation analysis results, soil origin and ultimate destination. This shall be communicated to both the FCC Waste Assessment team and to the FCC site manager for approval and so that provisions can be made for the transfer of soils to the approved destination. The validation report and any supporting information shall be stored on the STC server.

STC – WI 007 – ENVIRONMENTAL MONITORING

Author:	Andy Clee – Ops Man	**Approved By:**	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	**Summary of Changes**	**Date**
6	Minor wording change	14.12.2022

Introduction

This procedure relates to the measures to be undertaken for environmental monitoring at the STC, in order that all emission points are regularly monitored to ensure that the operation is compliant with the conditions of the Environmental Permit. This procedure does not replace any general monitoring of the site undertaken by FCC.

Principle of Operations

The main objective of the operation is to monitor and record the emission points on the STC. These included, but are not limited to the following:

- Air emissions from the biofilter (see WI 008 for further detail).
- Material measurements from the biofilter (see WI 008 for further detail).
- Water quality from the water discharge point at the STC (see WI 009 for further detail).
- Dust concentrations in air at the STC.
- PID measurements for Volatile Organic Compounds (VOC) at the STC.
- Noise assessment
- Odour assessment

Procedure

Site environmental monitoring aims to ensure compliance with the Environmental Permit as well as our internal procedures for PPE and RPE.

Process Emissions

The point emissions from the STC include process wate, air emissions from the biofilter, dust and odour from general site works. The monitoring for these processes includes:

- Biofilter sampling (from exhaust vents only).
- Process water sampling.
- Visual and olfactive assessment for dust and odour on site at Environmental Monitoring Locations.
- Dust monitoring at locations Environmental Monitoring Locations.

Environmental monitoring locations (EML) are specific for each site and are shown on individual site plans within the site files.

Biofilter Monitoring

The procedure for biofilter monitoring is documented in STC – WI 008.

Process Water Monitoring

The procedure for process water monitoring is documented in STC – WI 009.

STC Dust Control

Monitoring shall be done daily on a visual basis in addition to independent dust measurement carried out by nominated laboratory/subcontractor through on site frisbee gauges. Sampling locations are shown on site plans located within the site files.

Dust suppression is to be undertaken when soil movement is generating excessive dust, this includes traffic movements and soil turnovers. Measures for this are included within the Site-Specific Working Plan submitted to the Environment Agency. The source of dust will be identified and the operation creating a dust presence ceased. Mitigation measures will include the use of the on-site water bowser with spray rail and sweeper brush or equivalent.

PID Measurements

A photo-ionisation detector (PID) shall be used on a weekly basis at the Environmental Monitoring Locations and near the biofilter to quantify gaseous emissions. If PID readings for Benzene exceed 1ppm (based on EH40 guidance), then the source shall be identified and assessed by Provectus. It will be dealt with, for example, by increasing PPE and RPE levels on site, a cessation of soil movement or covering of odorous soils with a tarpaulin or woodfines etc.

If site activity involves the movement of soil that has been identified as having high levels of VOC's which may be harmful to personnel working in the vicinity or other off-site receptors, then PID and benzene monitoring shall occur on a daily basis.

Results shall be stored on the STC server and/or site files.

Noise Measurements

Weekly observations relating to excessive noise incidents shall be recorded in the STC server and/or site files.

STC Odour Control

Daily observations and weekly recorded checks will take place for odours on and around the treatment area. If excessive odours are identified, the source of odour will be assessed by Provectus and the site specific odour management plan should be consulted. On site odours will be dealt with, for example, by a cessation of soil movement if required or covering of odorous soils with a tarpaulin or woodfines etc. Observations shall be logged on the STC server and/or site files.

Recording of Results

All analytical results and monitoring results shall be stored onto the STC server and/or site files. Any changes made to the type of monitoring or adjustment to the biofilter shall also be recorded here.

STC – WI 008 – BIOFILTER OPERATION AND MONITORING

Author:	Andy Clee – Ops Man	**Approved By:**	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	Summary of Changes	Date
5	Change in wording for BF replacement	14.12.2022

Definitions and Abbreviations

VOC – Volatile Organic Compound
TPH – Total Petroleum Hydrocarbon
PAH – Polycyclic Aromatic Hydrocarbon
BTEX – Benzene, Toluene, Ethyl Benzene, Xylene

Introduction

This procedure relates to the measures to be undertaken for the regular monitoring of the quality and performance of the biofilter located on the STC. The biofilter is a compost mixture, acting as a natural filter medium for exhaust gases from the treatment pads. Its function is to absorb and control exhaust gases, including VOCs, TPHs, PAHs, and BTEX. In order to maintain moisture and temperature levels and to maximise process efficiency, the biofilter will normally kept under a tarpaulin cover. Both visual inspections and chemical analyses will constitute the quality control procedure relating to biofilter performance.

Principle of Operation

Air and process water are drawn from the treatment pads, *via* secondary pipes, into a primary pipe. This mixture then enters an air-water separator, where water is separated from the air fraction by gravity. This air fraction is then extracted through a treatment module, and eventually exhausted to the biofilter.

In order to maintain a moisture film on the matrix of the biofilter, re-circulating process water may be pumped periodically onto the surface of the biofilter. The moisture film must be maintained in order to facilitate desorption of organic gases onto the biofilter matrix. This, in conjunction with periodic visual inspections, decompaction, re-fertilisation and replacement techniques; ensures the continuing operation of a high-performance biofilter at the Soil Treatment Centre (STC).

Procedure

As part of the quality control system for the STC, Provectus will replace or “top up” the biofilter media on an annual basis unless gas analysis results show that the biofilter is still operating efficiently. This will involve the removal of the existing biofilter media and replacement with a similar material. The biofilter shall be turned, in a similar way to that described for the biopiles, on a recommended 6 monthly period or as required dependant on analytical results. At this point, if necessary, manual spraying of the biofilter *via* a transfer hose assembly from the water collection tank may be undertaken. Any such additions of water, turnovers and replacements shall be recorded as part of the quality control system on the STC server and/or site files. Physical monthly samples shall be taken from the biofilter to assess the moisture content and structure of the material. Other parameters such as pH, grain size, exchangeable ammoniacal nitrogen and phosphorus are also to be tested monthly.

Sampling of the gases directly exhausted from the biofilter will be undertaken as required by the Environmental permit for the site and sent to an independent laboratory. The parameters to be tested are described in the site specific Environmental permit, typically this includes VOC's, TPH, BTEX and PAH.

Result shall be reviewed by the STC operations manager and STC site manager and stored onto the STC server and/or site files.

STC – WI 009 – PROCESS WATER MONITORING

Author:	Andy Clee – Ops Man	**Approved By:**	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	Summary of Changes	Date
5	Change in wording	16.12.2022

Definitions and Abbreviations

VOC – Volatile Organic Compound
TPH – Total Petroleum Hydrocarbon
PAH – Polycyclic Aromatic Hydrocarbon
BTEX – Benzene, Toluene, Ethyl Benzene, Xylene

Introduction

This procedure relates to the monitoring of process water from the biotreatment area and asbestos area (if applicable) at the Soil Treatment Centre (STC). The water treatment system is designed to reduce the concentrations of suspended solids, TPH/BTEX, PAHs and VOCs from from the biotreatment pad and asbestos area (if applicable) prior to discharge.

The standard layout of the water treatment system is provided in Figure 1 and comprise of:

- $54m^3$ primary settlement tank and transfer pump
- Oil water separator/secondary settlement tank and transfer pump
- Sand/carbon vessels in series
- Water discharge meter
- Discharge sampling point on effluent pipe to foul sewer

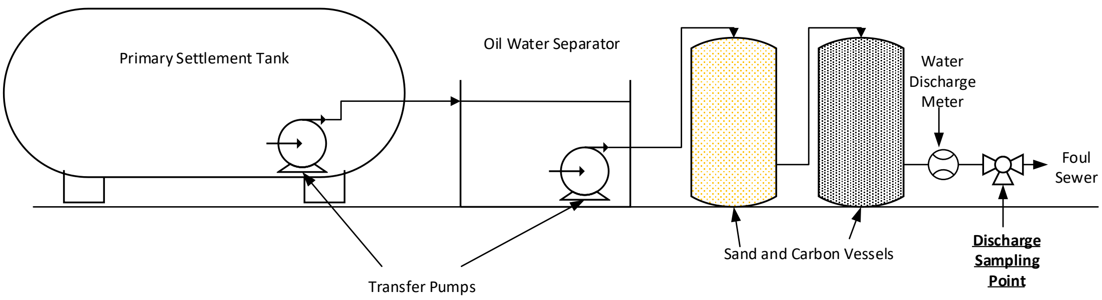


Figure 1. Standard Water Treatment System

Principle of Operation

Air and process water are drawn from the treatment pads, *via* secondary pipes, into a primary pipe. This mixture then enters an air-water separator, where water is separated from the air fraction by gravity. This air fraction is then extracted through a treatment module, and eventually exhausted to the biofilter.

The water is pumped to the primary settlement tank (Figure 1). On the Biotreatment pad and in the asbestos shed (if applicable) there are drainage gullies that intercept water run-off. Water collected in these drainage gullies is pumped directly into the primary settlement tank.

Water in the primary settlement tank is pumped into the oil-water separator/secondary settlement tank and then into the sand/carbon filters. The treated water leaves the carbon vessel and is discharged into foul sewer under consent – this is sometimes via a final holding tank.

Procedure

As part of the quality control system for the STC, Provectus will sample the treated water on a monthly basis to provide analytical results to FCC to pass onto the Environment Agency at the frequency required by the Environmental Permit.

The analysis results are to be compared with the contaminant limits on the discharge consent (Appendix 1) immediately upon receipt by the STC site manager and STC operations manager, with results recorded on the STC server. Any parameters that are found to be close to the discharge consent limits shall result in an action plan being created by Provectus. If any exceedances occur, then the discharge shall be stopped immediately until further investigations/alterations are made to the treatment system as well as additional sampling.

STC – WI 010 – PAD AND EQUIPMENT MAINTENANCE

Author:	Andy Clee – Ops Man	**Approved By:**	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	**Summary of Changes**	**Date**
5	Included settlement tanks in equipment	16.12.2022

Introduction

This procedure relates to the operations required to keep the Soil Treatment Centre (STC) fully functional, including maintaining an efficient and safe method of working. This maintenance comes under the remit of Provectus' quality control system. It is also seen as a desirable health and safety practice, since it incorporates measures which control the possibility of equipment, plant and permanent installations presenting dangers to operatives by entering a state of disrepair and untidiness.

Principle of Operation

The main aim is to ensure that the process performed at the STC is safely operating at a high level of efficiency, including the reduction of potential infringements. It is undertaken to keep the STC in a clean state of appearance, and to provide a safe working environment for all employees and other operatives in the vicinity of, and within the boundaries of, the STC.

Procedure

There is no specific, set procedure that can be listed to cover general maintenance. It comprises of constant visual monitoring of the state of the biopiles, soil treatment pad, equipment and any such areas of operation on the STC. Such things included in this operation are:

- regular monitoring checks and maintenance on equipment (including plant)
- tidy deployment of tools and equipment
- stockpiles of soils, gravels, amendments and materials kept in a safe and organised form
- the on-site office/decon area shall be cleaned as required
- the edges of the biopiles shall be kept clean and tidy
- the kerbs, drains and sumps along the edges of the biopiles and within the treatment area shall be regularly purged of any debris
- use of a road sweeper and water bowser with spray rail as required

The use of earthworks plant shall be used keep the treatment pads and associated areas clean. All of the procedures listed above shall be particularly observed during any operations on the STC, namely soil deliveries and the formation of biopiles, turnovers and soil removal for subsequent disposal.

As part of a good traffic management system, the regular maintenance of signs shall also be undertaken. The levels on the pad shall be visually monitored for differential settlement. Any potholes or deformation of the pad or associated roads will be reported to the STC operations manager and the matter resolved within an appropriate timescale.

Air/Water, Oil/Water, settlement Tanks and Carbon Filter Maintenance

It is important that the air/water separator (AWS), oil/water separator (OWS) and settlement tanks are regularly monitored and maintained with associated sumps cleared of sludge to maintain water treatment to an acceptable level to achieve foul sewer discharge consent.
Sludge removal of the AWS and OWS is to be done on a regular basis (recommended every six months or as required) by an external VAC tanker contractor.

Carbon and sand vessel pressure levels are to be checked weekly replaced/backflushed where possible. Water quality results are also to be used to help indicate when media needs to be changed within the carbon vessels.

The STC site manager is to ensure systems are correctly shut down prior to any maintenance work commencing and they are also responsible for supervision of any maintenance contractors whilst on site. Once complete the STC site manager is to ensure the treatment system is tested and fully operational. All maintenance records are to be recorded on the STC server and/or site files.

STC – WI 011 – PROCESSING OF SOILS WITH VISIBLE ASBESTOS DEBRIS

Author:	Andy Clee – Ops Man	**Approved By:**	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	**Summary of Changes**	**Date**
8	Change of wording	16.12.2022

Definitions and Abbreviations

ACM – Asbestos Containing Materials
NNLW – Notifiable non-licensed works

Introduction

This procedure relates to the measures to be undertaken for the removal of visible ACM fragments from soil received at the STC if permitted to do so. The purpose of the removal of asbestos debris would be to allow further treatment of soils by biotreatment or to stockpile processed soils for disposal in the non-hazardous void or to be reused as part of the landfill restoration scheme.

Principle of Operation

The general principle of the operation is to receive and treat soils at the site with visible asbestos fragments that would be classified as hazardous waste under Environment Agency guidance WM3.

The aim of the processing works would be to remove visible asbestos fragments from the soil to facilitate direct reuse in the adjacent non-hazardous void, to be reused as part of the restoration scheme on the landfill, or for further biotreatment to reduce hydrocarbons to concentrations suitable for reuse as described above.

Pre-acceptance checks and analysis of the received soil and processed soil will ensure that no unsuitable soil is received at the facility either for treatment or reuse in the non-hazardous void or restoration scheme. Strict RPE and air monitoring during the soil processing works will ensure the protection of site workers and surrounding receptors.

The works would be notified to the HSE as notifiable non-licensed works (NNLW) on the basis that ACMs are potentially broken/degraded and require effective management to ensure the protection of workers and surrounding receptors. No licensed works are proposed for treating soils at the site.

Procedure

Analysis for soils impacted with visible asbestos fragments would be reviewed prior to any offer to accept at the appropriately licensed sites. Waste acceptance limits for asbestos fibres in soils would be **0.1%** for serpentine asbestos (chrysotile) and **0.01%** for amphibole asbestos types. Site visits will be undertaken where required and any supplementary analysis undertaken to comply with STC-WI 002 and STC – WI 003 to ensure that soils are suitable for treatment using the available methodology at the site.

Should any non-compliant wastes be encountered, the standard rejection procedure will be implemented. In the event that the works to reject waste would constitute licensed asbestos works in accordance with HSE guidance, the standard notification would be made and works would cease until the non-compliant waste is removed.

Soils would be received at the site and placed in asbestos storage area. Soils will be visually inspected to ensure non-compliant materials (e.g. insulation products) are not present, sampled and covered with a tarpaulin to ensure control of any potential emissions during the reception analysis phase. The reception analysis will be reviewed and only soils that are deemed to have no potential to generate asbestos fibres above the detection limit of 0.1% (chrysotile) and 0.01% (amphibole) will be formally accepted. Soils that have the potential to generate airborne asbestos fibres, i.e. they exceed the asbestos fibre acceptance criteria or contain non-compliant products (e.g lagging, asbestos insulation board etc) will be rejected and removed from site.

Stockpiled soils will be transferred to the asbestos processing area and loaded onto a three way screen with a fines, mid range and oversize separation system. The mid range fraction will be loaded onto the picking station with asbestos operatives removing visible fragments and double bagging prior to storage in a locked skip. The fines and oversize will be visually inspected prior to storage for validation testing. If visually identifiable asbestos is present in the fines or oversize fraction these will be loaded onto the picking station, or spread out on the ground for picking prior to validation testing.

The locked asbestos skip will be removed from site when full and taken to a licensed hazardous landfill for disposal.

All personnel will enter and leave the asbestos area via the designated decontamination facility.

Plant/Equipment to be Used:

- Tarpaulins
- Asbestos air monitoring equipment
- 360 excavator
- Dumper truck
- 3 way screener
- Picking station
- Hopper feeder
- Decontamination Unit
- Pressure washer/misting unit

Plant/Operator Certification Required:

- CPCS/CSCS Cards
- Asbestos Awareness
- CAT B asbestos training (pickers)

Summary of Known or Suspected Hazards (either construction, physical or contamination hazards identified):

- The stored soil from a variety of sources will contain low levels of ACM debris and asbestos fibre concentrations lower than the waste acceptance limits previously described. The potential for airborne asbestos fibres being generated is considered extremely low.
- The potential routes of asbestos exposure are by inhalation of dust.
- Construction hazards (slips, trips and falls on uneven ground, machinery)
- Physical hazards associated with moving equipment & machinery.

General Description of Work

- Soils received will be covered with tarpaulins whilst awaiting reception analysis
- Reception analysis to be reviewed and approved by the Operations Manager prior to any transfer to the asbestos processing area.
- All screening and hand picking works to be undertaken with background air monitoring to confirm if asbestos fibres are being generated
- Enter clean end of decontamination unit and pick up disposable overalls/overshoes (if used) and disposable RPE if used
- Don PPE and where required RPE (as specified) prior to entering designated area of site via dirty exit of decontamination unit
- Excavate and screen stockpiled soils in a controlled manner with handpicking of debris into waste asbestos sack directly where possible. Where required, use the surfactant spray if any asbestiform materials appear dry/friable. Place double bagged ACM debris in the dedicated lockable skip at the end of each work period.
- Wipe all tools, etc. with a dampened cloth.
- Place used damp rags in a waste sack and seal.
- At the edge of the work area, clean the outside of all waste sacks and seal.
- Wipe off boots and face mask (if worn) with a cloth and bucket provided.
- Disposable overalls (turned inside out), gloves and where required, any used disposable respirators in asbestos waste bag. Seal the clear bag.
- Once soils have nil visible asbestos and are chemically approved as suitable for further treatment or reuse, they can be sent to the non-hazardous void or restoration scheme following approval from FCC Compliance.
- Ambient asbestos monitoring in air to be undertaken daily during screening/hand picking works. Works must cease to allow damping down measures to be implemented if fibre concentrations exceed **0.01f/cm3**.

Site Manager to conduct a visual inspection of work areas and transit routes.

Personal Protection

PPE:

- Hi-Visibility vest/jacket (where required)
- Hard Hat
- Protective boots (steel toecap/midsole)
- Disposable overalls: Type 5 (BS EN ISO 13982-1)
- Disposable overshoes (where required)
- Disposable gloves

RPE:

- disposable respirator to standards EN149 (type FFP3) or EN1827 (type
- FMP3);
- half or full mask respirator (to standard EN140) with P3 filter; or semi-disposable respirator (to EN405) with P3 filter. Masks may be positive or negative pressure depending on face fit requirements. Should negative pressure masks be used then a break every hour of continuous use should be undertaken.

Also:

- Surfactant spay (e.g. Idenden Dampstrip Asbestos Penetrant 30-330 or similar)
- First Aid Kit
- Mobile Phone
- Site radio

Emergency Procedures

Personnel injury/overexposure:

Remove to fresh air and provide first aid procedures as required; Contact Emergency services if accident/injuries warrants; Decontaminate personnel if required (remove overalls and PPE, wash hands and forearms).

Fire or Explosion:

Evacuate the work area and summon local Fire Brigade. Do not attempt to fight fire. Remain upwind of smoke in safe area. Follow existing Emergency Site Procedures.

Decontamination Procedure

Personnel: 1) Remove disposable contaminated clothing and discard in the designated waste container.
2) Wash hands/face/forearms prior to leaving decontamination unit.

Site Rules

- **NO SMOKING**, No eating, drinking, or chewing of gum.
- Wear protective equipment specified above.
- Utilise good personal hygiene habits – wash hands and exposed skin with soap and water prior to leaving site.
- Remove and dispose of contaminated clothing as described above before leaving the working area.

The safe working procedures detailed in this method statement must be adhered to.

STC – WI 012 - SOIL REJECTION PROCEDURE

Author:	Andy Clee – Ops Man	**Approved By:**	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	**Summary of Changes**	**Date**
5	Addition of new consignment note requirement	16.12.22

Introduction

This procedure relates to the rejection of non-conforming waste received at the Soil Treatment Centre (STC). It allows rejection of non-conforming waste to ensure no unacceptable materials are accepted which cannot be treated by the STC to a quality suitable for reuse, or which breach the list of permitted wastes as shown in the site's Environmental Permit.

Principle of Operation

The procedure allows for the rejection of non-conforming soils with:

- untreatable and hazardous materials (e.g. tars, clinker etc.) in the contaminated soil
- excessive litter/debris in the contaminated soil
- non-compliance with the previously supplied chemical/physical analysis information (supplied by waste producer)
- the potential for waste to behave as a liquid, have free water/oil in the waste or have too high a moisture content
- unacceptable levels of asbestos

The procedure also outlines the method for reporting the rejection to the site operator (FCC).

Procedure

Visual Inspection: Waste Input

Following the completion of the inspection procedure, described in STC-WI 002, and a decision to reject the waste is made. The following procedure is to be implemented:

- The material is to be reloaded into either the original lorry that delivered the load or a replacement lorry supplied by the waste producer
- The consignment note is completed accordingly with section E clearly stating that the waste has been REJECTED
- The customer is to be told that the material is being rejected by the Sales Manager and the customer is to advise on where the material will then be taken to.
- A new consignment note is to be written, the information authorised by the original producer of the waste but the note itself can be completed and signed in part D by the haulier as per EA guidance notes. https://www.gov.uk/guidance/hazardous-waste-rejected-loads-supplementary-guidance
- The consignment note code for the new ticket is to be a duplicate of the original ticket, with an "R" added into the additional box at the end.
- A rejection form is also completed with a copy given back to the haulier and customer and a copy retained at the STC along with the completed consignment note. This is to be stored on the STC server and/or site files
- FCC Landfill Manager is to be informed of the rejection and given a copy of the rejection form and consignment note. It is then FCC's responsibility to inform the Environment Agency of the rejection

STC – WI 013 - SOIL DISPOSAL PROCEDURE

Author:	Andy Clee – Ops Man	Approved By:	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	Summary of Changes	Date
4	Change of wording	16.12.2022

Introduction

This procedure relates to the disposal of treated soils that are to be backfilled in the FCC engineered void, placed in the non-hazardous stockpiling area or used as restoration soils.

Principle of Operation

The procedure allows for the disposal of treated soils with FCC approval by:

- Validating the soils using STC - WI 006
- Issuing a validation report to FCC
- Obtaining approval from the FCC compliance team
- Setting up disposal with the FCC site manager

Procedure

Validation Reporting and Disposal

The analysis results of the validation testing per batch are to be reviewed by the STC operations manager. Once the analysis indicates suitability for reuse a validation report is to be produced.

The validation report provides the following information to FCC:

- Name of the batch
- Inputs in the batch per DW Number
- Total volume (tonnes) proposed for disposal
- Photograph of soil proposed for disposal
- Soil analysis for the batch including leachability versus the water risk assessment for the site (if applicable)

The report needs to be sent in excel format, with a pdf copy of the soil analysis, to the FCC compliance team.

Once the FCC compliance approval has been received the Provectus site manager will arrange disposal timescales and locations with the FCC site manager.

Once the batch is disposed, the STC operations manager is update the SKYNET system to reflect this and a waste transfer note is to be issued to the FCC manager and weighbridge, so that they can record the soil movements out of the STC and into FCC.

STC – WI– 014 GCL STC PAD MAINTENANCE

Author:	Andy Clee – Ops Man	**Approved By:**	Jon Owens – STC Director
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	Summary of Changes	Date
2	Title and wording changes to make generic	16.12.2022

Introduction

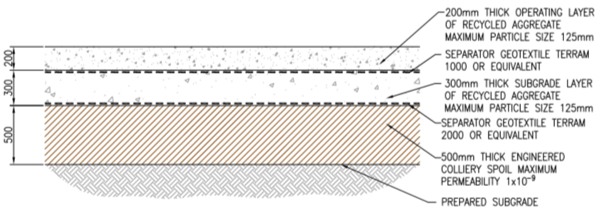
This procedure relates to the checks and maintenance required to keep the Soil Treatment Centre (STC) treatment pad integrity if it is constructed using a geosynthetic clay liner (GCL). This maintenance comes under the remit of Provectus' quality control system. It is also seen as a desirable environmental, health and safety practice, since it incorporates measures which control the possibility of permanent installations presenting harm to the local environment and to operatives by entering into a state of disrepair and untidiness.

Principle of Operation

The main aim is to ensure that the bioremediation process at the STC is performed on a treatment surface that contains the contaminated soil and prevents the uncontrolled escape of process water into the local environment. If the treatment pad will have been constructed following an approved CQA plan and this work instruction (WI) has been produced to ensure that the pad integrity remains throughout the life of the STC.

Procedure

Figure 1 shows the typical construction layers of a GCL treatment pad at an STC as detailed in the CQA Plan.



CROSS SECTION THROUGH COMPOSTING PAD
1:25

Figure 1

The top surface layer of the treatment pad consists of <125mm recycled aggregate. Weekly visual checks are to be made by the STF operator on areas of the treatment pad that are not covered in material for treatment. This will consist of looking for dips, troughs, tyre ruts or puddles on the pad surface. Formation of these defects are likely to eventually lead to that area of the pad being eroded quicker that other areas of the pad which could lead to the pad becoming permeable in localised areas.

Should a defect be found it is to be inspected closer to ensure that the 2nd layer of the treatment pad, the geotexile terram, is not compromised. If it is not, then a top up layer of <125mm recycled aggregate is to be used to redress the area in order to prevent further erosion. This will be tracked into the treatment pad using a roller or an excavator.

Should the geotextile terram be damaged, then the surface aggregate shall be carefully scraped away to expose all edges of the damaged terram, which can then be patch repaired before replacing the surface aggregate.

All repairs made are to be recorded on the company server and marked on a site map.

Where required, the pad will be inspected (where accessible) by a CQA engineer to make a more thorough test on the integrity and permeability of the underlying formation of the treatment pad. Any areas of concern will be repaired as per the above.

As well as pad surface checks, the perimeter of the treatment pad shall be walked weekly to inspect any peripheral surface water drainage structures.

Confirmation of checks both on the pad and around the perimeter are to be recorded on the weekly check sheet and filed in the site folders and/or the online server.

APPENDIX 2

Materials Safety Data Sheet – Asbestos Surfactant

SAFETY DATA SHEET

EVERGARD WETTING AGENT

Compilation date: 11/04/2017

Revision No: 1

Section 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name: EVERGARD WETTING AGENT

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.3. Details of the supplier of the safety data sheet

Company name: SMH Products Ltd

SMH House

Maxwell Street

South Shields

Tyne & Wear

NE33 4PU

Tel: 0191 456 6000

Fax: 0191 456 7777

Email: enquiries@smhproducts.com

1.4. Emergency telephone number

Section 2: Hazards identification

2.1. Classification of the substance or mixture

Classification under CLP: Aquatic Chronic 3: H412

Most important adverse effects: Harmful to aquatic life with long lasting effects.

2.2. Label elements

Label elements:

Hazard statements: H412: Harmful to aquatic life with long lasting effects.

Precautionary statements: P273: Avoid release to the environment.

P501: Dispose of contents/container to hazardous or special waste collection point.

2.3. Other hazards

PBT: This product is not identified as a PBT/vPvB substance.

Section 3: Composition/information on ingredients

3.2. Mixtures

[cont...]

Hazardous ingredients:

STEOL CS-230

EINECS	CAS	PBT / WEL	CLP Classification	Percent
-	-	-	Eye Dam. 1: H318; Skin Irrit. 2: H315; Aquatic Chronic 3: H412	1-10%

PRIMARY ALCOHOL ETHOXYLATE

EINECS	CAS	PBT / WEL	CLP Classification	Percent
614-482-0	68439-46-3	-	Eye Dam. 1: H318; Acute Tox. 4: H302	<1%

Section 4: First aid measures

4.1. Description of first aid measures

Skin contact: Wash immediately with plenty of soap and water.

Eye contact: Bathe the eye with running water for 15 minutes.

Ingestion: Wash out mouth with water.

Inhalation: Remove casualty from exposure ensuring one's own safety whilst doing so.

4.2. Most important symptoms and effects, both acute and delayed

Skin contact: There may be mild irritation at the site of contact.

Eye contact: There may be irritation and redness.

Ingestion: There may be irritation of the throat.

Inhalation: No symptoms.

Delayed / immediate effects: Immediate effects can be expected after short-term exposure.

4.3. Indication of any immediate medical attention and special treatment needed

Immediate / special treatment: Not applicable.

Section 5: Fire-fighting measures

5.1. Extinguishing media

Extinguishing media: Suitable extinguishing media for the surrounding fire should be used. Use water spray to cool containers.

5.2. Special hazards arising from the substance or mixture

Exposure hazards: In combustion emits toxic fumes.

5.3. Advice for fire-fighters

Advice for fire-fighters: Wear self-contained breathing apparatus. Wear protective clothing to prevent contact with skin and eyes.

Section 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions: Refer to section 8 of SDS for personal protection details. Turn leaking containers leak-side up to prevent the escape of liquid. Mark out the contaminated area with signs and prevent access to unauthorised personnel.

[cont...]

6.2. Environmental precautions

Environmental precautions: Do not discharge into drains or rivers. Contain the spillage using bunding.

6.3. Methods and material for containment and cleaning up

Clean-up procedures: Absorb into dry earth or sand. Transfer to a closable, labelled salvage container for disposal by an appropriate method.

6.4. Reference to other sections

Reference to other sections: Refer to section 8 of SDS.

Section 7: Handling and storage

7.1. Precautions for safe handling

Handling requirements: Avoid direct contact with the substance. Ensure there is sufficient ventilation of the area. Avoid the formation or spread of mists in the air.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions: Store in a cool, well ventilated area. Keep container tightly closed. The floor of the storage room must be impermeable to prevent the escape of liquids.

7.3. Specific end use(s)

Specific end use(s): No data available.

Section 8: Exposure controls/personal protection

8.1. Control parameters

Workplace exposure limits: No data available.

DNEL/PNEC Values

Hazardous ingredients:

STEOL CS-230

Type	Exposure	Value	Population	Effect
DNEL	Dermal	2750	Workers	Systemic
DNEL	Inhalation	175	Workers	Systemic
DNEL	Oral	15	General Population	Systemic
DNEL	Dermal	1650	General Population	Systemic
DNEL	Inhalation	52	General Population	Systemic
PNEC	Fresh water	0.24	-	-
PNEC	Marine water	0.024	-	-
PNEC	Fresh water sediments	0.9168	-	-
PNEC	Marine sediments	0.0917	-	-

[cont...]

PNEC	Soil (agricultural)	0.946	-	-
PNEC	Microorganisms in sewage treatment	10	-	-

8.2. Exposure controls

Engineering measures: The floor of the storage room must be impermeable to prevent the escape of liquids.

Respiratory protection: Respiratory protection not required.

Hand protection: Protective gloves.

Eye protection: Safety glasses.

Skin protection: Protective clothing.

Section 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

State: Liquid

Colour: Colourless

Odour: Characteristic odour

Viscosity: Non-viscous

pH: 3.00

9.2. Other information

Other information: No data available.

Section 10: Stability and reactivity

10.1. Reactivity

Reactivity: Stable under recommended transport or storage conditions.

10.2. Chemical stability

Chemical stability: Stable under normal conditions.

10.3. Possibility of hazardous reactions

Hazardous reactions: Hazardous reactions will not occur under normal transport or storage conditions.

Decomposition may occur on exposure to conditions or materials listed below.

10.4. Conditions to avoid

Conditions to avoid: Heat.

10.5. Incompatible materials

Materials to avoid: Strong oxidising agents. Strong acids.

10.6. Hazardous decomposition products

Haz. decomp. products: In combustion emits toxic fumes.

Section 11: Toxicological information

[cont...]

11.1. Information on toxicological effects

Hazardous ingredients:

STEOL CS-230

DERMAL	RAT	LD50	>2000	mg/kg
ORAL	RAT	LD50	>2000	mg/kg

PRIMARY ALCOHOL ETHOXYLATE

ORL	RAT	LD50	>200<2000	mg/kg

Toxicity values: No data available.

Symptoms / routes of exposure

Skin contact: There may be mild irritation at the site of contact.

Eye contact: There may be irritation and redness.

Ingestion: There may be irritation of the throat.

Inhalation: No symptoms.

Delayed / immediate effects: Immediate effects can be expected after short-term exposure.

Section 12: Ecological information

12.1. Toxicity

Hazardous ingredients:

STEOL CS-230

ALGAE	48H EC50	27.7	mg/l
DAPHNIA	48H EC50	7.4	mg/l
FISH	96H LC50	7.1	mg/l

PRIMARY ALCOHOL ETHOXYLATE

FISH	96H LC50	1-10	mg/l

12.2. Persistence and degradability

Persistence and degradability: Not biodegradable.

12.3. Bioaccumulative potential

Bioaccumulative potential: Bioaccumulation potential.

12.4. Mobility in soil

Mobility: Readily absorbed into soil.

12.5. Results of PBT and vPvB assessment

PBT identification: This product is not identified as a PBT/vPvB substance.

[cont...]

12.6. Other adverse effects

Other adverse effects: Toxic to aquatic organisms. Toxic to soil organisms.

Section 13: Disposal considerations

13.1. Waste treatment methods

Disposal operations: Transfer to a suitable container and arrange for collection by specialised disposal company.

NB: The user's attention is drawn to the possible existence of regional or national regulations regarding disposal.

Section 14: Transport information

Transport class: This product does not require a classification for transport.

Section 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Specific regulations: Not applicable.

15.2. Chemical Safety Assessment

Chemical safety assessment: A chemical safety assessment has not been carried out for the substance or the mixture by the supplier.

Section 16: Other information

Other information

Other information: This safety data sheet is prepared in accordance with Commission Regulation (EU) No 2015/830.

* indicates text in the SDS which has changed since the last revision.

Phrases used in s.2 and s.3: H302: Harmful if swallowed.

H315: Causes skin irritation.

H318: Causes serious eye damage.

H412: Harmful to aquatic life with long lasting effects.

Legal disclaimer: The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. This company shall not be held liable for any damage resulting from handling or from contact with the above product.

APPENDIX 3

Maw Green – Asbestos Fibre Airborne Emissions Monitoring Data 2022

IOM
working for a healthy and sustainable world

CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY:	Provectus Soils Management Regent House Bath Avenue Wolverhampton WV1 4EG	**CONTRACT NO:** **DATE OF ISSUE:**	S27510 31.08.22

DATE ANALYSIS REQUESTED: 24.08.22

DATE ANALYSIS COMPLETED: 30.08.22

SAMPLES: Five airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4μm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5μm and diameter <3μm and including fibres in contact with particles >3μm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

www.iom-world.org

Registered Address: Research Avenue North, Riccarton, Edinburgh, EH14 4AP, United Kingdom
Tel: 0131 449 8000 Fax: 0131 449 8084 Email: iom@iom-world.org

RESULTS:

Client Ref: PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ASB MG (15/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ASB MG (16/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ASB MG (17/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ASB MG (18/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ASB MG (19/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27510
DATE OF ISSUE: 31.08.22

COMMENTS:

No asbestos fibres were detected during the analysis of any of these samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

AUTHORISED BY: Steve Clark ………………………
S Clark
Head of Mineralogy

CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY:	Provectus Soils Management Regent House Bath Avenue Wolverhampton WV1 4EG	**CONTRACT NO:** **DATE OF ISSUE:**	S27631 05.09.22

DATE ANALYSIS REQUESTED: 01.09.22

DATE ANALYSIS COMPLETED: 05.09.22

SAMPLES: Five airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

www.iom-world.org

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CONTRACT NO: S27631
DATE OF ISSUE: 05.09.22

RESULTS:

Client Ref: PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ASB MG (22/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ASB MG (23/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ASB MG (24/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ASB MG (25/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ASB MG (26/08/22)	1440	2.5	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	2.5 /<0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

* **DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27631
DATE OF ISSUE: 05.09.22

COMMENTS:

No asbestos fibres were detected during the analysis of any of these samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

[1] UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

AUTHORISED BY: ……………………….
S Clark
Head of Mineralogy

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S27729

DATE OF ISSUE: 13.09.22

DATE ANALYSIS REQUESTED: 07.09.22

DATE ANALYSIS COMPLETED: 13.09.22

SAMPLES: Four airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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RESULTS:

Client Ref: PO – MG184

Sample No.	**Volume (l)**	(1) **No. of Resp. Fibres Found**	(1) **No. of Fields Searched**	**Total Fibres** *Fibre Conc^n (fml^{-1})*	**AMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**CMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**MMMF** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**NAM Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ASB MG (30/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ASB MG (31/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ASB MG (01/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
ASB MG (02/09/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27729
DATE OF ISSUE: 13.09.22

COMMENTS:

No asbestos fibres were detected during the analysis of any of these samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

AUTHORISED BY: Steve Clark ……………………
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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
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Wolverhampton
WV1 4EG

CONTRACT NO: S27808

DATE OF ISSUE: 19.09.22

DATE ANALYSIS REQUESTED: 12.09.22

DATE ANALYSIS COMPLETED: 16.09.22

SAMPLES: Eleven airborne dust samples each supplied on whole gridded or as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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RESULTS:

Client Ref: PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ASB MG (05/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ASB MG (06/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
(1)MG SCR-01 (07/09/22)	1440	1	300	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02 (07/09/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
(1)MG SCR-03 (07/09/22)	1440	1	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
(1)MG SCR-01 (08/09/22)	1440	6.5	300	0.0011	3.5 / 0.0006	0 / <0.0005*	3 / <0.0005	0 / <0.0005*
MG SCR-02 (08/09/22)	1440	3	150	0.0005	2 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
(1)MG SCR-03 (08/09/22)	1440	2	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-01 (09/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02 (09/09/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
MG SCR-03 (09/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27808
DATE OF ISSUE: 19.09.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of five of the eleven samples supplied for this analysis.

(1)These samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

Sample numbers ASB MG 05&06/09/22 supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S27958

DATE OF ISSUE: 27.09.22

DATE ANALYSIS REQUESTED: 20.09.22

DATE ANALYSIS COMPLETED: 26.09.22

SAMPLES: Sixteen airborne dust samples each supplied on a gridded MCE membrane filter.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4μm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5μm and diameter <3μm and including fibres in contact with particles >3μm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

UKAS TESTING
0374

RESULTS:

Client Ref: PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
MG SCR-01(12/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(12/09/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(12/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(13/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(13/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(13/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG PS-01(13/09/22)	1440	3	150	0.0005	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	2 / <0.0005*
MG SCR-01(14/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(14/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-03(14/09/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(15/09/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(15/09/22)	1440	2	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-03(15/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(16/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(16/09/22)	1440	3	150	0.0005	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*	1 / <0.0005*
MG SCR-03(16/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27958
DATE OF ISSUE: 27.09.22

COMMENTS:

Single asbestos fibres were detected during the analysis of six of the sixteen samples supplied for this analysis.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
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WV1 4EG

CONTRACT NO: S28093

DATE OF ISSUE: 28.09.22

DATE ANALYSIS REQUESTED: 26.09.22

DATE ANALYSIS COMPLETED: 28.09.22

SAMPLES: Twelve airborne dust samples each supplied on a gridded MCE membrane filter.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4μm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5μm and diameter <3μm and including fibres in contact with particles >3μm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

UKAS TESTING 0374

RESULTS:

Client Ref: PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
MG SCR-01(20/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(20/09/22)	1440	2	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
MG SCR-03(20/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-01(21/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(21/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-03(21/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(22/09/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(22/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(22/09/22)	1440	2	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-01(23/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-02(23/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(23/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S28093
DATE OF ISSUE: 28.09.22

COMMENTS:

Single asbestos fibres were detected during the analysis of three of the twelve samples supplied for this analysis.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
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WV1 4EG

CONTRACT NO: S28297

DATE OF ISSUE: 11.10.22

DATE ANALYSIS REQUESTED: 05.10.22

DATE ANALYSIS COMPLETED: 10.10.22

SAMPLES: Fifteen airborne dust samples each supplied on a gridded MCE membrane filter.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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Registered Address: Research Avenue North, Riccarton, Edinburgh, EH14 4AP, United Kingdom
Tel: 0131 449 8000 Fax: 0131 449 8084 Email: iom@iom-world.org

RESULTS:

Client Ref: PO – MG184

Sample No.	**Volume (l)**	**(1) No. of Resp. Fibres Found**	**(1) No. of Fields Searched**	**Total Fibres** *Fibre Conc^n (fml^{-1})*	**AMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**CMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**MMMF** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**NAM Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
MG SCR-01(26/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(26/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(26/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-01(27/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-02(27/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(27/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(28/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-02(28/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(28/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(29/09/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
MG SCR-02(29/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(29/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(30/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(30/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(30/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S28297
DATE OF ISSUE: 11.10.22

COMMENTS:

No asbestos fibres were detected during the analysis of any of the samples supplied for this analysis.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark
AUTHORISED BY: ……………………….
S Clark
Head of Mineralogy

working for a healthy and sustainable world

CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY:	Provectus Soils Management Regent House Bath Avenue Wolverhampton WV1 4EG	**CONTRACT NO:** **DATE OF ISSUE:**	S28333 18.10.22

DATE ANALYSIS REQUESTED: 10.10.22

DATE ANALYSIS COMPLETED: 17.10.22

SAMPLES: Thirteen airborne dust samples each supplied on a gridded MCE membrane filter.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4μm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5μm and diameter <3μm and including fibres in contact with particles >3μm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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Registered Address: Research Avenue North, Riccarton, Edinburgh, EH14 4AP, United Kingdom
Tel: 0131 449 8000 Fax: 0131 449 8084 Email: iom@iom-world.org

RESULTS:

Client Ref: PO – MG184

Sample No.	**Volume (l)**	**(1) No. of Resp. Fibres Found**	**(1) No. of Fields Searched**	**Total Fibres** *Fibre Conc^n (fml^{-1})*	**AMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**CMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**MMMF** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**NAM Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
MG SCR-01(03/10/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
MG SCR-02(03/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(03/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(04/10/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-02(04/10/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
MG SCR-03(04/10/22)	1440	3	150	0.0005	3 / 0.0005	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(06/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(06/10/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
MG SCR-03(06/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG PS-01(06/10/22)	1440	2	150	<0.0005*	2 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^MG SCR-01(07/10/22)	1440	0	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^MG SCR-02(07/10/22)	1440	3	300	0.0005	2 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-03(07/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S28333
DATE OF ISSUE: 18.10.22

COMMENTS:

Small numbers of amphibole asbestos fibres were detected during the analysis of three of the thirteen samples supplied for this analysis.

^ These samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample is made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension used to prepare a filter suitable for analysis. This dilution factor is taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work is outside the scope of our UKAS accreditation.
Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

AUTHORISED BY: ……………………….
S Clark
Head of Mineralogy

APPENDIX 4

Edwin Richards & Maw Green - Asbestos Emissions Report 2022

Asbestos Emissions Report
Soil Treatment Facilities at Maw Green and Rowley Regis

14 December 2022

PROVECTUS
www.provectusgroup.com

Project Quality Assurance Information Sheet

Report Type	:	Asbestos Emissions Report
Site Location	:	Soil Treatment Facilities at Maw Green and Rowley Regis
Report Number	:	RRMG/AER/001
Report Status	:	Issue 1
Report Date	:	14 December 2022
Prepared for	:	FCC Environment Ltd
Prepared by	:	Provectus Soils Management Limited Regent House Bath Avenue Wolverhampton West Midlands WV1 4EG
Compiled by	:	Jonathan Owens Operations Director
Authorised by	:	Steve Langford Managing Director

TABLE OF CONTENTS

APPENDICES

1 INTRODUCTION

1.1 Background

This report provides details of the emissions from the use of a soil screener to pre-treat soils containing bound asbestos debris at two separate soil treatment facilities located at Rowley Regis in the West Midlands and Maw Green, near Crewe in Cheshire.

The aim of the report was to demonstrate the air quality during the screening of soils and subsequent hand picking. This monitoring data also validates the effectiveness of the pre-acceptance criteria for asbestos content which are designed to prevent elevated airborne asbestos emissions.

To allow the screening of soils with asbestos debris, a mobile treatment license was deployed by Provectus for a 12 month period on both sites (Appendix A). The aim of the MTL deployment was to monitor emissions and provide a dataset for review by the Environment Agency who have previously been unable to assess the actual emissions from the process. This is due to the relatively recent introduction of this approach onto long term installations which has been undertaken for many years with Environment Agency approval under a mobile treatment license.

The data set will validate the initial emissions from the soil screening and establish if the screening process increases concentrations of airborne asbestos and the effectiveness of any abatement measures on emissions.

There is a need in the construction industry for a compliant and cost effective treatment and disposal option for soils with visible asbestos. There is no cost effective or robust treatment recovery option for asbestos and therefore once removed from soil it requires ultimate disposal in hazardous landfill.

This report uses methods that are implemented as standard in the land remediation industry to facilitate the minimisation of the amount of asbestos impacted waste that requires hazardous landfill disposal. This aim is aligned with the requirements of the waste hierarchy and landfill directive to reduce minimise waste/reduce waste volumes, reduce its hazardous nature, facilitate its handling, and enhance its recovery.

1.2 Information Sources

The following data sources were used in the preparation of this report:

- CL: AIRE, 2016. Control of Asbestos Regulations 2012 - Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry guidance. CL: AIRE, London August 2016.
- Managing and working with asbestos. Control of Asbestos Regulations 2012. Approved Code of Practice and Guidance (L143). HSE 2013
- A Tiered Approach for the Assessment of the Human Health Risks of Asbestos in Soils. Frank A. Swartjes and Peter C. Tromp. *Soil & Sediment Contamination*, 17:137–149, 2008
- Guidance on the classification and assessment of waste. Technical Guidance WM3 (v1.2.GB). Environment Agency October 2021.
- Chemical Waste: Appropriate Measures for Permitted Facilities. Environment Agency, 18 November 2020.
- Asbestos in soil: A pan European Perspective. NICOLE 2021 (Appendix B)
- Asbestos Monitoring Data (Appendix C to E)
- World Health Organization. Regional Office for Europe. (2000). Air quality guidelines for Europe, 2nd ed. World Health Organization

2 ASBESTOS IN SOIL TREATMENT APPROACH

2.1 Background

The overall aim for the physico-chemical treatment method proposed is to receive hazardous asbestos impacted soils that can be treated effectively to ultimately recover soil with a non-hazardous classification; this would then result in the disposal of a minimised volume of asbestos to an off-site hazardous waste landfill.

The treatable waste streams would be limited to soils that are hazardous due to the presence of bound asbestos fragments but do not contain either hazardous concentrations of asbestos fibres, or fibre concentrations that could generate airborne fibres at concentrations above the permit threshold limit of 0.01f/ml.

The overall approach has the aim to allow the soil screening and subsequent treatment to be undertaken whilst achieving the World Health Organisation air quality target for asbestos of <0.0005f/ml.

2.2 Waste Acceptance Criteria

2.2.1 Establishing Asbestos Concentration Criteria for Soil

Our previous experience on other land remediation projects involving asbestos in soil has shown that the airborne emissions are always below the detection limit of 0.01f/ml. However, the data set that this experience covers is insufficient to demonstrate any correlation between asbestos type, concentration in soil and expected emissions to air of asbestos fibres.

For summarising the anticipated emissions and developing our methods of work over many years we regularly review peer reviewed studies of large data sets. To present this relationship we have included a graph from a published article[1] which summarised over 1,000 separate data sets that measured the concentration of asbestos in soils and the corresponding measured concentrations of asbestos in air. This was taken from the journal article published by Swartjes and Trompe as referenced in Section 1.2.

The data presented is from worst case scenarios of using a blower to dry soil with known concentrations of different types of asbestos: serpentine (chrysotile) or amphibole. The air was sampled to assess the concentration of airborne asbestos fibres.

- [1] A Tiered Approach for the Assessment of the Human Health Risks of Asbestos in Soils. Frank A. Swartjes and Peter C. Tromp. *Soil & Sediment Contamination*, 17:137–149, 2008

The Dutch study used fibre equivalents rather than fibre count as they weighted the fibres based upon the expected risk to human health as follows:

- 1 chrysotile fibre, length >5 μm: equivalence factor 1;
- 1 chrysotile fibre, length <5 μm: equivalence factor 0.1;
- 1 amphibole fibre, length >5 μm: equivalence factor 10;
- 1 amphibole fibre, length <5 μm: equivalence factor 1.

The study compared the results to the Dutch the following human health quality criteria in air; these were defined as yearly average values:

- Negligible Risk level: 1,000 fibre equivalents/m^{3}air;
- Maximum Permissible Risk level: 100,000 fibre equivalents/m^{3}air.

The study resulted in the data plotted in the graph below.

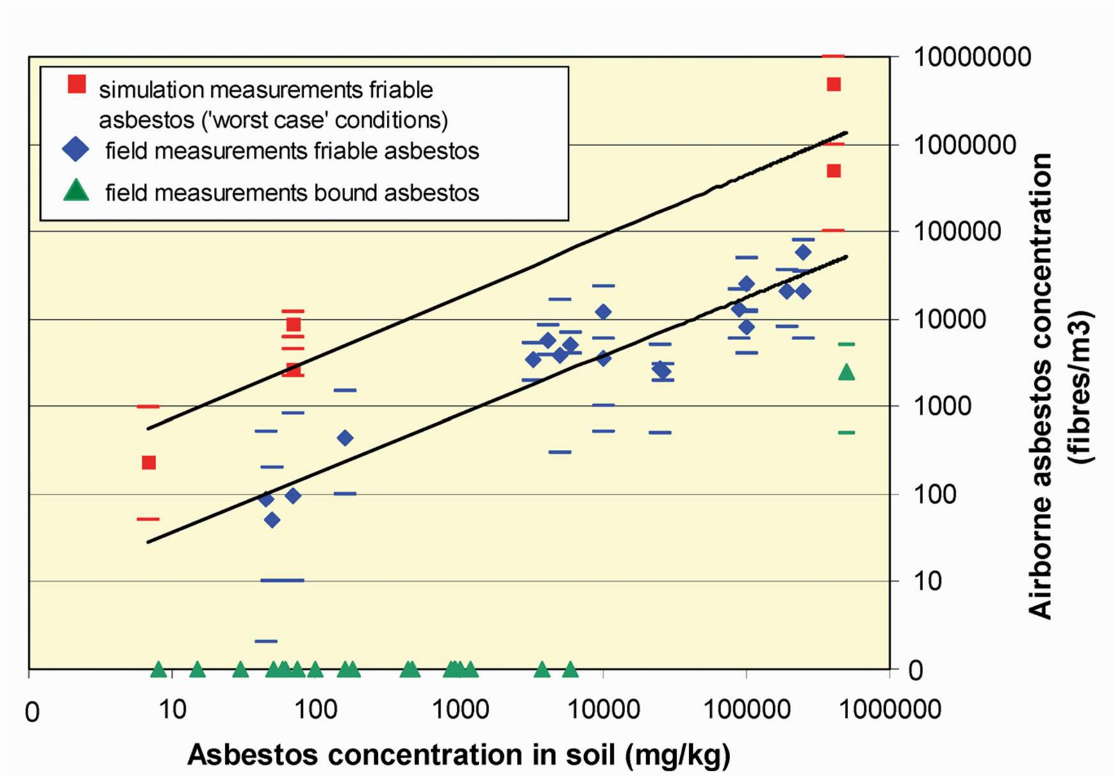


Figure 1. Relationship of Airborne Asbestos Concentration and Soil Concentrations (source: Frank A. Swartjes and Peter C. Tromp, 2008).

The interpretation of the data concluded that for less contaminated soils with bound asbestos (less than 10,000 mg/kg soil (1%)) no airborne asbestos fibres were found. For less contaminated soils with friable asbestos materials (less than 100 mg/kg soil (0.01%)) the Maximal Permissible Risk (MPR) risk level in the air is never exceeded and the

Negligible Risk (NR) level in the air is hardly exceeded. The same conclusion holds in case of activities such as digging, dumping, and sifting.

The report then presents data to confirm the: reduction in asbestos fibre concentrations at the receptor with increased distance from the source; and decreased fibre release with increased soil humidity. The report concludes with describing different tiers of assessment and modelling of human health risks from asbestos in soil.

In the Dutch context the tier one intervention value for asbestos regardless of type is stated as 100mg/kg (**0.01%**). This is unless it is proven that the asbestos is bound and then the criteria stated is 1,000mg/kg (**0.1%**) and if this criteria is met then exposure to asbestos is deemed impossible or unlikely and human health risks can be excluded. There are a number of other criteria relating to the depth of asbestos in soils, vegetation cover, moisture content (sediments) etc but for the purpose of this document we have based this proposal on the basis that no mitigation of emissions will need to be undertaken.

2.2.2 Agreed Asbestos Acceptance Criteria

In order to determine if soils are suitable for treatment, they need to meet a number of pre-acceptance conditions. This ensures that untreatable soils or soils which would result in unacceptable emissions are not accepted. The criteria used is the levels described in Section 2.2.2.

The asbestos criteria in the FCC EPR for the Edwin Richards Quarry site (ref: EPR/HP3632RP) are included in Table S2.4 Permitted waste types and quantities for handpicking of asbestos waste and are as follows:

- Soil and stones containing hazardous substances (CONTAINS IDENTIFIABLE PIECES OF BONDED ASBESTOS (any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye))
- Asbestos in unbound fibrous form (FREE CHRYSOTILE FIBROUS ASBESTOS IN THE SOIL MUST BE **<0.1%** w/w. OTHER FORMS OR MIXED FORMS OF FIBROUS ASBESTOS IN THE SOIL MUST BE **<0.01%** w/w)

2.2.3 Formal Acceptance or Rejection of Soils

If a visual inspection of the soil confirms that there are no apparent reasons for immediate rejection, then soils will be stockpiled in a quarantine area and subject to formal soil sampling and analysis at a MCERTs accredited laboratory.

As soon as reception testing has been completed the soils will either be formally accepted or rejected subject to the acceptance criteria described later in this document.

2.3 Overview of Soil Treatment Approach involving Screening

An overview of the approach for managing soils with visible asbestos is provided in Figure 2. The overall approach aims to recover soils for subsequent disposal as non-hazardous waste and dispose of a small amount of asbestos as hazardous waste.

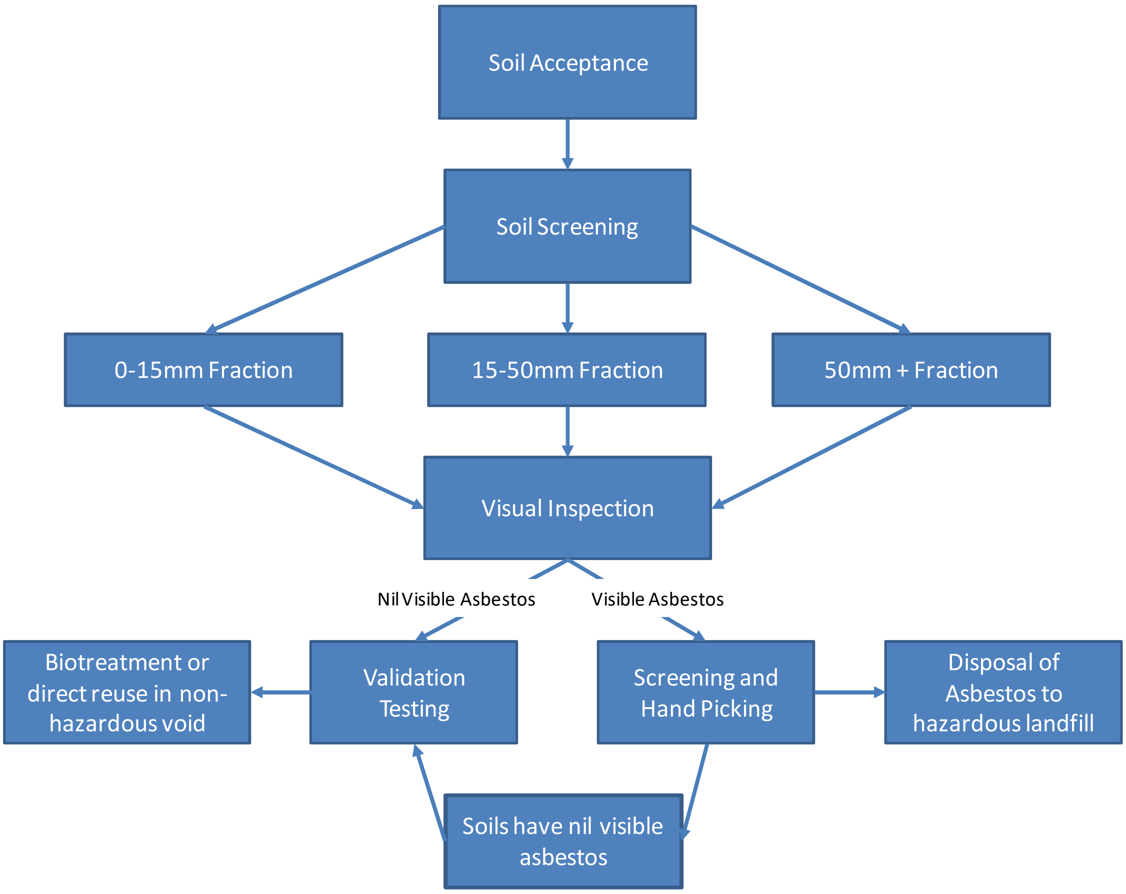


Figure 2. Soil Treatment Overview

3 ASBESTOS EMISSIONS FROM CONTAMINATED SOIL

3.1 Introduction

The main area of concern we would anticipate from any external regulator is the potential for emissions of asbestos fibres as a result of the acceptance and processing of contaminated soil at the treatment site.

3.1.1 Licensing of Soil Screening

Provectus hold a Mobile Treatment License ref: EA/EPR/EB3636AK/A001 (EAWML 105284). This environmental permit is deployed on a site by site basis where soil and groundwater treatment is undertaken on a client's development site.

3.2 Airborne Asbestos Monitoring Data from Storage of Soils and Hand Picking

As a minimum the monitoring of asbestos in air at the site requires the use of methods described in HSG248[2] and Technical Guidance Document M17[3]. From July 2021, a modified version of the method to reduce the reported detection limit from <0.01f/ml as stated in the installation permit held by FCC to <0.0005f/ml which is the WHO air quality guidance for Europe that is deemed to be a threshold at which no excess carcinogenic risk is present. This requires the volume of air that is filtered in the sample to increase from 480l to 1440l, a threefold increase.

3.3 Soil Screening Approach

The soil screener commenced operation on the 27 June 2022 under the MTL deployment at Rowley Regis and 15 August 2022 at Maw Green (Appendix A).

The soil screener has been run using three different configurations. The first one described in Section 3.3.1. The two different configurations at Rowley Regis inside the building were to establish the emissions from using covers on an enclosed screener and under negative pressure from a ducted HEPA filter.

The second configuration was to screen soils using an uncovered screener inside the building as this was the approach that was approved by the Environment Agency for the mobile treatment license deployment.

The third configuration at the Maw Green site was to undertake the uncovered screening externally and monitor the asbestos fibre concentrations in air in accordance with the mobile treatment license deployment.

---

[2] Asbestos: The Analysts Guide, HSG248 (2nd Edition) May 2021

[3] TGN M17. Monitoring Particulate Matter in Ambient Air around Waste Facilities. Environment Agency Ver 2 July 2013.

3.3.1 Use of Covered Screener with HEPA Filter

The screener deck and arms of the screener were enclosed to prevent dust emissions during the screening of soil. These covered areas were linked with a piping system to a HEPA filter (Aerial AMH 100 Industrial HEPA Air Scrubber). The HEPA filter has a capacity of 1,600m3/hr to ensure that the internal area of the hopper and screening decks were fully contained as well as ensuring the air flow from around the screener is directed through the HEPA filter. A schematic drawing of the screener with covers is shown in Figure 3.

Figure 3. Areas of Covering on Soil Screener

Figure 4. Covers on screener, note the asbestos monitoring pump located under the sheet on the screener deck

3.3.2 Use of uncovered soil screener with continuous dust suppression

During the w/c 22 August the covers on the soil screener and HEPA filter were removed (Figure 5). The uncovered screener deck was monitored directly from 22 August to 25 August 2022. Screening from the additional points inside the building continued from 22 August 2022 onwards whilst the screening and hand picking of soils was undertaken (Figure 6).

3.3.3 Use of uncovered soil screener with continuous dust suppression

During the w/c 22 August the covers on the soil screener and HEPA filter were removed (Figure 5). The uncovered screener deck was monitored directly from 22 August to 25 August 2022. Screening from the additional points inside the building continued from 22 August 2022 onwards whilst the screening and hand picking of soils was undertaken (Figure 6).

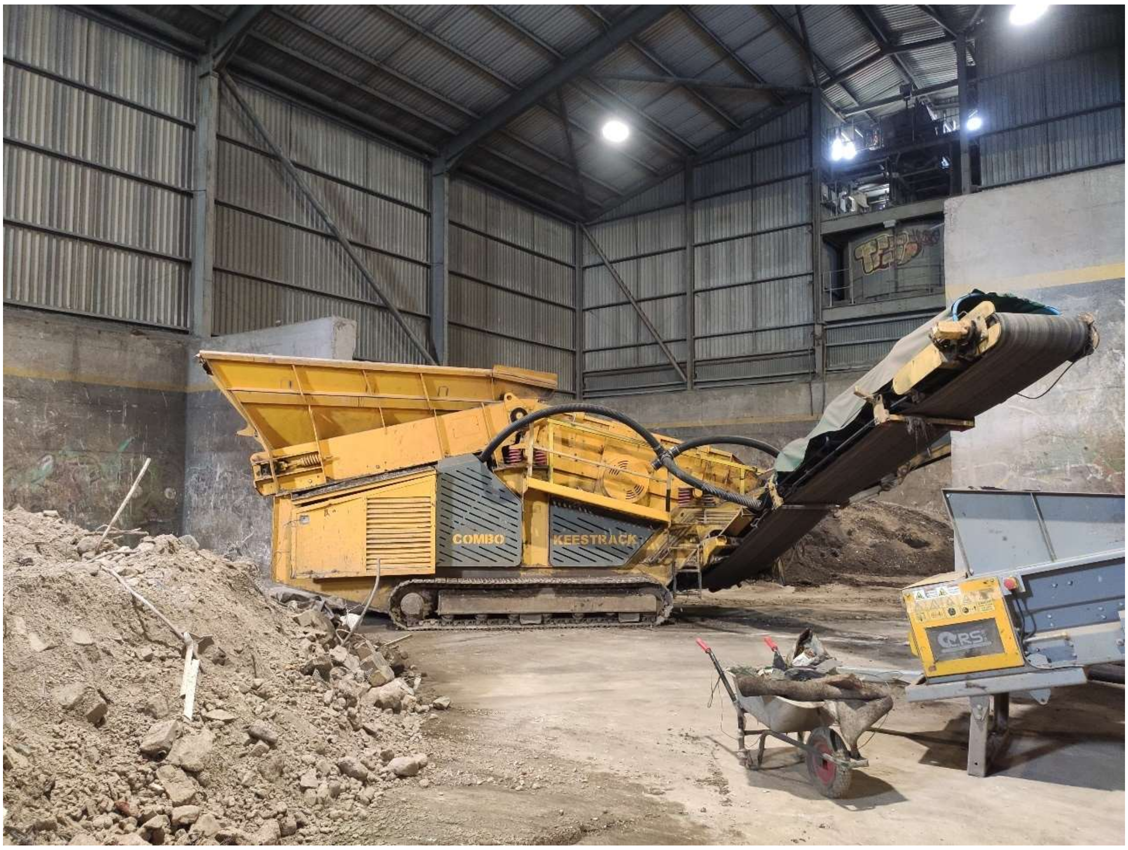


Figure 5. Uncovered soil screener inside asbestos building (Rowley Regis)

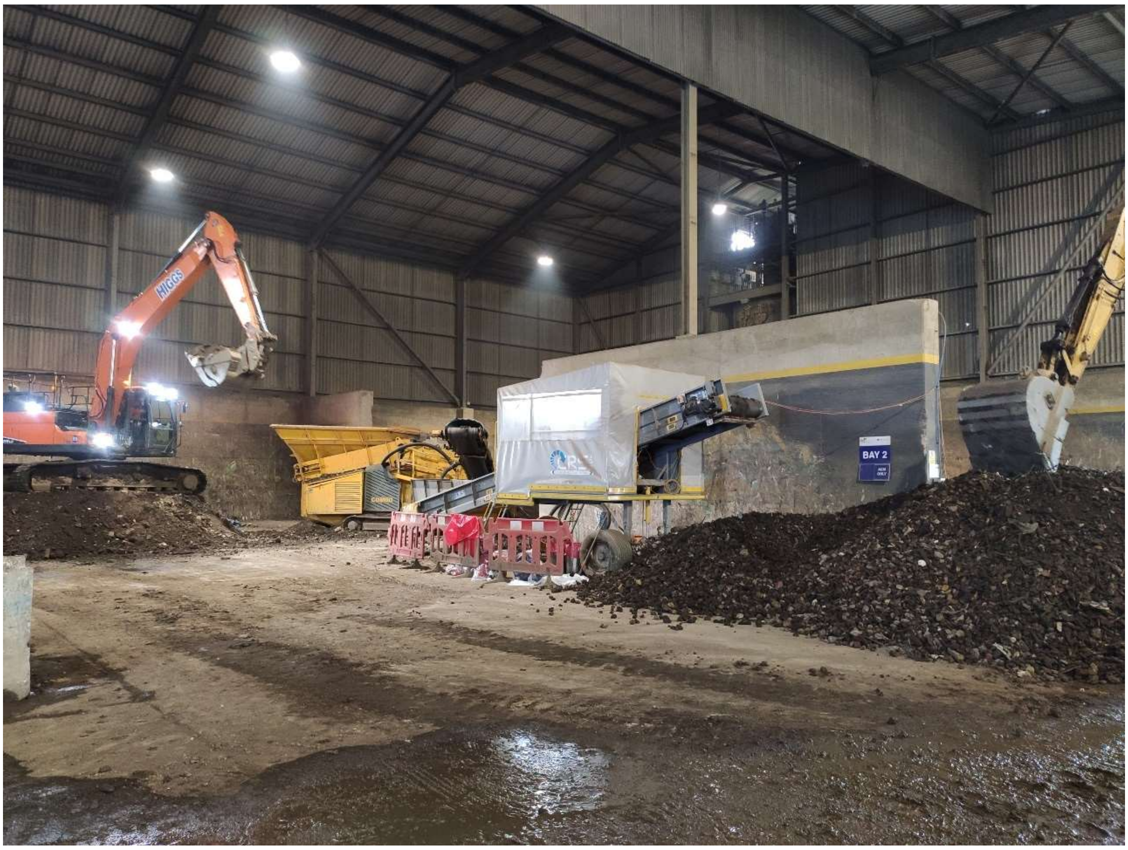


Figure 6. Soil screening and hand picking of soil (Rowley Regis)

Figure 7. Soil Screening and hand picking of soil (Maw Green)

3.4 Monitoring Locations (Rowley Regis)

To review the effectiveness of the screener covers and HEPA filter, air samples were obtained over between 27 June 2022 to 6 July 2022 from below the screener cover whilst soils were being screened.

Monitoring undertaken until 7 July 2022 was undertaken with one sample inside the building and 3 locations externally when soils were placed on the soil storage pad. The external soils were uncovered from 7 July to 22 July.

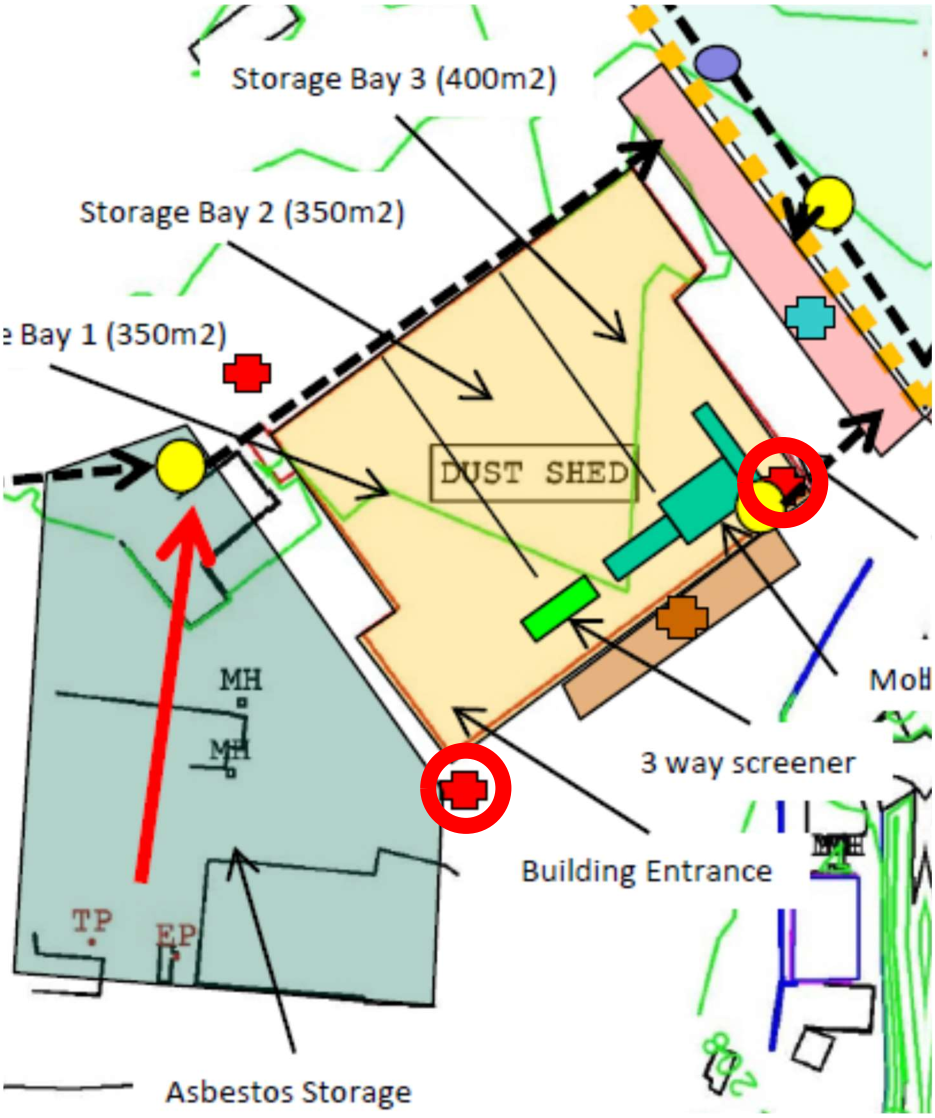


Figure 8. Initial Sampling Locations (circled in red)

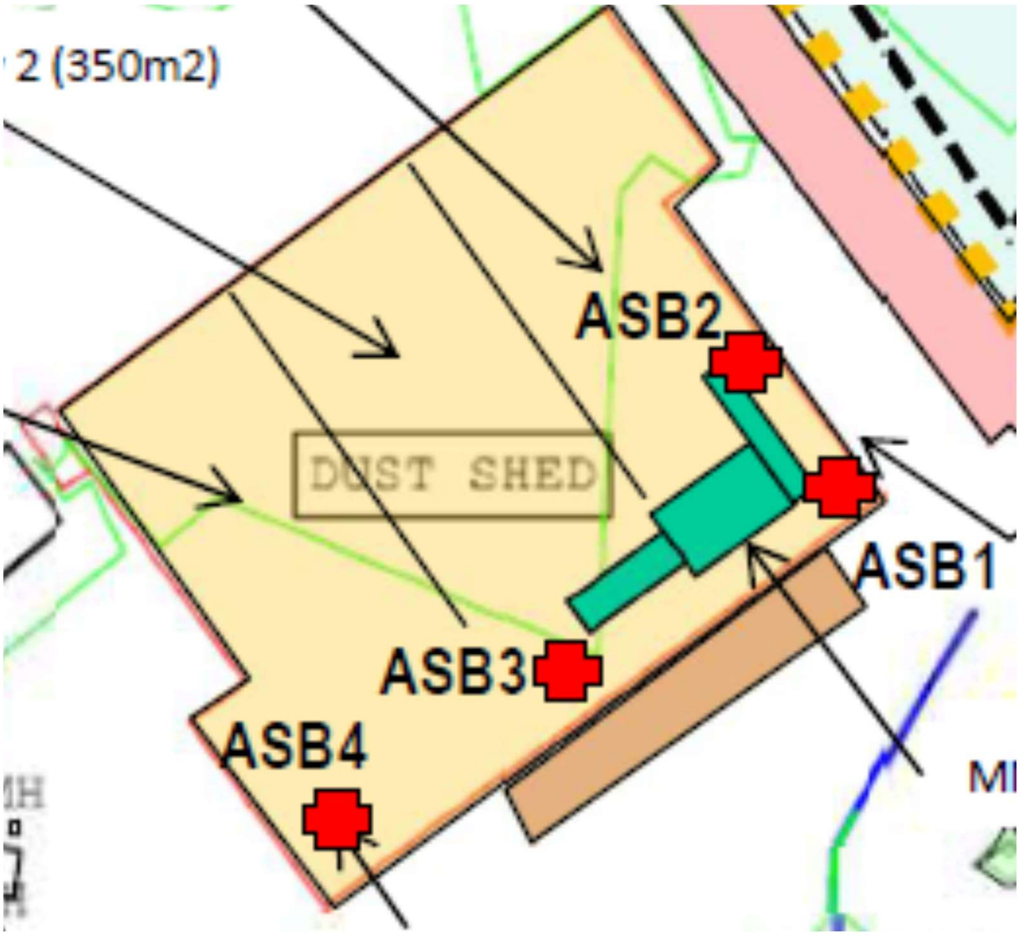


Figure 9. Internal Monitoring Locations 1-4 Sampling Locations (in red)

3.5 Monitoring Locations (Maw Green)

To review the emissions from the soil screener and picking stations, air samples were obtained from 15 August to review the effect of screening soil and compare these results with the pre-operational screening results. The monitoring locations are taken from the mobile treatment deployment application.

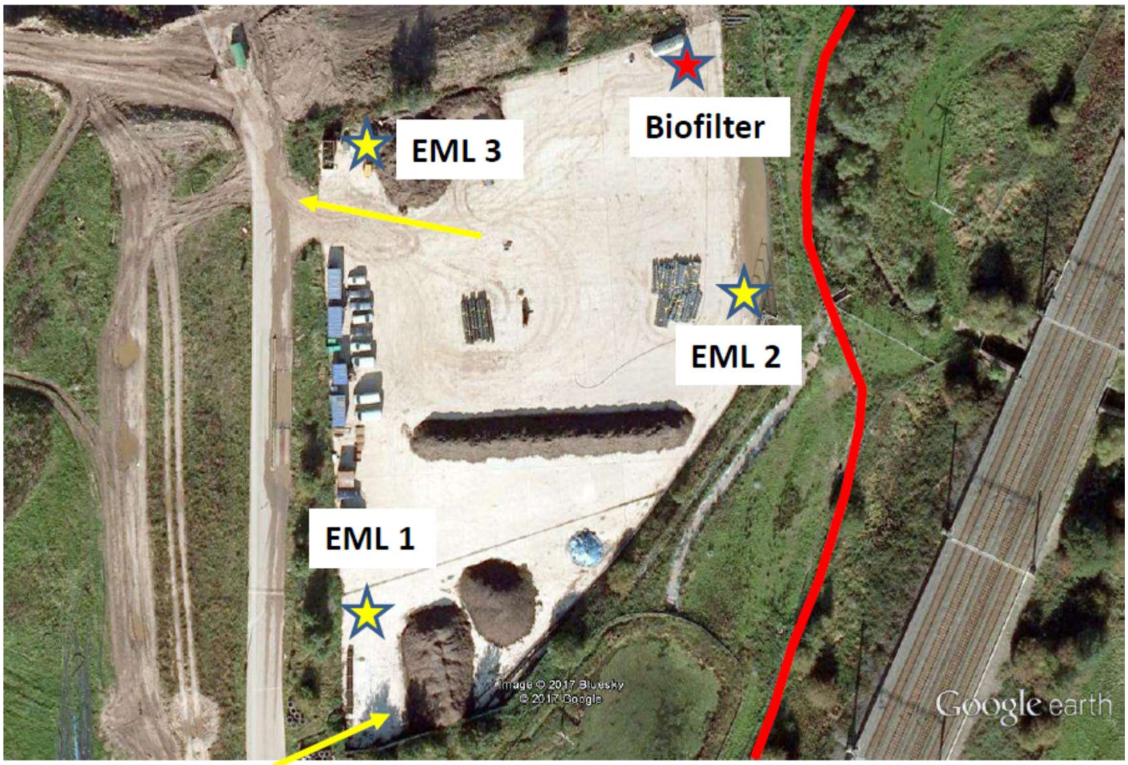


Figure 10. Environmental Monitoring Locations 1-3 Sampling Locations

4 ASBESTOS EMISSIONS RESULTS

4.1 Introduction

The following section provides a summary of the results obtained from the different screener configurations.

Prior to the use of a screener the asbestos monitoring results from 2018 through to the 15 June 2022 was undertaken to monitor emissions from uncovered storage of ACM in soils and hand picking from inside the asbestos building.

All monitoring that was undertaken demonstrated that the airborne asbestos fibre concentrations were below the permit threshold of <0.01f/ml.

4.1.1 Soil screener with cover and HEPA filter (Rowley Regis)

The monitoring was undertaken from 27 June until 22 August to provide a 4 week data set on asbestos emissions.

The screener deck of the screener under a cover with the HEPA filter operational was monitored between 27/06/22 – 06/07/22. This ceased due to the results having a maximum concentration of 0.0005f/ml and equivalent to the method detection limit.

All monitoring was undertaken using the monitoring points shown in Figure 8 up to the 06/07/22. Between 07/07/22 and 12/08/22 the sampling points were as per the points described in Table S3.3 of the Rowley Regis permit. Asbestos DWG3/Rev1 dated October 2020. This included one internal monitoring location next to the screening and picking operation but accidentally omitted the further internal locations shown on drawing 100993 – Asbestos DWG1 dated January 2018.

From 13/08/22, the sampling points have been as per 100993 – Asbestos DWG1 dated January 2018 (Figure 8). Soils treated after the initial storage bays inside the building were emptied have been from lorries delivered into the building from external sites. Some limited soil inputs from the external storage area commenced on 20/09/22 to supplement soils stored within the building (results to follow).

A summary of the results are provided in Table 1.

4.1.2 Soil screener uncovered and with continuous misting abatement (Rowley Regis)

The use of an uncovered screener with dust suppression in the form of mobile atomisers and dust cannons was described in the MTL deployment.

The screener was uncovered on 22 August 2022, predominantly due to the number of blockages that were observed to occur with the enclosed screener that prevented a longer term assessment of emissions from a contained screener than the initial c.4 weeks. The continual blockages posed additional health and safety risks to personal as well as causing damage to the conveyor belts and other equipment.

The sampling points shown in Figure 9 were used to monitor the screening and hand picking operation as shown in Figure 6. Monitoring of the uncovered screener deck was implemented between 22/08/22 – 25/08/22 (4 days) and 30/08/22 - 21/09/22 (17 days) and were below the method detection limit – although this detection limit varied with the presence of exhaust particulates from the screener within the building.

All the results are summarised in Table 1.

4.1.3 External soil screener uncovered and with continuous misting abatement (Maw Green)

The three sampling points were monitored from 15 August 2022 with the latest results from 04/11/22 included. On the spreadsheet in Appendix E prior to the laboratory certificate there is a summary of the activity on site corresponding to the sampling date.

All the results are summarised in Table 2.

Table 1. Summary of Asbestos Monitoring Results

Asbestos Treatment Description	Date Range	Number of Internal Monitoring Points	Number of External Monitoring Points	Detection Limit (f/ml)	Maximum Concentrations (f/ml)	Permit Threshold (f/ml)
Storage and Hand Picking	08/05/18 - 05/07/21	4	-	<0.01	<0.01	<0.01
Storage and Hand Picking	09/07/22 - 17/06/22	4	-	<0.0005	0.0007	<0.01
Covered Screener/HEPA and Hand Picking	27/06/22 - 06/07/22	1	1	<0.0005	0.0007	<0.01
Screener Deck inside cover	27/06/2022 – 06/07/22	1	-	<0.0005	0.0006	<0.01
Covered Screener/HEPA and Hand Picking	07/07/22 - 12/08/22	1	3	<0.0005	0.0007	<0.01
Covered Screener/HEPA and Hand Picking	13/08/22 - 19/08/22	4		<0.0005	<0.0005	<0.01
Uncovered Screener and Hand Picking	22/08/2022 – 21/09/22	4	3	<0.0005/<0.002*	0.0009/<0.002*	<0.01
Uncovered Screener Deck	22/08/22 - 24/08/22, 30/08/22 - 02/09/22, 05/09/22 – 08/09/22	1	-	<0.0005 - <0.0061*	<0.0061*	<0.01

*Indicates detection limit due to occluded slides from combustion residues from operating mobile plant

Table 2. Summary of Asbestos Monitoring Results

Asbestos Treatment Description	Date Range	Number of External Monitoring Results	Detection Limit (f/ml)	Maximum Concentrations (f/ml)	Permit Threshold (f/ml)
Reception of soils/background	15/08/22 – 06/09/22	16-	<0.0005	<0.0005	<0.01
Uncovered Screener and Hand Picking	07/09/22 – 04/11/22	120	<0.0005	0.0006	<0.01
Control Test (no activity)	27/10/22	1	<0.0005	<0.0005	<0.01

4.2 Summary

Prior to the MTL deployment, it was established that the storage of soils and hand picking of asbestos debris does not result in airborne asbestos concentrations above the permit threshold of <0.01f/ml at the Rowley Regis site.

The method detection limit was reduced to <0.0005f/ml in July 2021 and the results from the monitoring during hand picking works did not exceed this detection limit.

The following is a summary of the results obtained from the different scenarios implemented and monitored.

1. Hand picking only without screening inside the building at Rowley Regis resulted in monitored concentrations in air ranging from <0.0005f/ml to a maximum of 0.0007f/ml
2. The use of a covered screener with HEPA filter inside the building at Rowley Regis resulted in monitored concentrations in air ranging from <0.0005f/ml to a maximum of 0.0007f/ml
3. The use of an uncovered screener inside the building at Rowley Regis resulted in monitored concentrations in air ranging from <0.0005f/ml to a maximum of 0.0009f/ml
4. The use of an uncovered screener externally at Maw Green resulted in monitored concentrations in air ranging from <0.0005f/ml to a maximum of 0.0006f/ml

Whilst not an objective of this report, there was no increase in the asbestos content of the soil resulting from soil screening which correlates with historical data from physical treatment of soils with asbestos. The screening resulted in no detrimental impact to soil quality or its ability for recovery.

4.3 Conclusion

- The waste acceptance criteria have proven to be entirely efficient at preventing the release of unacceptable asbestos fibres during soil screening
- The air quality targets described in the FCC permit for asbestos were achieved irrespective of the processing or abatement method implemented
- The covering of the screener and use of a HEPA filter resulted in operational problems due to the need to unblock the screener arms and change HEPA filters. This significantly slowed down the processing of soils, increased exhaust emissions,

the potential for harm to operatives due to restricted working areas whilst providing no benefit to air quality from asbestos concentrations.

- There were no emissions that required abatement other than the precautionary use of boundary dust suppression using water and propriety asbestos surfactant solution dispersed via an atomiser system
- Due to the use of a temporary diesel powered screener inside a building at Rowley Regis increased the occlusion of slides due to the diesel combustion emissions. This issue can be resolved through the use of an exhaust abatement system or procurement of an electric screener for dedicated use within the building
- There is no discernible difference in asbestos emissions between the several different scenarios (hand picking/screening etc) inside buildings or externally based upon the monitoring results
- The soil screening does not result in elevated airborne asbestos concentrations and poses no risk of exceeding the normal EA permit threshold of <0.01f/ml

4.4 Proposed Soil Processing Approach

The following approach is therefore proposed from a review of the monitoring data to date:

- Continue to use the existing waste acceptance criteria that are designed to support a risk elimination approach
- Continue to implement a reassurance boundary dust suppression system via atomisers fed by a water and surfactant solution as this provides secondary abatement for general fugitive dust emissions
- The use of an uncovered screener with dust suppression atomisers (mixed with asbestos specific surfactant) to ensure that low reporting limits of <0.0005f/ml can be achieved consistently
- Continue to monitor to reporting limits of <0.0005f/ml to ensure that there is sufficient visibility on airborne asbestos concentrations below the permit threshold of <0.01f/ml.

APPENDICES

APPENDIX A. MTL DEPLOYMENT

Provectus Remediation Ltd
Regent House
Bath Avenue
Wolverhampton
West Midlands
WV1 4EG

Our ref: EB3636AK/W0028

Date: 15/07/2022

Dear Mr Jon Owens

Environmental Permitting (England and Wales) Regulations 2016

Deployment ref: EB3636AK/W0028
Permit holder: Provectus Remediation Ltd
Location of the deployment: Maw Green Landfill, Maw Green Road, Maw Green, Crewe, CW1 5NG,

Following assessment of your deployment notification reference number EB3636AK/W0028 I can confirm that we have agreed your deployment form and you may now start to operate.

You have up to 12 months to notify us that your deployment activities are commencing. Once notified your deployment lasts for 52 weeks. If you wish to continue beyond this 52 week period you can request an extension up to a maximum of 12 months or submit a new deployment application for a further 12 month extension. Please see section 4.1 of the Land and groundwater remediation deployment form guidance.

You must comply with your permit and carry out the activities in accordance with the requirements of the agreed deployment form and further information;

- Supporting Document: Environmental Monitoring Location Plan
  from Jon Owens received on 15/07/2022 at 11:45

You must seek written permission from us if any of the details provided in the deployment form change.

This approval letter is associated with the mobile plant permitting regime only. As the operator, it is your responsibility to agree other authorisations, for example, planning permission, remedial strategy, abstraction or discharge consents with the relevant regulatory authority.

Please note that operating under your Mobile Plant Permit / Mobile Treatment Licence does not imply that the remediation processes used will be suitable for meeting any remediation objectives specified. These issues must be considered separately by the developer/consultant and our local area Groundwater and Contaminated Land team. These must be defined in the site remedial strategy which sets out the remediation options to reduce or control the risks from pollution linkages associated with the site as a whole. You may need to carry out further remediation if an unacceptable risk to the environment remains at the site.

Please notify us at least seven days prior to starting the remediation activities, at psc@environment-agency.gov.uk & GMMCLandandWater@environment-agency.gov.uk

If you have any queries about this matter please contact us by telephone on 03708 506 506 or email us at enquiries@environment-agency.gov.uk quoting your deployment application reference EB3636AK/W0028.

Yours faithfully

Maria Gibbons,
Team Leader,
National Permitting Service

The Company Director and/or Secretary
Provectus Remediation Ltd
9 Kingsdale Business Centre
Regina Road
Chelmsford
Essex
CM1 1PE

Our ref: EB3636AK/W0027

Date: 6th May 2022

Dear Sir or Madam,

Environmental Permitting (England and Wales) Regulations 2016

Deployment ref: EB3636AK/W0027
Permit holder: Provectus Remediation Ltd
Location of the deployment: Edwin Richards Quarry, Portway Road, Rowley Regis, B65 9DS,

Following assessment of your deployment notification reference number EB3636AK/W0027 I can confirm that we have agreed your deployment form and you may now start to operate.

This deployment lasts for one year from the date the activity starts on site. If you wish to continue beyond this one year period you must re-notify.

You must comply with your permit and carry out the activities in accordance with the requirements of the agreed deployment form and

- further information (Ref: Appendix A – Location of Soil Screening updated Drawing & Monitoring) received by us on 04/05/2022

You must seek written permission from us if any of the details provided in the deployment form change.

This approval letter is associated with the mobile plant permitting regime only. As the operator, it is your responsibility to agree other authorisations, for example, planning permission, remedial strategy, abstraction or discharge consents with the relevant regulatory authority.

Please note that operating under your Mobile Plant Permit / Mobile Treatment Licence does not imply that the remediation processes used will be suitable for meeting any remediation objectives specified. These issues must be considered separately by the developer/consultant and our local area Groundwater and Contaminated Land team. These must be defined in the site remedial strategy which sets out the remediation options to reduce or control the risks from pollution linkages associated with the site as a whole. You may need to carry out further remediation if an unacceptable risk to the environment remains at the site.

Please notify us at least seven days prior to starting the remediation activities, at psc@environment-agency.gov.uk & WMDEPR@environment-agency.gov.uk

If you have any queries about this matter please contact us by telephone on 03708 506 506 or email us at enquiries@environment-agency.gov.uk quoting your deployment application reference EB3636AK/W0027.

Yours faithfully

Grant Wilson
Team Leader,
National Permitting Service

APPENDIX B. NICOLE – ASBESTOS: A PAN EUROPEAN PERSPECTIVE

ASBESTOS IN SOIL

A pan european perspective

Demolition earthworks | AECOM

ASBESTOS IN SOIL

A pan european perspective

NICOLE

Network for Industrially Co-ordinated Sustainable Land Management in Europe

ASBESTOS IN SOIL - A PAN EUROPEAN PERSPECTIVE

Foreword

There are common themes and good practice running throughout Europe with respect to the management of asbestos in soil, although many variations in approach exist.

As with other contaminants, the assessment and management of asbestos risks should follow a risk based assessment approach (source-pathway-receptor analysis) with selection of appropriate remediation following a suitable remedial options appraisal.

However, many decisions regarding the remediation and management of asbestos in soils are based on stakeholder perception and a subjective or emotive response (i.e. hazard based rather than risk-based).

As demonstrated in this report there are few European countries with clear standards and detailed guidance. This document provides an overview of best practice in the industry with a pan European perspective and with some case studies to illustrate typical responses to asbestos in soils impacts.

Contents

Asbestos warning sign | AECOM

1 Introduction

Asbestos is a common and challenging contaminant in soil; a legacy of widespread historic use in buildings and poor historic control of construction waste, building demolition, and re-use of crushed demolition aggregate as made ground.

Hazard, risk perception and acceptance can vary widely amongst stakeholders and the management of asbestos in soil can vary widely as a result.

Differing stakeholder positions on risk acceptance or risk avoidance (zero tolerance) can have a significant impact on project designs, programmes, and costs, and there is little harmonisation in approach across Europe.

Asbestos in soils is increasingly recognised by those involved in the management of brownfield

Degraded asbestos debris in soil | AECOM


Visual detection of asbestos during remediation | NTP

land regeneration as a potentially high-cost, risk-driven issue, and this publication seeks to: provide a pan-European perspective; identifying opportunities for harmonisation; improve awareness and understanding; and promote greater consistency.

The content of this publication reflects the work of the NICOLE Asbestos Working Group from 2017 to 2021.

The aims of the NICOLE Working Group were to:
Compare and contrast current industry approaches, regulatory positions and quality and availability of existing guidance in European Countries as an initial "baselining" exercise to help identify significant differences and opportunities for harmonisation.

Improve awareness and understanding in managing the risks of asbestos in soil (considering its occurrence both on its own and as a co-contaminant with other pollutants) by advocating a pragmatic approach and promoting greater consistency where possible.

These aims were to be achieved by:

1. Collating information on, and benchmarking of, current methods, standards and guidance for the characterisation, risk assessment, remediation and regulation of asbestos in soils that are currently adopted by industry and regulators in European Countries;
2. Identifying how asbestos contaminated soils (including those also contaminated with other pollutants) are currently remediated in different countries, considering different treatment technologies and the availability (or otherwise) of appropriate disposal/ treatment facilities;
3. Identify existing research efforts into characterisation, risk assessment and remediation, and identify research opportunities that could support a sustainable pragmatic approach; and
4. Identifying case studies that support and improve confidence in risk management decisions and in developing best practice.

2 NICOLE Survey of Members

To establish a baseline of current legislation, guidance and practice in European countries, a detailed survey was issued to NICOLE and Common Forum members in 2018. Three years on and very little has changed. The survey comprised 70 questions covering 6 topic areas.

These were:

1. Legislative provision and regulatory position
2. Good practice industry guidance
3. Laboratory methods
4. Waste classification, handling and disposal
5. Remediation options
6. Research and innovation

12 responses were received for 6 countries.

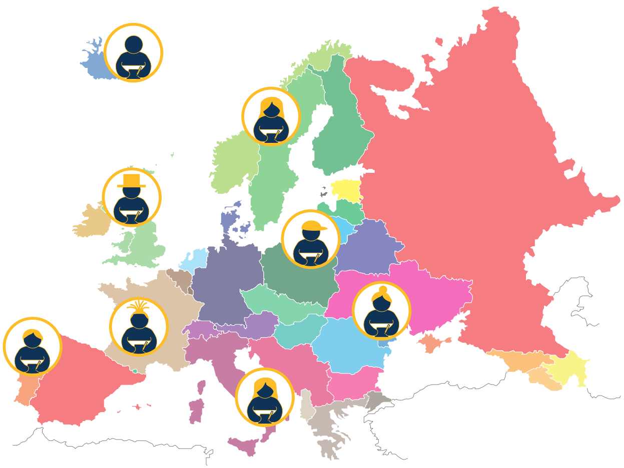


Figure 2.1 NICOLE Network Survey of members

3 Legislative and Regulatory Positions

One potential harmonising factor is EU Directive 2009/148/EC, on the protection of workers from the risks related to exposure to asbestos at work, that sets out occupational health and safety requirements for work involving asbestos. However, even with this in place, the control limits for asbestos in air vary considerably across Europe, ranging from the Directive Control Limit of 0.1f/ml in the UK to 0.002f/ml in The Netherlands (50x lower). No country has specific legal provision solely addressing exposure to asbestos in soil, although it is increasingly recognised that disturbance of asbestos containing soil is an activity that is captured by existing asbestos-specific occupational regulations relating to work in buildings (e.g. maintenance, refurbishment and demolition).

Asbestos cement fragments in soil | AECOM

Country	Occupational exposure limit (f/ml 8hr TWA)
EU limit value (2009/148/EC)	0.1 (100,000f/m^3)
UK	0.1
France	0.01
Italy	0.01
Germany	0.001
Netherlands	0.002 (with intention to reduce to 0.0003)

Table 3.1 Occupational exposure limit

Presence of AiS guidance. Detailed sampling and testing protocols. Air and soil guidelines. Regular testing

Absence of AiS guidance. Reliance on OSH and waste regulations. No regular testing

There is a stark divergence between those countries with detailed regulatory guidance on the risk management of asbestos in soil and those countries with no specific regulatory guidance for asbestos in soil. It was discussed at the NICOLE workshop in Warsaw in November 2019 that asbestos is considered to be an emerging soil contaminant in Germany, and in many Eastern European countries, even though in other countries it has been recognised as a contaminant of concern for decades. Where detailed gui-dance is in place, it is largely based on the research of RIVM and TNO published between 2003-2008.

The only European regulatory guidance levels for asbestos in soil are those published by the Dutch, Belgian and Italian authorities. The Dutch and Belgian authorities adopt a Tiered approach and use the same Tier 1 value, but importantly use different definitions for those values.

Dutch Tier 1 Intervention value = 100mg/kg (sum of chrysotile+10x amphibole as measured by NEN 5707)

Flanders Tier 1 Intervention value = 100mg/kg (sum of fixed + x10 loose fibres (all asbestos types) as measured by TEM)

4 Industry Good Practice

It is only common among a small number of European Countries to test made ground soil samples for asbestos as part of a normal site investigation. Sampling is either carried out using typical practice adopted for contaminated land or using detailed prescriptive practice specific to asbestos (such as for the Netherlands and Belgium). Guidance on sampling strategies, sample plans, laboratory test methods, and requirements for site staff competency/qualifications is mixed, with no common approach across the countries surveyed.

When suspected asbestos is observed in the soil there is a legal requirement under workplace regulations to put in place procedures to manage the associated risks. If suspected asbestos is found onsite during site investigation or remediation works, the general procedure is to stop work, make the work area safe and temporarily vacate the area until the risk assessment and method statements for the work can be revised. Actions can include the use of dust suppression, asbestos survey of the area, confirmatory laboratory testing of the identified material, and use of Licensed contractors to remove the asbestos. Work should only ever continue if safe methods of work can be put in place.

Signing of an asbestos impacted area | NTP

Guidance Questions	Belgium (Flanders)	Belgium (Wallonia)	France	Italy	Portugal	Spain	UK
Is the testing of brownfield sites for asbestos commonplace?	yes	yes	no	yes	yes	not	yes
Is guidance available for the risk management of asbestos in soil?	yes	yes	yes	no	no	no	yes
Does the guidance fill a gap in regulatory guidance?	yes	no	yes	no	no	no	yes
Is the guidance entirely country specific?	no	no	yes	yes	no	no	yes
Does the guidance advocate a tiered approach?	yes	no	no	no	no	no	yes
Does guidance include method on soil sampling if asbestos is present?	yes	yes	no	yes	no	no	yes
Does the guidance recommend air testing during site-based activities?	no	no	yes	yes	yes	no	yes
Does the guidance advocate health and safety precautions during sitebased activities?	yes	yes	yes	yes	yes	yes	yes
Does the guidance advocate a guideline for asbestos in soil?	yes	yes	no	no	no	no	no
Is there any guidance on how to assess risk from asbestos fibres being present in water?	no	no	no	no	no	no	no

Table 4.1 Summary of questionnaire responses on good practice guidance

5 Approaches to Ground Investigation

Some of the specific aspects of ground investigation identified in the survey included:

The importance of desk study and site walkover to establish the likelihood of asbestos being present. Sampling strategies — can be targeted or random/systematic.

Sampling approach — size and frequency. Dutch, Belgian, and SoBRA guidance require/advocate the use of much larger sample sizes that typically used for other soil contaminants. The Dutch and Belgian guidance also specify sample frequency, e.g. 1 sample per 50 m^3 or 1 per 1000 m^2.

Activity based sampling is occasionally used. This is in essence what the RIVM/TNO guidance was based on, what is described in US EPA guidance,

Asbestos sampling activities in Belgium | AECOM and what is advocated in SoBRA guidance to better understand the likelihood of asbestos fibres becoming airborne as a result of soil disturbance.

Other ground condition factors are important to risk, including soil type, vegetation or other surface cover, and moisture content.

Asbestos sampling activities in Belgium | AECOM

Differing views exist as to whether ground investigation falls under occupational regulations for work with asbestos (as per in buildings).

Requirement for suitably trained/experienced staff. For example, Dutch guidance requires specific certification and accreditation for inspection and sampling of soils.

Asbestos was found to be present in up to 20% of made ground samples according to SoBRA research in the UK based on 150,000 soil samples submitted to UK laboratories between 2015 and 2018.

6 Detecting asbestos in soil

Asbestos sampling activity in UK | AECOM

The conceptual understanding of the spatial distribution of asbestos is fundamental to the design of an investigation and the interpretation of the results. Is it a delineable area subject to asbestos disposal? Is it dispersed fragments across a wide area? What is the likelihood of detecting the asbestos using your sampling strategy?

Grid Size	Probability of detecting one ACM fragment	Sample size as a proportion of grid square
100	1 in 100,000	0.01%
50	1 in 10,000	0.04%
10	1 in 1000	1%

Table 6.1 Probability of detecting asbestos based on a soil sample size of 1 litre

The reliability of the site investigation is a function of:

- Sample size
- Sample density

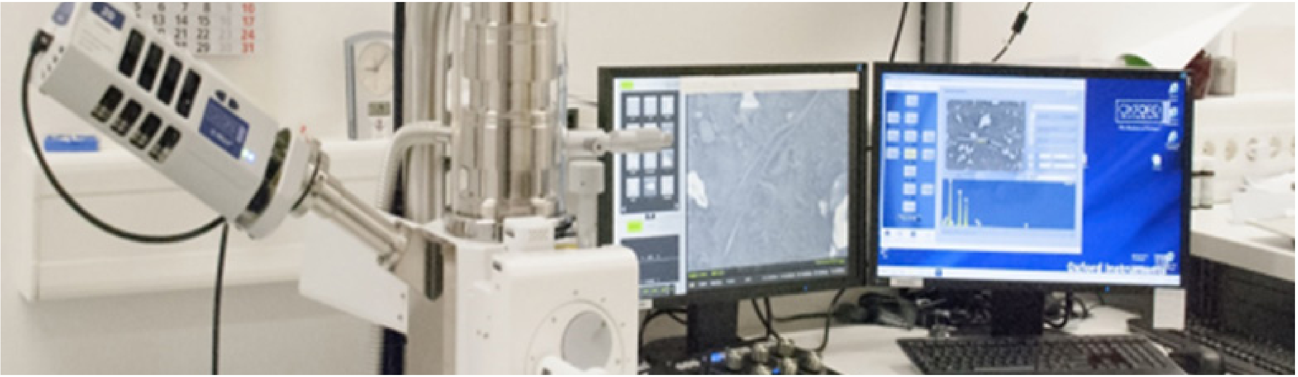
As noted previously the Dutch and Belgian authorities, and SoBRA in the UK, advocate taking larger samples for asbestos compared to typical size of soil samples taken for other contaminant testing because of the greater uncertainties involved in sampling for asbestos in soil.

The theoretical probability of detecting a small area of isolated asbestos fragments in soil can be extremely low. If random fragments are found in soil the probability of more unidentified fragments being present in the soil can be high.

Samples taken in The Netherlands | NTP

7 Laboratory Methods

Electron microscope



Laboratory methods vary widely across Europe. Some countries have very detailed analytical methods that are embedded in the regulatory guidance (for example the Netherlands and NEN Standard 5707). Other countries such as the UK have a mixture of methods published by regulatory bodies (HSE for HSG248) and industry bodies (SCA Blue Book Method*).

Current European Standards specifically for quantifying asbestos in soil include: NEN 5707 (The Netherlands) SCA Blue Book Method (UK)*

** Withdrawn in October 2020 due to concerns over validation triggered by AISS results*

The methods that are available vary depending on the regulatory context and purpose of the test.

The three most common purposes are:

1. Bulk analysis for the presence of asbestos (driven by occupational regulation)
2. Air monitoring (also driven by occupational regulation)
3. Gravimetric quantification for waste classification

The reliability of laboratory test methods can be better understood by studying the inter-laboratory proficiency schemes, such as those provided by the UK Health & Safety Laboratory schemes (including AISS) **[link]**

Detailed standards for quantification in soil are the least common and also tend to have the greatest variability. When a single standard method is not mandated by regulation, interlaboratory variability can be high. Each laboratory undertaking the often multi-stage analytical process slightly differently—be it in the sample preparation, the mass of sub-sample analysed, the magnification of the microscope used, the type of microscopic method (PLM, PCOM, SEM, TEM), the assumed composition of man-made asbestos products, or the fibre counting rules employed.

8 Waste Classification, Handling and Disposal

The classification, handling and disposal of asbestos and soil impacted asbestos waste is addressed by the EU Waste Framework Directive (2008/98/EC) and is potentially the most harmonised aspect of dealing with asbestos in soil across Europe as a result.

All European countries adopt the 0.1% hazardous waste threshold.

Soil that contains identifiable pieces of asbestos containing material (i.e. any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye), then the soil is regarded as hazardous waste.

Collection of asbestos fragments should be done using double bagged, be labelled asbestos waste,

Double bagging of asbestos waste in UK | Ramboll

Double bagging of asbestos waste in UK | Ramboll

and shipped using the correct waste transfer documentation.

Large asbestos sheets can be wrapped in 1000 gauge polythene sheeting, labelled as above and placed in an enclosed and locked skip.

The transport of asbestos impacted soils can be either in enclosed containers or in sheeted lorries by a licensed waste carrier.
It is important to note that in accordance with the waste hierarchy, the volume of hazardous waste should be reduced by physical separation of visible asbestos from residual soils (if feasible).

9 Approaches to Risk Assessment

Motor-powered breathing system | NTP

The most established approaches to risk assessment for asbestos in soil in Europe are the frameworks developed by VROM (now IenW) and OVAM, and with the latter OVAM framework being highly influenced by the earlier VROM framework. Further steps to better understand the potential fibre release of asbestos from the affected land are introduced by the US EPA framework that advocates activity-based sampling, and UK good practice that advocates the better understanding of dust and asbestos fibre release from soil disturbance.

Published research on which the frameworks are based is limited, and dated—the research that forms the basis of the VROM framework dates from the 1990s, and a core piece of research advocated in the UK guidance dates from the 1980s.

Whilst individual frameworks vary in the detail, and the data requirements for those frameworks vary (see section on Ground Investigation), there is a common theme to the frameworks that is illustrated in the diagram below.

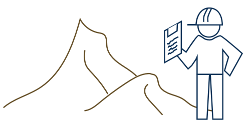
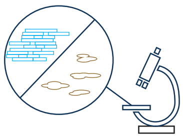
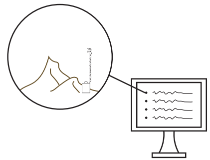
Tier	Tier 1	Tier 2	Tier 3	Tier 4
Data	Basic soil characterisation 	Differentiation in asbestos form and type 	Respirable fibre content in soil. Particle size fraction of interest 	Site-specific fibre-release data 
Criteria	Generic assessment criteria (not asbestos type specific)	Generic assessment criteria for asbestos types and/or forms	Generic assessment criteria for respirable fibre content	Site-specific assessment criteria

Figure 9.1 Common theme in frameworks

Hobmoor School – Birmingham, UK | Google Maps

Frequently occurring fragments of asbestos cement and AIB were discovered

Ramboll was commissioned by Balfour Beatty Construction Limited to develop and implement an asbestos remediation strategy to enable the construction of a new school.

Previously developed as industrial land, the historic review and site visit established significant volumes of demolition rubble from prefabricated buildings across the site. The proposed development included landscaping, sports areas and

Asbestos finds | Ramboll

earthworks reprofiling. This meant significant cut and fill works across the site with soil containing demolition rubble.

Asbestos Containing Material (ACM) was encountered during site clearance, so a specialist survey contractor was commissioned for soil sampling and perimeter air monitoring. The asbestos detected in this survey was asbestos cement (chrysotile), asbestos insulation board (amosite) and found in the topsoil till a depth of 1,00-1,50 meters. The pollutant linkages identified during construction and operation were potential exposure to free fibres from friable materials from the asbestos cement and insulation board.

The remedial options appraisal included:

- Dig contaminated soil and dump on site in vegetation strip; costs over £800 000,
- Hand pick asbestos material, capping with imported top soil (0,3 meters) and install a marker layer between clean top soil and contaminated soil underneath; costs approximately £500 000,
- Assess the risks of in situ reusing the top soil.

Pockets of asbestos covered much of the site at depths up to 5m.

Asbestos finds—hand picking | Ramboll

Processing plant | Ramboll

Based on the options appraisal a bespoke methodology was developed and a comprehensive worldwide review of asbestos legislation and guidelines was undertaken. The final remediation strategy designed comprised of:

1. Hand picking of asbestos cement and asbestos insulation board fragments,
2. Trommel sieving of soil on a 14 mm mesh,
3. Air monitoring for fibres across the perimeter of the site and in the "Control Zone",
4. Works carried out by a licensed contractor with a HSE approved asbestos methodology.

A dust and fibre release experiment was designed to estimate the potential fibre release during school operation, which could be released by soil derived indoor dust. This was done by simulating a realistic and real time situation. For this a 12 m^3 sealed enclosure was built into the school with an air lock entry. The soil in the sealed enclosure was vigorously disturbed to generate dust. The indoor air was monitored and sampled. The samples were tested with Phase Contrast Optical Microscopy (PCOM) analyses.

The remediation delivered a screened top soil which was suitable for re-use in the landscape area

Indoor air experiment | Ramboll

without requirement of a cover layer. The worst case activities were simulated and tested and concluded no residual fibres and low residual risks. All air monitoring results were below detection limit of the standard HSE method i.e. <0.01 f/ml during the earthworks. And the air testing experiment (samples repeatedly disturbed) did not generate airborne fibre concentrations above limit of detection of the standard HSE method (<0.01 f/ml).

The new school is in place and the landscaping offers a nice area around it.

Before and after construction | Ramboll

10 Risk-Based Soil Guidelines

There are few published guideline values for asbestos in soil in Europe. Those that are published are summarised below:

Country/ Region	Guideline Value	Additional Information
The Netherlands	Tier 1: 100mg/kg Tier 2: 1000mg/kg (non-friable) or 100mg/kg friable Tier 3: 10mg/kg respirable fibres	Soil Remediation Circular 2013 Annex 3. Concentrations defined as the sum of chrysotile + x10 amphibole and as the average dry weight concentration over a maximum spatial unit of 1000m2. Samples to be taken and analysed as per SIKB Protocol 2018 and NEN 5707.
Italy	1000mg/kg	D.Lgs 152/06. Analysis required to be either SEM for asbestos content <1% or DRX/FTIR for asbestos contents >1%.
Belgium/ Flanders	100mg/kg	Phase 1—minimum of two 10 litre sieved soil samples per 1000m2 of unpaved ground. If concentration < 100mg/kg or >70cm bgl, no action required. If >100mg/kg, further site-specific inspection (Phase 2) required. Concentrations defined as the sum of fixed fibres + x10 loose fibres.
Belgium/ Wallonia	100mg/kg	Concentrations defined as the sum of bonded fibres + x10 unbound fibres. If concentration is > 100mg/kg but <500mg/kg it is acceptable to use soil beneath 1m clean soil + geotextile.
Belgium/ Brussels	100mg/kg Intervention Value 80mg/kg Remediation Value	If the results obtained for a sample exceed the intervention standard for asbestos or if there is a question of pollution (in the sense of art. 3 25° of the Soil Ordinance), a detailed soil survey must be carried out.

Table 10.1 Published guidelines in Europe

11 Approaches to Risk Management

Risk perception and stakeholder acceptance of a risk-based approach to asbestos is potentially a far stronger driver of intervention than for many other soil contaminants. Zero tolerance or an abundance of caution towards asbestos can drive remediation towards “non-detect” solutions.

There are well established risk assessment decision frameworks available, for example the Australian, US EPA, Dutch, and Belgian approaches. What is not well understood is how often those frameworks are used past “Tier 1”.

Is the challenge to prove the worth of the more detailed risk assessment Tiers? Is the scientific evidence sufficient to be able to persuade stake-holders that the risk is acceptable? Does the retention of asbestos-containing soils on-site leave constraints on land-use that is not cost-beneficial? Detailed risk assessment has its place and can be valuable in situations where it is not possible and not sustainable to remove the asbestos entirely. This is illustrated in the decision flowchart on the next page.

The difference in the prescriptive nature and detail of frameworks for individual countries and the sus-tainability of the output from those frameworks is worth further consideration.

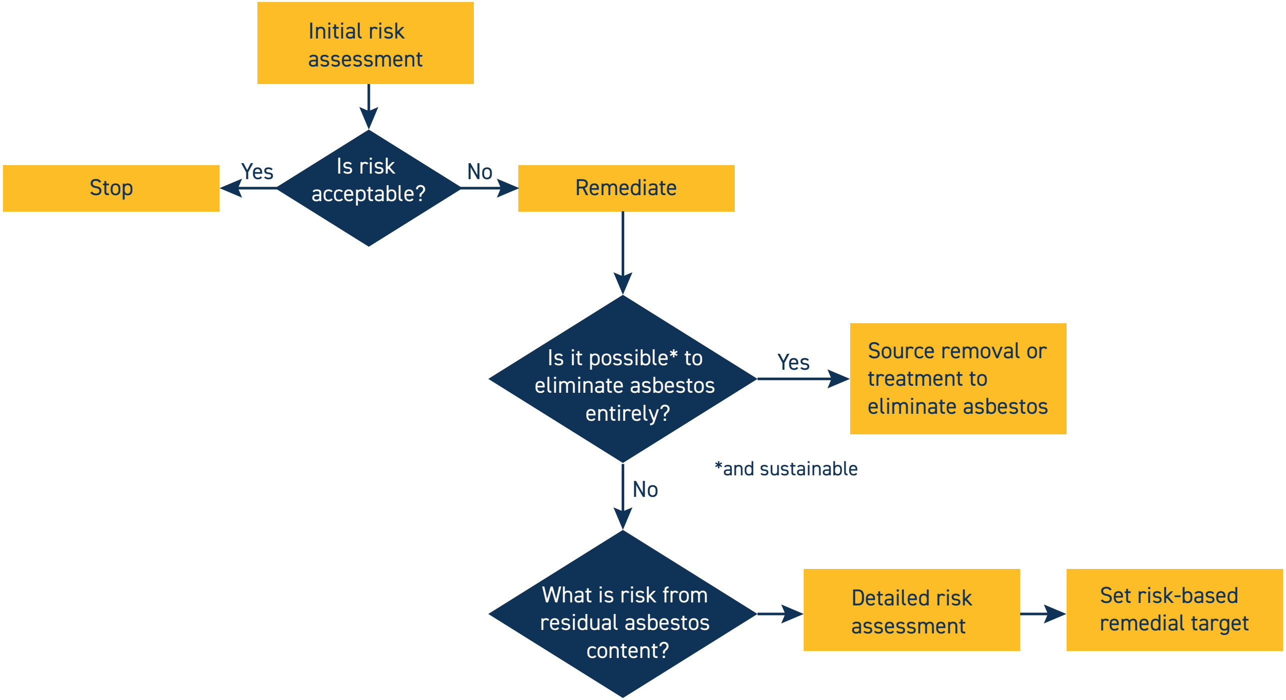


Figure 11.1 Approaches to Risk Management

12 Research and Innovation

Little innovation was specifically identified by the respondents to the questionnaire. A literature review of the most recent developments (within a 5 year time window) in the fields of analytical methodologies, remediation technologies and survey studies has been carried out for NICOLE through the analysis of scientific publications hosted at all the Web of Science databases [Link].

Asbestos investigations have historically focused on commercial asbestos fibers, which were commonly defined in regulations as chrysotile, crocidolite, amosite, tremolite, actinolite, and anthophyllite. Investigations now include other types of elongate mineral particles such as winchite and richterite (van Orden, 2018).

The most common analytical methods for asbestos analysis are polarised light microscopy (PLM), phase contract optical microscopy (PCOM) and electron microscopy (either scanning (SEM) or transmission (TEM).

Cossio et al (2018) improved the sensitivity and precision and enhanced the productivity of a Scanning Electron Microscopy with Energy Dispersive Spectrometry (SEMEDS) methodology for the analysis of asbestos in a natural confining matrix and also with a very low asbestos content.

Wroble et al (2017) compared different soil sampling and analytical methods for asbestos quantification in order develop a toolbox for better assessment in order to overcome the difficulties that exist in the detection of asbestos at low concentrations and its correspondent extrapolation from soil concentrations to air concentrations. Sampling was performed using two distinct methods: traditional discrete ("grab") and incremental sampling methodology (ISM). Analysis was carried out using PLM, TEM and a combination of these two methods were used. Using a Fluidized Bed Asbestos Segregator (FBAS) followed by TEM analysis resulted in the detection of asbestos at locations that were not detected using other analytical methods.

Fibre counting by automated image analysis using fluorescence microscopy has been evaluated by Alexandrov et al (2015). There is the potential from this for faster analysis and less human error, but whilst good validation for medium to high fibre concentrations was achieved, for lower fibre concentrations it was less accurate.

In the last 5 years just a few articles mentioned innovative or upgraded technologies for the asbestos treatment in contaminated sites, mostly considering biological treatment.

Mohanty et al. (2018) examined whether environmentally relevant concentrations of siderophores (exudates from bacteria and fungi that facilitate iron mobilisation and uptake) could alter chrysotile toxicity. Iron removal by siderophores decreased the carcinogenicity of the fibres, the fungal exudates being more effective than those from the bacteria. However, the authors stated that this approach should be more deeply explored in order to develop a viable strategy to manage asbestos-contaminated sites. Native bacteria and fungi from asbestos mines in India (Aspergillus tubingenesis and Coemansia reverse) have also reportedly been used to detoxify asbestos (Bhattacharya et al. 2015 & 2016).

Gonneau et al. (2017) evaluated the capacity of crop cultivar and grasses for the phytoremediation of soils containing asbestos from natural and anthropogenic causes. The presence of asbestos caused less or no impact on the plant growth when compared to other factors such as the presence of heavy metals or lack of nutrients.

Valouma et al. (2016) used a combined treatment of oxalic acid dihydrate with silicates (tetraethoxysilane and pure water glass (potassium silicate)) to achieve total destruction of chrysotile. Oxalic acid leaching followed by the tetraethoxysilane addition was more appropriate for cases of glushinskite recovery; while an Oxalic acid leaching followed by water glass managed to encapsulate the asbestos fibers, which might be a valid option for onsite asbestos detoxification.

A small number of commercial companies have developed innovative solutions to asbestos remediation:

- An Italian company offers an innovative remediation technology that uses microwave energy to convert asbestos waste to an inert material. The technology involves a movable reactor that can heat the asbestos and produce a reusable inert material [Link].
- A Japanese company Sagasiki offers 'ND Lock', a solidification solution based on calcium polysulphide (CaSx) formulation. The treatment involves a crystallization and decomposition process. Numerous applications relating to asbestos treatment are given on their website.

13 Remediation Options

The most common remediation approach in many countries is still to "dig and dump" (i.e. excavate and dispose to an off-site landfill). A question is whether this is a sustainable approach? The risk is removed by removing the hazard (i.e. the source) but does the context of site use permit a lower impact solution?

The trigger for remediation is also different between countries. For example, mandatory testing for microscopic fibres in soil whenever a construction activity takes place versus action only if visible asbestos waste is encountered. In France, all road asphalt has to be tested for the presence of asbestos as part of any road improvement scheme.

From the questionnaire responses it is clear that there is substantial variation in remediation

Typical remediation earthworks activities in UK | AECOM

Damping down of stockpiled material with water spray | AECOM

triggers, in what restrictions and requirements the identified presence of asbestos introduces, and in the remediation standards enforced. Even if the value of the remediation standard appears at face value to be the same (for example for The Netherlands and Belgium), the detailed definition of that value is different.

What is generally recognised in the questionnaire responses is that the presence of asbestos in the ground can have a significant effect on land use and costs for remediation (either in the cost for remediating the asbestos itself as a risk and remediation driver, or in the additional cost for remediating a different risk driving contaminant because of the co-presence of asbestos).

There are a number of remediation options to consider, some more established than others. From a risk management perspective these options can be grouped as follows:

Monitor
- Risk assessment
- Monitoring strategy

Institutional Controls
- Land-use management
- Signs
- Fencing
- Permit control
- Land-use restrictions

Traditional Remediation Methods
- Excavation and disposal offsite
- In-situ containment (cover system)
- Hand-picking (ground or belt)
- Tilling
- Mechanical screening

Emerging/Innovative/Alternative Methods
- Mechanical screening (advanced)
- Soil washing
- Vitrification
- ABCOV (acid destruction)
- Microwave destruction
- Modified low temperature thermal desorption
- Soil fungi
- Fine grinding
- Physical stabilisation
- Phytoremediation

The following scheme (next page) presents the risk management based considerations for the remedial options.

What is the context for the decision?

- Management of current situation (land condition and use)
- Regulatory intervention
- Preparation for site divestment/acquisition
- Preparation for site for new use
- Construction activity requiring asbestos containing soil to be excavated and/or constructed on

What is the risk characterisation?

- Negligible risk and no regulatory driver for further action/intervention
- Low risk - potential to manage risk without extensive remedial action
- Higher risk - requires more detailed consideration of remediation options

Remediation options	Considerations for remediation options
Monitor	Monitoring locations and monitoring frequency Type of monitoring (realtime/continuous or spot monitoring, time duration, dust and/or fibres) Limit of detection and sensitivity of method (e.g. differentiation of fibre types and fibre sizes)
Institutional control	Is control of use/access of area practicable and achievable? Does it require reassurance boundary monitoring? Fencing, signage, specific PPE/RPE requirements
Remove	Can it be treated and re-used on-site? Can it be treated to reduce volume requiring disposal? Can it be treated to reduce handling/ transportation risk?
Cover	What level/degree of soil disturbance does this need to protect against? Durability. What ground access constraints are present which may restrict/constrain installation of cover (type, extent)?
Ex-situ treatment	Treatment type - physical separation, chemical destruction, stabilisation. What is the required post-treatment specification for the material? What is the treatment capable of achieving?
In-situ treatment	Treatment type - physical separation, chemical destruction, stabilisation. What is the required post-treatment specification for the material? What is the treatment capable of achieving?

Figure 14.2 Example of a Risk Management Decision Flowchart

John F Hunt demolished and remediated this former 44-acre foundry / iron works site in Ipswich. The mixed-use site also held two historic landfills containing inert and 'difficult' waste.

Part of the works involved the management of 35,000 m^3 of previously unidentified fibrous asbestos in soil. This unforeseen event had not been budgeted for and could have potentially rendered the project unviable. John F Hunt worked quickly and pragmatically with the client's consultants and regulators to agree a solution to enable the re-use of materials on site, making the necessary adjustments to the remedial design and Materials Management Plan.

An innovative process engineered approach of complex sorting and cement stabilisation of the

Futura Business Park – Ipswich, UK | John F Hunt

All forms of asbestos were discovered including crocidolite lagging.

Pockets of asbestos covered much of the site at depths up to 5m.

Asbestos finds | John F Hunt

soil was agreed with the regulators to derive site won engineered fill that was suitable for use.

Due to the nature of the asbestos, the remediation works were undertaken as Licensed Asbestos Works managed by John F Hunt.

Contaminated soil was fed into a three-way screener. The oversize material off the screener was proven to be suitable for re-use. The mid-size component was passed to an 'asbestos picking station' where six operatives hand removed visible asbestos products; in some instance the material was passed though the picking station twice to ensure the re-use criteria of <0.1% asbestos (w/w) was achieved. Fine material coming off the screener was passed to a mill unit where

2% cement was added. The stabilised fines were fed onto a stacking conveyor with misting sprays that deposited the material directly into the excavation.

Throughout the works the air was monitored by an independent Asbestos Analyst to demonstrate that the control measures were suitable.

The processed soil was tested to show compliance with the Remediation Strategy, following which it was placed and compacted to form a development platform 1.5m below the finished site level.

John F Hunt were able to successfully treat 65,000 tonnes of asbestos contaminated soil using innovative techniques that ultimately saved the client over £10,000,000 in disposal costs.

Processing plant | John F Hunt

A number of innovations in remediation have either been proposed and/or implemented by remediation specialists, as exemplified in some of the case studies included in this document and the listing of potential options on page 37. Innovation does not have to be a completely new technology, and can include the innovative use of an existing technology.

Examples of this include the use of:

- Cement impregnated geotextiles for cover systems (see photographs to the right)
- Low temperature driers or thermal desorption units to extract loose fibres by drying + extraction of airborne fibres
- Mechanical screening (dry and/or wet)

Installation of surface barrier geotextile | Curtis Barrier Intl

A comprehensive review of remediation technologies is provided in a report by Bureau KLB for the Dutch Ministry for Infrastructure and Water Management published in 2018. This was driven by the need to reduce the unsustainable volume of asbestos contaminated soils being disposed to landfill in the Netherlands.

Mechanical screening of excavated soil | AECOM

Remedial objectives can shape option choices. For example:

Remove ACM fragments and re-use remaining soil at depth on-site →	Physical separation of ACMs using hand picking or mechanical screening?
Remove asbestos fibres and re-use remaining soil at surface on-site →	Physical separation of fibres by soil washing or drying + vacuum extraction?
Treat soil + asbestos so that material is suitable for re-use →	Stabilisation or fibre destruction technology?
Re-use on-site is not possible/ acceptable →	Off-site disposal—can pre-treatment reduce cost by minimising hazardous waste volume?

Figure 13.1 Examples of choices for different Remedial objectives

Factors to consider in remedial selection can include:

- Types of asbestos present
- Levels of asbestos present
- Area / volume of impacted soil
- Timescales
- Client risk perception / avoid land blight
- Sustainability
- Presence of other contamination
- Current and/or proposed land-use
- Site location (and proximity to receptors)
- Occupational health constraints
- Remediation standard required
- Other requirements for soil (e.g. geotechnical)

Removing asbestos contaminated soil | NTP

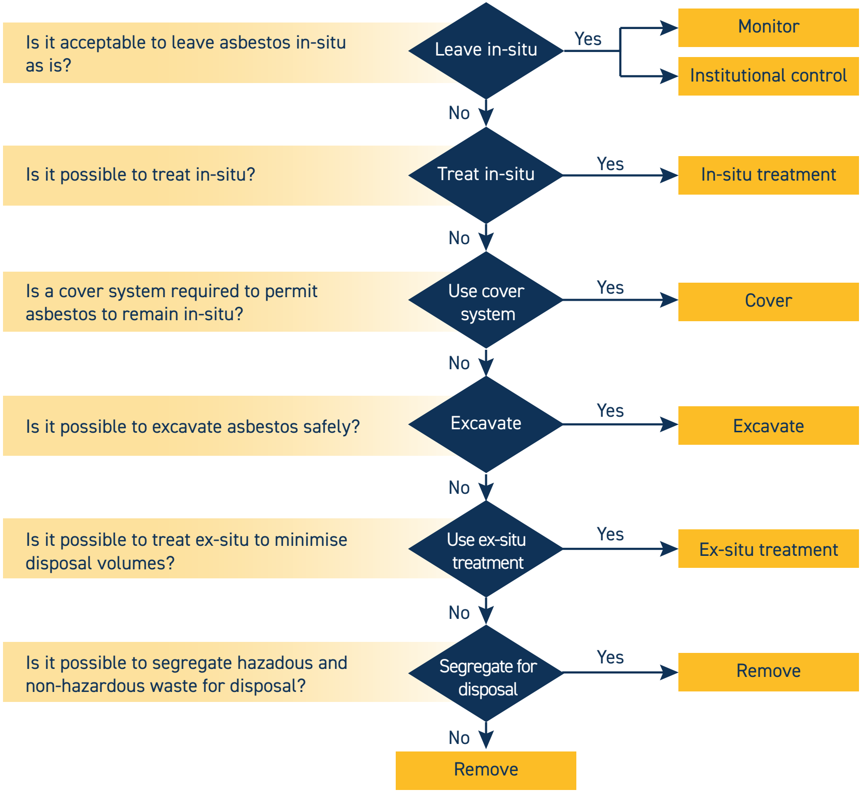


Figure 13.2 Example of a Remediation Decision Flowchart

14 Sustainable Remediation

Trommel screening of excavated soil | McAuliffe

Asbestos in soil remediation options should be considered in accordance with sustainable remediation frameworks (e.g. SuRF). Does the remediation approach represent the best solution when considering environmental, economic and social factors as agreed with stakeholders? How can successful remediation best be achieved with minimal environmental impact? What remedial solution delivers the greatest cost-benefit? Does the selected approach transfer impacts to future generations?

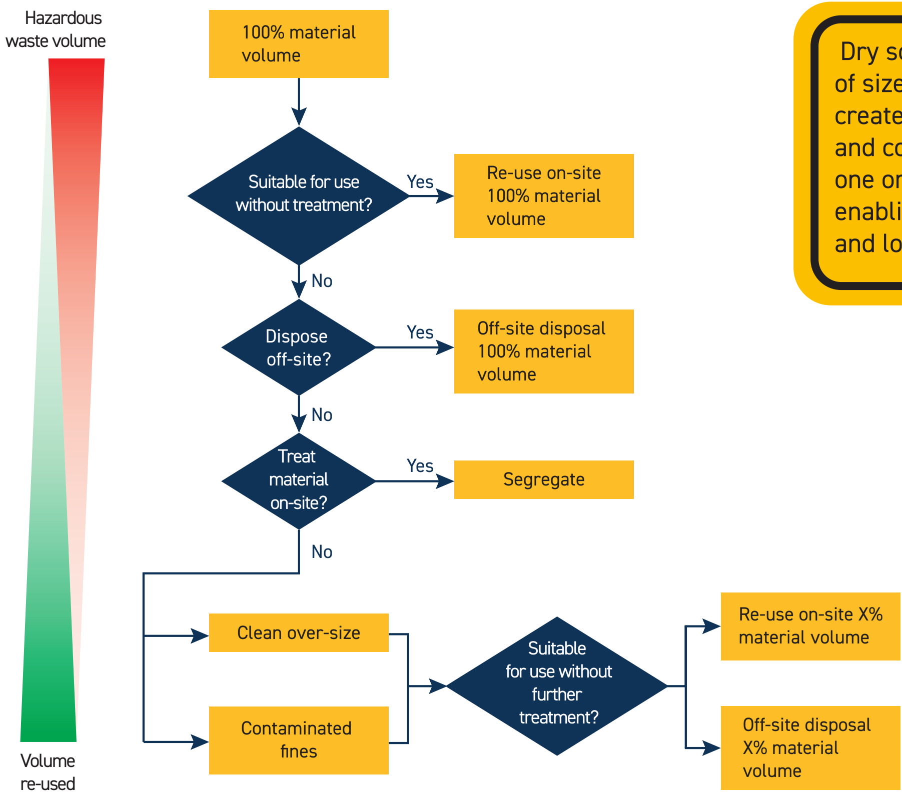
A simple example is the consideration of on-site physical separation to maximise the re-use of

Belt-picking station | McAuliffe


Hand picking of asbestos fragments on a belt | McAuliffe

material on-site and minimise off-site waste disposal. One way of viewing this is via a decision flowchart such as the examples on the following pages which illustrate the decision process and disposal volume reduction created by the adoption of mechanical separation treatment techniques. The use and sequencing of the material screening techniques will be influenced by a number of factors including:

- Cost of treatment versus cost of disposal
- Particle size distribution of material
- Remediation standard



Dry screening and separation of size fractions could create clean size-fractions and concentrate asbestos in one or more size fractions, enabling re-use of some material and lowering disposal volumes

Figure 14.1 An example of a treatment decision process for dry screening as a sustainable option

AECOM developed a remediation and excavated materials management strategy for the redevelopment of a former car part manufacturing facility located in the UK.

The presence of soil contaminants necessitated a remediation and earthworks strategy that had sustainability at its core: maximising reuse of site-won material, and minimising off-site disposal whist at the same time providing a safe development platform. The remediation strategy sought to first treat organic-based contamination through ex-situ bioremediation. Alongside the remediation works, an excavated materials management plan (MMP) was developed under the CL:AIRE Definition of Waste: Development Industry Code of Practice (Code of Practice) to support the earthworks design. Demolition of the former buildings and hard standing occurred alongside the soil remediation under separate contract by a third party. Four stockpiles of screened demolition materials (approx. 26,500 m^3) were prepared for re-use. However, these materials were subsequently found to contain a proportion of asbestos containing materials (ACM) which had in places also contaminated the ground as the stockpiles had been moved around by the contractor.

Fragment of asbestos lagging encountered

Asbestos finds | AECOM

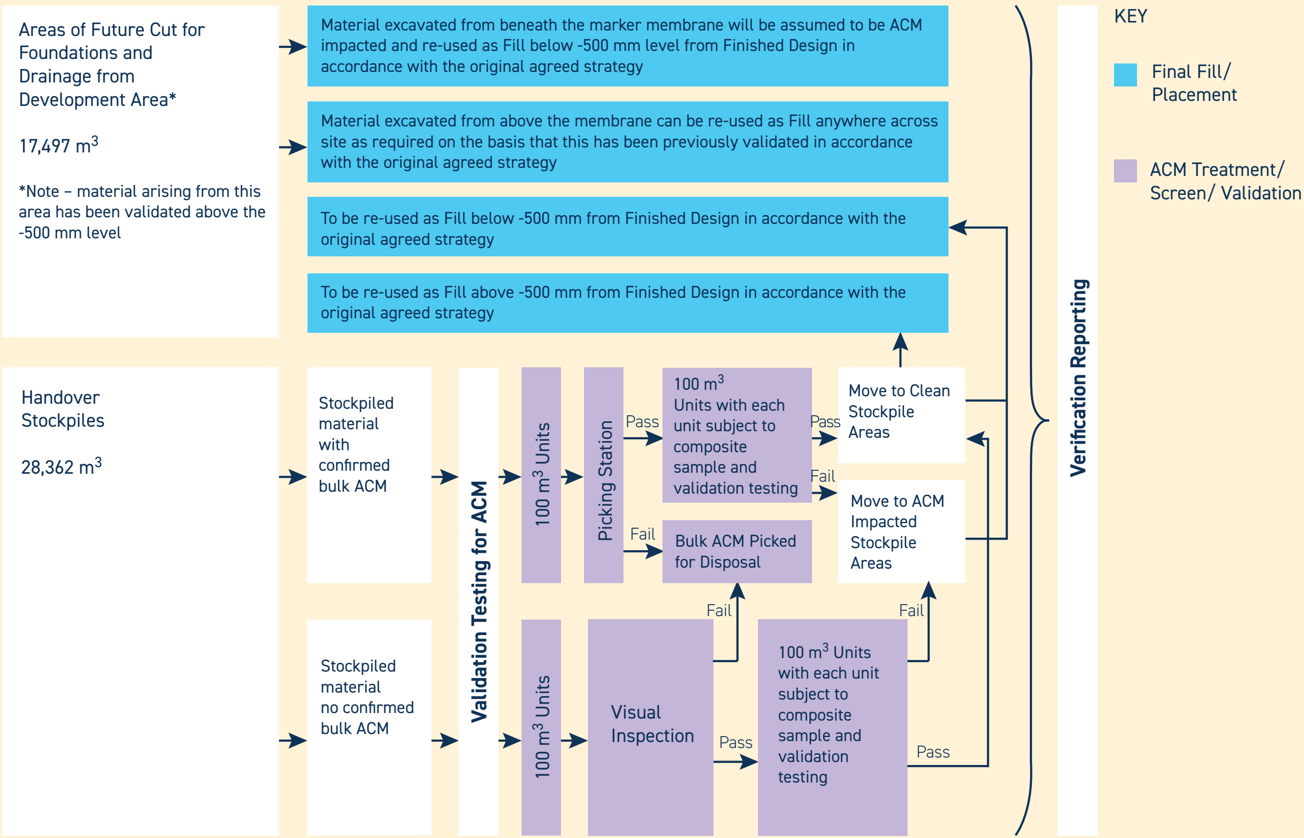


Figure C2.1 Material Management Flowchart

In order for the stockpiled materials to be re-used as part of the consented design a revised strategy was required to ensure the appropriate and safe re-use of these materials. AECOM prepared a detailed assessment on the levels of ACM and asbestos free fibres recorded in the materials and also quantified the level of risk posed by the materials. The soil re-use strategy was developed in accordance with the Control of Asbestos Regulations (2012) and the HSE Approved Code of Practice for managing and working with asbestos (ACoP L143) and gained regulatory agreement.

The strategy developed for the areas of impacted ground centred on a minimum of 500mm validated clean cover being placed below finished design level with the installation of a geotextile marker membrane at the interface of the clean cover and existing ground level. The strategy also made provision for selected 6F2 (UK highway's grade of aggregate) stockpiles impacted with asbestos to be

Installation of the cover system | AECOM treated through mechanical screening, sorting and hand picking to generate screened material that met agreed validation criteria (<0.001% asbestos). The mechanical screening successfully separating the larger size fractions that were free of asbestos from the smaller size fractions where the asbestos tended to be. The treated larger size fractions could then be recrushed to produce graded material suitable for use in the development without restriction. Stockpiles that were not treated were tracked and used in dedicated areas of the development under 500mm of clean cover with geotextile marker membrane. In areas where soils containing ACM were placed beneath cover, the strategy set out the principles and expectations for a future site management strategy that would need to be adopted upon completion.

The approach taken at this site ensured that the excavated and site-won materials were managed sustainably on site, minimising potential off-site disposal and material import consistent with the original design aspirations and expectations attached to the planning consent.

15 Opportunities for Harmonisation

There are opportunities for and benefits of harmonisation:

- The advocacy of sustainable approaches to risk management
- Greater recognition of the cost-benefit of waste minimisation using ex-situ or in-situ techniques
- A common understanding of risk and a risk-based, proportionate, response to asbestos in soil

There are also barriers to harmonisation that ultimately will limit the degree of harmonisation that is possible. For example:

- Different national legislation and regulatory guidance
- Differing risk perception and/or prioritisation
- Differing scale of issue
- Differing scientific opinion

Figure 15.1 Harmonised approach

16 Concluding Remarks

The problem of asbestos contaminated soil is a common one across Europe, albeit to varying degrees and largely linked to the historic use and management of asbestos in construction and demolition of buildings. It is a recognised challenge for the risk management of existing land use and the re-purposing of brownfield land in some but not all European countries. As result there are well established guidance and procedures in place in some countries and an absence in others. The variability in approaches is marked, with highly detailed and prescriptive regulator-driven guidance in countries such as The Netherlands and Belgium, and less prescriptive industry-led guidance in the UK.

The opportunities for harmonisation across countries are few—certainly in the short-term, and this is driven by the different legislature and regulatory guidance in each country and the large differences in investigation approaches across European countries that have guidance in place. It is also evident that the approaches in countries are not all entirely risk-based. For example, the requirement to remove all visible fragments of asbestos in soil in Italy irrespective of the soil standard in Italy of 1000 mg/kg (which is the EU hazardous waste limit for asbestos). For many countries it is still the case that no risk-based guidance exists for asbestos in soil, and in those countries (unless gross asbestos contamination is identified) the consideration of low or trace levels of asbestos in soil is not a default consideration in site investigation design and land management.

There is therefore a place for advocating good practice in investigation, in risk assessment, and in remediation, employing the best science and utilising the most sustainable remediation options. This is relevant both for European countries where regulation and guidance is currently absent, and for European countries where guidance is in place.

The pace of change in asbestos regulation and guidance is slow and there are opportunities to learn from countries outside of Europe, for example the work of the US EPA in the USA and the work of the Australasian Land and Groundwater Association (ALGA) and BRANZ Ltd in Australia and New Zealand.

CONTENT DISCLAIMER:
This publication does not necessarily represent the opinions of all NICOLE members.

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Acronyms and Abbreviations

ACM Asbestos containing material

AIB Asbestos insulation board

AISS UK Health and Safety Laboratory (HSL) Proficiency Testing for Asbestos in https://www.hsl.gov.uk/proficiency-testing-schemes/aiss

DRX X-ray diffraction

f/ml a unit of measurement for air (asbestos fibres per millilitre of air sampled)

f/m^3 a unit of measurement for air (asbestos fibres per cubic metre of air sampled)

FTIR Fourier transform infrared spectrometry

HSE UK Health and Safety Executive https://www.hse.gov.uk/

OVAM Public waste agency of Flanders https://www.ovam.be/

PCOM Phase-contrast optical microscopy (alternative acronym used is PCM)

PLM Polarised light microscopy

RIVM Netherlands National Institute for Public Health and the Environment https://www.rivm.nl/en

SCA UK Standing Committee of Analysts
http://standingcommitteeofanalysts.co.uk/

SEM Scanning electron microscopy

SoBRA UK Society of Brownfield Risk Assessment https://sobra.org.uk/

SuRF Sustainable Remediation Forum https://www.sustainableremediation.org/
and https://www.claire.co.uk/projects-and-initiatives/surf-uk

TEM Transmission electron microscopy

TNO Netherlands Organisation for Applied Scientific Research
https://www.tno.nl/en/

VROM Former Netherlands Ministry of Housing, Spatial Planning and the Environment (since 2010 with the Ministry of Infrastructure and the Environment)

US EPA United States Environmental Protection Agency https://www.epa.gov/

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Further information: www.NICOLE.org

APPENDIX C. ASBESTOS MONITORING DATA: COVERED SCREENER AND HEPA FILTER DATA: ROWLEY REGIS

IOM
working for a healthy and sustainable world

CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S26545a

DATE OF ISSUE: 11.07.22

DATE ANALYSIS REQUESTED: 05.07.22

DATE ANALYSIS COMPLETED: 08.07.22

SAMPLES: Ten airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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Tel: 0131 449 8000 Fax: 0131 449 8084 Email: iom@iom-world.org

RESULTS:

Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^-1)*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^-1)*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^-1)*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^-1)*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^-1)*
*ERQ ASB 1 (27/06/22)	1440	12	300	0.0020	1 / <0.0005*	4.5 / 0.0007	4 / 0.0007	2.5/ <0.0005*
ERQ outside (27/06/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
*ERQ ASB 1 (28/06/22)	1440	11	300	0.0018	3 / 0.0005	0 / <0.0005*	5 / 0.0008	3 / 0.0005
ERQ outside (28/06/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
*ERQ ASB 1 (29/06/22)	1440	6.5	300	0.0011	4 / 0.0007	2.5/ <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ outside (29/06/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ ASB 1 (30/06/22)	1440	6	300	0.0010	1 / <0.0005*	0 / <0.0005*	3 / 0.0005	2 / <0.0005*
ERQ outside (30/06/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
*ERQ ASB 1 (01/07/22)	1440	3	300	0.0005	1 / <0.0005*	0 / <0.0005*	2 / <0.0005*	0 / <0.0005*
ERQ outside (01/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S26545a
DATE OF ISSUE: 11.07.22

COMMENTS:

Asbestos fibres were detected during the analysis of all of the ERQ ASB 1 samples and sample ERQ Outside 30/06/22. No asbestos fibres were detected on any of the other samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

The ERQ ASB 1 samples (marked with *) were too dusty to be analysed as received. Following plasma ashing, the residue from each of the dusty samples was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on the entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for the samples that required dilution.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark
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S Clark
Head of Mineralogy

working for a healthy and sustainable world

CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S26732a

DATE OF ISSUE: 19.07.22

DATE ANALYSIS REQUESTED: 13.07.22

DATE ANALYSIS COMPLETED: 18.07.22

SAMPLES: Fourteen airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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RESULTS:

Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ERQ ASB 1 (04/07/22)	1440	1.5	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1.5 /<0.0005*
ERQ outside (04/07/22)	1440	1.5	150	<0.0005*	1.5 /<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 1 (05/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ outside (05/07/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 1 (06/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ outside (06/07/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ ASB 1 (07/07/22)	1440	4	300	0.0007	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	3 / 0.0005
ERQ ASB 2 (07/07/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 3 (07/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (07/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 1 (08/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 2 (08/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (08/07/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 4 (08/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of sample numbers ERQ Outside 04.07.22 and ERQ ASB 1 07.07.22. No asbestos fibres were detected on any of the other samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

The ERQ ASB 1 sample (marked with *) was too dusty to be analysed as received. Following plasma ashing, the residue from the dusty sample was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on the entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for the samples that required dilution.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S26905

DATE OF ISSUE: 28.07.22

DATE ANALYSIS REQUESTED: 21.07.22

DATE ANALYSIS COMPLETED: 27.07.22

SAMPLES: Twenty airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

UKAS TESTING
0374

RESULTS:
Client Ref: PO – RR151

Sample No.	**Volume (l)**	(1) **No. of Resp. Fibres Found**	(1) **No. of Fields Searched**	**Total Fibres** *Fibre Conc^n (fml^{-1})*	**AMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**CMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**MMMF** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**NAM Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
*ERQ ASB 1 (11/07/22)	1440	9	600	0.0015	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	8 / 0.0013
ERQ ASB 2 (11/07/22)	1440	2	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (11/07/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	1 / <0.0005*
ERQ ASB 4 (11/07/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ ASB 1 (12/07/22)	1440	5	600	0.0008	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	4 / 0.0007
ERQ ASB 2 (12/07/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
ERQ ASB 3 (12/07/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
ERQ ASB 4 (12/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
*ERQ ASB 1 (13/07/22)	1440	2	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
ERQ ASB 2 (13/07/22)	1440	2	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 3 (13/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (13/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
*ERQ ASB 1 (14/07/22)	1440	1	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 2 (14/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (14/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (14/07/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	1 / <0.0005*
*ERQ ASB 1 (15/07/22)	1440	4	600	0.0007	2 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
ERQ ASB 2 (15/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (15/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (15/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S26905
DATE OF ISSUE: 28.07.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of four of the twenty samples supplied for this analysis. No asbestos fibres were detected on any of the other samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

The samples (marked with *) were too dusty to be analysed as received. Following plasma ashing, the residue from each of the dusty samples was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on the entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for the samples that required dilution.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

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IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S27044

DATE OF ISSUE: 03.08.22

DATE ANALYSIS REQUESTED: 29.07.22

DATE ANALYSIS COMPLETED: 02.08.22

SAMPLES: Twenty airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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CONTRACT NO: S27044
DATE OF ISSUE: 03.08.22

RESULTS:
Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
*ERQ ASB 1 (18/07/22)	1440	2	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*	0 / <0.0005*
ERQ ASB 2 (18/07/22)	1440	1.5	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0.5 /<0.0005*
ERQ ASB 3 (18/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (18/07/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
*ERQ ASB 1 (19/07/22)	1440	4	600	0.0007	0 / <0.0005*	0 / <0.0005*	4 / 0.0007	0 / <0.0005*
ERQ ASB 2 (19/07/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (19/07/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
ERQ ASB 4 (19/07/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
*ERQ ASB 1 (20/07/22)	1440	3	300	0.0005	0 / <0.0005*	1 / <0.0005*	1 / <0.0005*	1 / <0.0005*
ERQ ASB 2 (20/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (20/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (20/07/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ ASB 1 (21/07/22)	1440	2	300	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 2 (21/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (21/07/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 4 (21/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 1 (22/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 2 (22/07/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 3 (22/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (22/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27044
DATE OF ISSUE: 03.08.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of three of the twenty samples supplied for this analysis. No asbestos fibres were detected on any of the other samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

The samples (marked with *) were too dusty to be analysed as received. Following plasma ashing, the residue from each of the dusty samples was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on the entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for the samples that required dilution.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

AUTHORISED BY: ………………………
S Clark
Head of Mineralogy

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S27272

DATE OF ISSUE: 17.08.22

DATE ANALYSIS REQUESTED: 11.08.22

DATE ANALYSIS COMPLETED: 16.08.22

SAMPLES: Twenty airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

UKAS TESTING
0374

RESULTS:
Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ERQ ASB 1 (25/07/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 2 (25/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 /<0.0005*
ERQ ASB 3 (25/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (25/07/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*	0 / <0.0005*
ERQ ASB 1 (26/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / 0.0007	0 / <0.0005*
ERQ ASB 2 (26/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (26/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (26/07/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 1 (27/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 2 (27/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (27/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (27/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 1 (28/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 2 (28/07/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 3 (28/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (28/07/22)	1440	1.5	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0.5 /<0.0005*
ERQ ASB 1 (29/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 2 (29/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (29/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (29/07/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27272
DATE OF ISSUE: 17.08.22

COMMENTS:

Single asbestos fibres were detected during the analysis of two of the twenty samples supplied for this analysis. No asbestos fibres were detected on any of the other samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for the samples that required dilution.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S27326

DATE OF ISSUE: 23.08.22

DATE ANALYSIS REQUESTED: 15.08.22

DATE ANALYSIS COMPLETED: 23.08.22

SAMPLES: Twenty airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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RESULTS:
Client Ref: PO – RR151

Sample No.	**Volume (l)**	**(1) No. of Resp. Fibres Found**	**(1) No. of Fields Searched**	**Total Fibres** *Fibre Conc^n (fml^{-1})*	**AMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**CMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**MMMF** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**NAM Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ERQ ASB 1 (01/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 2 (01/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (01/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (01/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 1 (02/08/22)	1440	3	150	0.0005	0 / <0.0005*	0 / <0.0005*	0 / 0.0007	3 / 0.0005
ERQ ASB 2 (02/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (02/08/22)	1440	1.5	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0.5 /<0.0005*
ERQ ASB 4 (02/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 1 (03/08/22)	1440	2	150	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 2 (03/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 3 (03/08/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (03/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 1 (04/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 2 (04/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (04/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (04/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
*ERQ ASB 1 (05/08/22)	1440	13.5	600	0.0022	0 / <0.0005*	4 / 0.0007	1 / <0.0005*	8.5 / 0.0014
ERQ ASB 2 (05/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (05/08/22)	1440	2	150	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 4 (05/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27326
DATE OF ISSUE: 23.08.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of six of the twenty samples supplied for this analysis. No asbestos fibres were detected in any of the other samples.

*Sample number ERQ ASB 1 (05/08/22) was too dusty to be analysed as received. Following plasma ashing, the residue from this sample was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on the entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for the samples that required dilution.

[(1)] UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark
AUTHORISED BY: ....
S Clark
Head of Mineralogy

CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S27368

DATE OF ISSUE: 25.08.22

DATE ANALYSIS REQUESTED: 17.08.22

DATE ANALYSIS COMPLETED: 24.08.22

SAMPLES: Twenty airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

RESULTS:
Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres Fibre Conc^{n} (fml^{-1})	AMX Fibre No. of Resp. Fibres/ Fibre Conc^{n} (fml^{-1})	CMX Fibre No. of Resp. Fibres/ Fibre Conc^{n} (fml^{-1})	MMMF No. of Resp. Fibres/ Fibre Conc^{n} (fml^{-1})	NAM Fibre No. of Resp. Fibres/ Fibre Conc^{n} (fml^{-1})
*ERQ ASB 1 (08/08/22)	1440	3.5	600	0.0005	0.5 /<0.0005*	0 / <0.0005*	1 / <0.0005*	2 / <0.0005*
*ERQ ASB 2 (08/08/22)	1440	1	300	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (08/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (08/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
*ERQ ASB 1 (09/08/22)	1440	10	600	0.0016	1 / <0.0005*	1 / <0.0005*	0 / <0.0005*	8 / 0.0013
*ERQ ASB 2 (09/08/22)	1440	3	300	0.0005	2 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ ASB 3 (09/08/22)	1440	2	300	<0.0005*	1 / <0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (09/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
*ERQ ASB 1 (10/08/22)	1440	5	1200	0.0008	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	4 / 0.0007
ERQ ASB 2 (10/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (10/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (10/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
*ERQ ASB 1 (11/08/22)	1440	1.5	300	<0.0005*	0 / <0.0005*	1.5 /<0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 2 (11/08/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (11/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (11/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
*ERQ ASB 1 (12/08/22)	1440	5	1200	0.0005	1 / <0.0005*	1 / <0.0005*	1 / <0.0005*	2 / <0.0005*
ERQ ASB 2 (12/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (12/08/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
ERQ ASB 4 (12/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27368
DATE OF ISSUE: 25.08.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of nine of the twenty samples supplied for this analysis.

*These samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for the samples that required dilution.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

AUTHORISED BY: ………………………
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Head of Mineralogy

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY:	Provectus Soils Management Regent House Bath Avenue Wolverhampton WV1 4EG	**CONTRACT NO:** **DATE OF ISSUE:**	S27684 12.09.22

DATE ANALYSIS REQUESTED: 05.09.22

DATE ANALYSIS COMPLETED: 09.09.22

SAMPLES: Twenty airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

UKAS TESTING 0374

RESULTS:

Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
*ERQ ASB 1 (15/08/22)	1440	7	600	0.0011	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*	5 / 0.0008
ERQ ASB 2 (15/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (15/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (15/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ ASB 1 (16/08/22)	1440	5.5	600	0.0009	0.5 /<0.0005*	0 / <0.0005*	0 / <0.0005*	5 / 0.0008
ERQ ASB 2 (16/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (16/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (16/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ ASB 1 (17/08/22)	1440	9.5	600	0.0016	1 / <0.0005*	1 / <0.0005*	0 / <0.0005*	7.5 / 0.0012
ERQ ASB 2 (17/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 3 (17/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (17/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
*ERQ ASB 1 (18/08/22)	1440	2	600	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 2 (18/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 3 (18/08/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 4 (18/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
*ERQ ASB 1 (19/08/22)	1440	1	600	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 2 (19/08/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
ERQ ASB 3 (19/08/22)	1440	2	150	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 4 (19/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27684
DATE OF ISSUE: 12.09.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of eight of the twenty samples supplied for this analysis.

*These samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Some of the samples supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

[1] UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

AUTHORISED BY: ………………………
S Clark
Head of Mineralogy

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
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WV1 4EG

CONTRACT NO: S26545b

DATE OF ISSUE: 11.07.22

DATE ANALYSIS REQUESTED: 05.07.22

DATE ANALYSIS COMPLETED: 08.07.22

SAMPLES: Five airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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RESULTS:

Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ERQ Screener (27/06/22)	1440	5.5	300	0.0009	1 / <0.0005*	0 / <0.0005*	2.5 /<0.0005*	2 / <0.0005*
ERQ Screener (28/06/22)	1440	11	300	0.0018	2 / <0.0005*	0 / <0.0005*	8 / 0.0013	1 / <0.0005*
ERQ Screener (29/06/22)	1440	7.5	300	0.0012	3 / 0.0005	0 / <0.0005*	4.5 / 0.0007	0 / <0.0005*
ERQ Screener (30/06/22)	1440	2	300	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ Screener (01/07/22)	1440	4.5	300	0.0007	3.5 / 0.0006	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S26545b
DATE OF ISSUE: 11.07.22

COMMENTS:

Small numbers of amphibole asbestos fibres were detected during the analysis of all five samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

These samples were too dusty to be analysed as received. Following plasma ashing, the residue from each of the dusty samples was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on the entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for the samples that required dilution.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

AUTHORISED BY: ………………………
S Clark
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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
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CONTRACT NO: S26732b

DATE OF ISSUE: 19.07.22

DATE ANALYSIS REQUESTED: 13.07.22

DATE ANALYSIS COMPLETED: 18.07.22

SAMPLES: Three airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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RESULTS:

Client Ref: PO – RR151

Sample No.	**Volume (l)**	**(1) No. of Resp. Fibres Found**	**(1) No. of Fields Searched**	**Total Fibres** *Fibre Conc^n (fml^{-1})*	**AMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**CMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**MMMF** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**NAM Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ERQ Screener (04/07/22)	1440	0	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ Screener (05/07/22)	1440	1.5	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1.5 /<0.0005*
ERQ Screener (06/07/22)	1440	1	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

COMMENTS:

No asbestos fibres were detected during the analysis of any of these samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

These samples were too dusty to be analysed as received. Following plasma ashing, the residue from each of the dusty samples was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on the entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for the samples that required dilution.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

AUTHORISED BY: ………………………
S Clark
Head of Mineralogy

APPENDIX D. ASBESTOS MONITORING DATA: UNCOVERED SCREENER: ROWLEY REGUS

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S27685

DATE OF ISSUE: 12.09.22

DATE ANALYSIS REQUESTED: 05.09.22

DATE ANALYSIS COMPLETED: 12.09.22

SAMPLES: Twenty airborne dust samples each supplied on gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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RESULTS:

Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Concⁿ (fml-1)*	AMX Fibre *No. of Resp. Fibres/ Fibre Concn (fml-1)*	CMX Fibre *No. of Resp. Fibres/ Fibre Concn (fml-1)*	MMMF *No. of Resp. Fibres/ Fibre Concn (fml-1)*	NAM Fibre *No. of Resp. Fibres/ Fibre Concn (fml-1)*
*ERQ SCREENER (22/08/22)	1440	2.5	1200	<0.0010*	1 / <0.0010*	0 / <0.0010*	0 / <0.0010*	1.5 /<0.0010*
*ERQ SCREENER (23/08/22)	1440	1	1200	<0.0010*	0 / <0.0010*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ SCREENER (24/08/22)	1440	4.5	1200	0.0059	0 / <0.0040*	0.5 /<0.0040*	0 / <0.0040*	4 / 0.0052
*ERQ SCREENER (25/08/22)	1440	4	1200	0.0013	0 / <0.0010*	1 / <0.0010*	0 / <0.0010*	3 / 0.0010
*ERQ ASB 1 (22/08/22)	1440	1	1200	<0.0010*	0/ <0.0010*	0 / <0.0010*	0 / <0.0010*	1 / <0.0010*
*ERQ ASB 2 (22/08/22)	1440	8	600	0.0013	1 / <0.0005*	1 / <0.0005*	0 / <0.0005*	6 / 0.0010
*ERQ ASB 3 (22/08/22)	1440	6	300	0.0010	1 / <0.0005*	2 / <0.0005*	0 / <0.0005*	3 / 0.0005
*ERQ ASB 4 (22/08/22)	1440	3	300	0.0005	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	3 / 0.0005
*ERQ ASB 1 (23/08/22)	1440	23	1200	0.0038	3 / 0.0005	2.5 /<0.0005*	0 / <0.0005*	17.5 /0.0029
*ERQ ASB 2 (23/08/22)	1440	17.5	600	0.0029	0 / <0.0005*	5.5 / 0.0009	3 / 0.0005	9 / 0.0015
*ERQ ASB 3 (23/08/22)	1440	13	600	0.0021	1 / <0.0005*	2 / <0.0005*	1 / <0.0005*	9 / 0.0015
*ERQ ASB 4 (23/08/22)	1440	3.5	300	0.0006	2.5 /<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ ASB 1 (24/08/22)	1440	2	600	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ ASB 2 (24/08/22)	1440	5	600	0.0008	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	4 / 0.0007
*ERQ ASB 3 (24/08/22)	1440	3.5	300	0.0006	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	2.5 /<0.0005*
ERQ ASB 4 (24/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ ASB 1 (25/08/22)	1440	5	600	0.0008	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	5 / 0.0008
*ERQ ASB 2 (25/08/22)	1440	7	600	0.0011	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	7 / 0.0011
ERQ ASB 3 (25/08/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
ERQ ASB 4 (25/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of twelve of the twenty samples supplied for this analysis.

*These samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

AUTHORISED BY: ………………………
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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
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WV1 4EG

CONTRACT NO: S27805

DATE OF ISSUE: 16.09.22

DATE ANALYSIS REQUESTED: 12.09.22

DATE ANALYSIS COMPLETED: 16.09.22

SAMPLES: Twenty airborne dust samples each supplied on gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

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RESULTS:

Client Ref: PO – RR151

Sample No.	**Volume (l)**	**(1) No. of Resp. Fibres Found**	**(1) No. of Fields Searched**	**Total Fibres** *Fibre Conc^n (fml^{-1})*	**AMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**CMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**MMMF** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**NAM Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ERQ ASB 1 (30/08/22)	1440	1	600	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 2 (30/08/22)	1440	2	600	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 3 (30/08/22)	1440	3	1200	0.0020	0 / <0.0020*	0 / <0.0020*	0 / <0.0020*	3 / 0.0020
ERQ ASB 4 (30/08/22)	1440	3	1200	0.0020	1 / <0.0020*	0 / <0.0020*	0 / <0.0020*	2 / <0.0020*
ERQ ASB 1 (31/08/22)	1440	6.5	1200	0.0021	1 / <0.0010*	2 / <0.0010*	0.5 /<0.0010*	3 / 0.0010
ERQ ASB 2 (31/08/22)	1440	4.5	1200	0.0007	0 / <0.0005*	1.5 /<0.0005*	0 / <0.0005*	3 / <0.0005*
ERQ ASB 3 (31/08/22)	1440	5	1200	0.0008	1 / <0.0005*	1 / <0.0005*	0 / <0.0005*	3 / 0.0005
ERQ ASB 4 (31/08/22)	1440	11	1200	0.0018	2 / <0.0005*	0 / <0.0005*	1 / <0.0005*	8 / 0.0013*
ERQ ASB 1 (01/09/22)	1440	4	1200	0.0007	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	4 / 0.0007
ERQ ASB 2 (01/09/22)	1440	6	600	0.0010	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	5 / 0.0008
ERQ ASB 3 (01/09/22)	1440	9	1200	0.0015	1 / <0.0005*	1 / <0.0005*	0 / <0.0005*	7 / 0.0011
ERQ ASB 4 (01/09/22)	1440	6	1200	0.0010	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	5 / 0.0008
ERQ ASB 1 (02/09/22)	1440	1	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 2 (02/09/22)	1440	4	1200	0.0007	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	3 / 0.0005
ERQ ASB 3 (02/09/22)	1440	2	1200	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
ERQ ASB 4 (02/09/22)	1440	3	1200	0.0005	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	3 / 0.0005
ERQ SCREENER (30/08/22)	1440	2	1200	<0.0039*	1 / <0.0039*	0 / <0.0039*	0 / <0.0039*	1 / <0.0039*
ERQ SCREENER (31/08/22)	1440	2	1200	<0.0061*	0 / <0.0061*	0 / <0.0061*	0 / <0.0061*	2 / <0.0061*
ERQ SCREENER (01/09/22)	1440	5	1200	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	5 / <0.0005*
ERQ SCREENER (02/09/22)	1440	1.5	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27805
DATE OF ISSUE: 16.09.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of twelve of the twenty samples supplied for this analysis.

All of these samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

AUTHORISED BY: ………………………
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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S27956

DATE OF ISSUE: 23.09.22

DATE ANALYSIS REQUESTED: 20.09.22

DATE ANALYSIS COMPLETED: 23.09.22

SAMPLES: Twenty airborne dust samples each supplied on gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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RESULTS:

Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres Fibre Conc^n (fml^{-1})	AMX Fibre No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})	CMX Fibre No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})	MMMF No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})	NAM Fibre No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})
^ERQ SCREENER (05/09/22)	1440	3	300	0.0005	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	3 / 0.0005
^ERQ SCREENER (06/09/22)	1440	1	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
^ERQ SCREENER (07/09/22)	1440	2	300	<0.0005*	1 / <0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ SCREENER (08/09/22)	1440	3.5	300	0.0006	1.5 <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
^ERQ ASB 1 (05/09/22)	1440	1	300	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ ASB 2 (05/09/22)	1440	1	600	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ ASB 3 (05/09/22)	1440	2	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
^ERQ ASB 4 (05/09/22)	1440	6	1200	0.0010	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	5 / 0.0008
^ERQ ASB 1 (06/09/22)	1440	7	1200	0.0011	0 / <0.0005*	3 / 0.0005	0 / <0.0005*	4 / 0.0007
^ERQ ASB 2 (06/09/22)	1440	2.5	600	<0.0005*	1.5 /<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
^ERQ ASB 3 (06/09/22)	1440	3	600	0.0005	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	3 / 0.0005
ERQ ASB 4 (06/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
^ERQ ASB 1 (07/09/22)	1440	3	300	0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
^ERQ ASB 2 (07/09/22)	1440	1	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
^ERQ ASB 3 (07/09/22)	1440	0	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ ASB 4 (07/09/22)	1440	0	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ ASB 1 (08/09/22)	1440	2	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	1 / <0.0005*
^ERQ ASB 2 (08/09/22)	1440	0	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ ASB 3 (08/09/22)	1440	0	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ ASB 4 (08/09/22)	1440	1	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27956
DATE OF ISSUE: 23.09.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of eight of the twenty samples supplied for this analysis.

^ Samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

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Steve Clark

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY:	Provectus Soils Management Regent House Bath Avenue Wolverhampton WV1 4EG	**CONTRACT NO:** **DATE OF ISSUE:**	S27685 12.09.22

DATE ANALYSIS REQUESTED: 05.09.22

DATE ANALYSIS COMPLETED: 12.09.22

SAMPLES: Twenty airborne dust samples each supplied on gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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RESULTS:

Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Concn (fml-1)*	AMX Fibre *No. of Resp. Fibres/ Fibre Concn (fml-1)*	CMX Fibre *No. of Resp. Fibres/ Fibre Concn (fml-1)*	MMMF *No. of Resp. Fibres/ Fibre Concn (fml-1)*	NAM Fibre *No. of Resp. Fibres/ Fibre Concn (fml-1)*
*ERQ SCREENER (22/08/22)	1440	2.5	1200	<0.0010*	1 / <0.0010*	0 / <0.0010*	0 / <0.0010*	1.5 /<0.0010*
*ERQ SCREENER (23/08/22)	1440	1	1200	<0.0010*	0 / <0.0010*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ SCREENER (24/08/22)	1440	4.5	1200	0.0059	0 / <0.0040*	0.5 /<0.0040*	0 / <0.0040*	4 / 0.0052
*ERQ SCREENER (25/08/22)	1440	4	1200	0.0013	0 / <0.0010*	1 / <0.0010*	0 / <0.0010*	3 / 0.0010
*ERQ ASB 1 (22/08/22)	1440	1	1200	<0.0010*	0/ <0.0010*	0 / <0.0010*	0 / <0.0010*	1 / <0.0010*
*ERQ ASB 2 (22/08/22)	1440	8	600	0.0013	1 / <0.0005*	1 / <0.0005*	0 / <0.0005*	6 / 0.0010
*ERQ ASB 3 (22/08/22)	1440	6	300	0.0010	1 / <0.0005*	2 / <0.0005*	0 / <0.0005*	3 / 0.0005
*ERQ ASB 4 (22/08/22)	1440	3	300	0.0005	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	3 / 0.0005
*ERQ ASB 1 (23/08/22)	1440	23	1200	0.0038	3 / 0.0005	2.5 /<0.0005*	0 / <0.0005*	17.5 /0.0029
*ERQ ASB 2 (23/08/22)	1440	17.5	600	0.0029	0 / <0.0005*	5.5 / 0.0009	3 / 0.0005	9 / 0.0015
*ERQ ASB 3 (23/08/22)	1440	13	600	0.0021	1 / <0.0005*	2 / <0.0005*	1 / <0.0005*	9 / 0.0015
*ERQ ASB 4 (23/08/22)	1440	3.5	300	0.0006	2.5 /<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ ASB 1 (24/08/22)	1440	2	600	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ ASB 2 (24/08/22)	1440	5	600	0.0008	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	4 / 0.0007
*ERQ ASB 3 (24/08/22)	1440	3.5	300	0.0006	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	2.5 /<0.0005*
ERQ ASB 4 (24/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
*ERQ ASB 1 (25/08/22)	1440	5	600	0.0008	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	5 / 0.0008
*ERQ ASB 2 (25/08/22)	1440	7	600	0.0011	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	7 / 0.0011
ERQ ASB 3 (25/08/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
ERQ ASB 4 (25/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27685
DATE OF ISSUE: 12.09.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of twelve of the twenty samples supplied for this analysis.

*These samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client’s request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY:	Provectus Soils Management Regent House Bath Avenue Wolverhampton WV1 4EG	**CONTRACT NO:** **DATE OF ISSUE:**	S27805 16.09.22

DATE ANALYSIS REQUESTED: 12.09.22

DATE ANALYSIS COMPLETED: 16.09.22

SAMPLES: Twenty airborne dust samples each supplied on gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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Tel: 0131 449 8000 Fax: 0131 449 8084 Email: iom@iom-world.org

RESULTS:

Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ERQ ASB 1 (30/08/22)	1440	1	600	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ ASB 2 (30/08/22)	1440	2	600	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 3 (30/08/22)	1440	3	1200	0.0020	0 / <0.0020*	0 / <0.0020*	0 / <0.0020*	3 / 0.0020
ERQ ASB 4 (30/08/22)	1440	3	1200	0.0020	1 / <0.0020*	0 / <0.0020*	0 / <0.0020*	2 / <0.0020*
ERQ ASB 1 (31/08/22)	1440	6.5	1200	0.0021	1 / <0.0010*	2 / <0.0010*	0.5 /<0.0010*	3 / 0.0010
ERQ ASB 2 (31/08/22)	1440	4.5	1200	0.0007	0 / <0.0005*	1.5 /<0.0005*	0 / <0.0005*	3 / <0.0005*
ERQ ASB 3 (31/08/22)	1440	5	1200	0.0008	1 / <0.0005*	1 / <0.0005*	0 / <0.0005*	3 / 0.0005
ERQ ASB 4 (31/08/22)	1440	11	1200	0.0018	2 / <0.0005*	0 / <0.0005*	1 / <0.0005*	8 / 0.0013*
ERQ ASB 1 (01/09/22)	1440	4	1200	0.0007	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	4 / 0.0007
ERQ ASB 2 (01/09/22)	1440	6	600	0.0010	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	5 / 0.0008
ERQ ASB 3 (01/09/22)	1440	9	1200	0.0015	1 / <0.0005*	1 / <0.0005*	0 / <0.0005*	7 / 0.0011
ERQ ASB 4 (01/09/22)	1440	6	1200	0.0010	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	5 / 0.0008
ERQ ASB 1 (02/09/22)	1440	1	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ ASB 2 (02/09/22)	1440	4	1200	0.0007	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	3 / 0.0005
ERQ ASB 3 (02/09/22)	1440	2	1200	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
ERQ ASB 4 (02/09/22)	1440	3	1200	0.0005	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	3 / 0.0005
ERQ SCREENER (30/08/22)	1440	2	1200	<0.0039*	1 / <0.0039*	0 / <0.0039*	0 / <0.0039*	1 / <0.0039*
ERQ SCREENER (31/08/22)	1440	2	1200	<0.0061*	0 / <0.0061*	0 / <0.0061*	0 / <0.0061*	2 / <0.0061*
ERQ SCREENER (01/09/22)	1440	5	1200	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	5 / <0.0005*
ERQ SCREENER (02/09/22)	1440	1.5	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27805
DATE OF ISSUE: 16.09.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of twelve of the twenty samples supplied for this analysis.

All of these samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

[1] UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY:	Provectus Soils Management Regent House Bath Avenue Wolverhampton WV1 4EG	**CONTRACT NO:** **DATE OF ISSUE:**	S27956 23.09.22

DATE ANALYSIS REQUESTED: 20.09.22

DATE ANALYSIS COMPLETED: 23.09.22

SAMPLES: Twenty airborne dust samples each supplied on gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

UKAS TESTING
0374

CONTRACT NO: S27956
DATE OF ISSUE: 23.09.22

RESULTS:

Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Concn (fml-1)*	AMX Fibre *No. of Resp. Fibres/ Fibre Concn (fml-1)*	CMX Fibre *No. of Resp. Fibres/ Fibre Concn (fml-1)*	MMMF *No. of Resp. Fibres/ Fibre Concn (fml-1)*	NAM Fibre *No. of Resp. Fibres/ Fibre Concn (fml-1)*
^ERQ SCREENER (05/09/22)	1440	3	300	0.0005	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	3 / 0.0005
^ERQ SCREENER (06/09/22)	1440	1	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
^ERQ SCREENER (07/09/22)	1440	2	300	<0.0005*	1 / <0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ SCREENER (08/09/22)	1440	3.5	300	0.0006	1.5 <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
^ERQ ASB 1 (05/09/22)	1440	1	300	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ ASB 2 (05/09/22)	1440	1	600	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ ASB 3 (05/09/22)	1440	2	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
^ERQ ASB 4 (05/09/22)	1440	6	1200	0.0010	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	5 / 0.0008
^ERQ ASB 1 (06/09/22)	1440	7	1200	0.0011	0 / <0.0005*	3 / 0.0005	0 / <0.0005*	4 / 0.0007
^ERQ ASB 2 (06/09/22)	1440	2.5	600	<0.0005*	1.5 /<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
^ERQ ASB 3 (06/09/22)	1440	3	600	0.0005	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	3 / 0.0005
ERQ ASB 4 (06/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
^ERQ ASB 1 (07/09/22)	1440	3	300	0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
^ERQ ASB 2 (07/09/22)	1440	1	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
^ERQ ASB 3 (07/09/22)	1440	0	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ ASB 4 (07/09/22)	1440	0	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ ASB 1 (08/09/22)	1440	2	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	1 / <0.0005*
^ERQ ASB 2 (08/09/22)	1440	0	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ ASB 3 (08/09/22)	1440	0	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^ERQ ASB 4 (08/09/22)	1440	1	600	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of eight of the twenty samples supplied for this analysis.

^ Samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

[(1)] UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

AUTHORISED BY: Steve Clark ………………………
S Clark
Head of Mineralogy

working for a healthy and sustainable world

CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S28156

DATE OF ISSUE: 04.10.22

DATE ANALYSIS REQUESTED: 28.09.22

DATE ANALYSIS COMPLETED: 03.10.22

SAMPLES: Twenty airborne dust samples each supplied on gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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RESULTS:

<u>Client Ref:</u> PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ERQ Inside 1 (12/09/22)	1440	0	150	0.0005	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ Outside 2 (12/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ Outside 3 (12/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ Outside 4 (12/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ Inside 1 (13/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ Outside 2 (13/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ Outside 3 (13/09/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ Outside 4 (13/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ INT 1 (14/09/22)	1440	2	150	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ EXT 2 (14/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ EXT 3 (14/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ EXT 4 (14/09/22)	1440	2	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
ERQ INT 1 (15/09/22)	1440	4	150	0.0007	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	4 / 0.0007
ERQ EXT 2 (15/09/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
ERQ EXT 3 (15/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ EXT 4 (15/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
^ERQ INT 1 (16/09/22)	1440	4	300	0.0007	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	3 / 0.0005
ERQ EXT 2 (16/09/22)	1440	4.5	150	0.0007	1 / <0.0005*	1 / <0.0005*	0.5/ <0.0005*	2 / <0.0005*
ERQ EXT 3 (16/09/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 /<0.0005*	0 / <0.0005*
ERQ EXT 4 (16/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S28156
DATE OF ISSUE: 04.10.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of five of the twenty samples supplied for this analysis.

^ This sample was too dusty to be analysed as received. Following plasma ashing, the residue from each sample is made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension used to prepare a filter suitable for analysis. This dilution factor is taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work is outside the scope of our UKAS accreditation.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

[(1)] UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

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Steve Clark

AUTHORISED BY: ....
S Clark
Head of Mineralogy

working for a healthy and sustainable world

CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S28231

DATE OF ISSUE: 06.10.22

DATE ANALYSIS REQUESTED: 03.10.22

DATE ANALYSIS COMPLETED: 05.10.22

SAMPLES: Sixteen airborne dust samples each supplied on a gridded MCE membrane filter.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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Tel: 0131 449 8000 Fax: 0131 449 8084 Email: iom@iom-world.org

RESULTS:

Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
^ERQ SHED 1 (20/09/22)	1440	3	300	0.0005	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
ERQ SHED 2 (20/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ SHED 3 (20/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ SHED 4 (20/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ SHED 1 (21/09/22)	1440	3.5	150	0.0006	2 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1.5 /<0.0005*
ERQ SHED 2 (21/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ SHED 3 (21/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ SHED 4 (21/09/22)	1440	0.5	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0.5 /<0.0005*
ERQ SHED 1 (22/09/22)	1440	2	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ SHED 2 (22/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
ERQ SHED 3 (22/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ERQ SHED 4 (22/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ SHED 1 (23/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ SHED 2 (23/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ SHED 3 (23/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ERQ SHED 4 (23/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S28231
DATE OF ISSUE: 06.10.22

COMMENTS:

Small numbers of amphibole asbestos fibres were detected during the analysis of three of the sixteen samples supplied for this analysis.

^ This sample was too dusty to be analysed as received. Following plasma ashing, the residue from each sample is made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension used to prepare a filter suitable for analysis. This dilution factor is taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work is outside the scope of our UKAS accreditation.
Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

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Steve Clark

AUTHORISED BY: ………………………
S Clark
Head of Mineralogy

APPENDIX E. ASBESTOS MONITORING DATA: UNCOVERED SCREENER: MAW GREEN

Maw Green

Asbestos Monitoring Results

Date	Sample Name	Sample Location/Activity	Asbestos Analyst	Volume (l)	Number of Pumps Used	Maximum Concentration of Asbestos Fibres - Amphibole (f/ml)	Maximum Concentration of Asbestos Fibres - Chrysotile (f/r	Detection Limit (f/ml)
15/08/2022	ASB MG	Reception tipping	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
16/08/2022	ASB MG	Reception tipping	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
17/08/2022	ASB MG	Reception tipping	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
18/08/2022	ASB MG	Backgorund Monitoring - no activity on site	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
19/08/2022	ASB MG	Reception tipping	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
22/08/2022	ASB MG	Reception tipping	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
23/08/2022	ASB MG	Reception tipping	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
24/08/2022	ASB MG	Reception tipping	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
25/08/2022	ASB MG	Backgorund Monitoring - no activity on site	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
26/08/2022	ASB MG	Backgorund Monitoring - no activity on site	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
30/08/2022	ASB MG	Backgorund Monitoring - no activity on site	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
31/08/2022	ASB MG	Reception tipping	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
01/09/2022	ASB MG	Reception tipping	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
02/09/2022	ASB MG	Reception tipping	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
05/09/2022	ASB MG	Reception tipping	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
06/09/2022	ASB MG	Reception tipping	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
07/09/2022	MGSCR-1	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
07/09/2022	MGSCR-2	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
07/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
08/09/2022	MGSCR-1	Screening	IOM	1440	2	3.5 / 0.0006	0 / <0.0005	0.0005
08/09/2022	MGSCR-2	Screening	IOM	1440	2	2 / <0.0005	0 / <0.0005	0.0005
08/09/2022	MGSCR-3	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
09/09/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
09/09/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
09/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
12/09/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
12/09/2022	MGSCR-2	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
12/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
13/09/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
13/09/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
13/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
13/09/2022	MG PS-1	Picking Station	IOM	1440	2	0 / <0.0005	1 / <0.0005	0.0005
14/09/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
14/09/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
14/09/2022	MGSCR-3	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
15/09/2022	MGSCR-1	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
15/09/2022	MGSCR-2	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
15/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
16/09/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
16/09/2022	MGSCR-2	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
16/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
20/09/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
20/09/2022	MGSCR-2	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
20/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
21/09/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
21/09/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
21/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
22/09/2022	MGSCR-1	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
22/09/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
22/09/2022	MGSCR-3	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
23/09/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
23/09/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
23/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
26/09/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
26/09/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
26/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
27/09/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
27/09/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
27/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
28/09/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
28/09/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
28/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
29/09/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
29/09/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
29/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
30/09/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
30/09/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
30/09/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
03/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
03/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
03/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
04/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
04/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
04/10/2022	MGSCR-3	Screening	IOM	1440	2	3 / 0.0005	0 / <0.0005	0.0005
06/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005

Maw Green

Asbestos Monitoring Results

Date	Sample Name	Sample Location/Activity	Asbestos Analyst	Volume (l)	Number of Pumps Used	Maximum Concentration of Asbestos Fibres - Amphibole (f/ml)	Maximum Concentration of Asbestos Fibres - Chrysotile (f/r	Detection Limit (f/ml)
06/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
06/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
06/10/2022	MG PS -1	Picking Station	IOM	1440	2	2 / <0.0005	0 / <0.0005	0.0005
07/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
07/10/2022	MGSCR-2	Screening	IOM	1440	2	2 / <0.0005	0 / <0.0005	0.0005
07/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
11/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
11/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
11/10/2022	MGSCR-3	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
12/10/2022	MGSCR-1	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
12/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
12/10/2022	MGSCR-3	Screening	IOM	1440	2	2 / <0.0005	1 / <0.0005	0.0005
13/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
13/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
13/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
13/10/2022	MG PS-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
14/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
14/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	1 / <0.0005	0.0005
14/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
17/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
17/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
17/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
18/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
18/10/2022	MGSCR-2	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
18/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
19/10/2022	MGSCR-1	Screening	IOM	1440	2	1 / <0.0005	0 / <0.0005	0.0005
19/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
19/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
20/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
20/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
20/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
21/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
21/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
21/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
24/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
24/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
24/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
25/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
25/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
25/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
26/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
26/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
26/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
27/10/2022	MG Cont	Control Test	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
28/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
28/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
28/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
31/10/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
31/10/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
31/10/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
01/11/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
01/11/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
01/11/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
02/11/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
02/11/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
02/11/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
03/11/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
03/11/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
03/11/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	1 / <0.0005	0.0005
04/11/2022	MGSCR-1	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
04/11/2022	MGSCR-2	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005
04/11/2022	MGSCR-3	Screening	IOM	1440	2	0 / <0.0005	0 / <0.0005	0.0005

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S27510

DATE OF ISSUE: 31.08.22

DATE ANALYSIS REQUESTED: 24.08.22

DATE ANALYSIS COMPLETED: 30.08.22

SAMPLES: Five airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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Tel: 0131 449 8000 Fax: 0131 449 8084 Email: iom@iom-world.org

IOM CONSULTING LIMITED, registered in Scotland No. SC205670

UKAS TESTING
0374

RESULTS:

<u>Client Ref:</u> PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ASB MG (15/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ASB MG (16/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ASB MG (17/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ASB MG (18/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ASB MG (19/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27510
DATE OF ISSUE: 31.08.22

COMMENTS:

No asbestos fibres were detected during the analysis of any of these samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark
AUTHORISED BY: ………………………
S Clark
Head of Mineralogy

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY:	Provectus Soils Management Regent House Bath Avenue Wolverhampton WV1 4EG	**CONTRACT NO:** **DATE OF ISSUE:**	S27631 05.09.22

DATE ANALYSIS REQUESTED: 01.09.22

DATE ANALYSIS COMPLETED: 05.09.22

SAMPLES: Five airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The combined residue from each pair is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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CONTRACT NO: S27631
DATE OF ISSUE: 05.09.22

RESULTS:

Client Ref: PO – MG184

Sample No.	**Volume (l)**	**(1) No. of Resp. Fibres Found**	**(1) No. of Fields Searched**	**Total Fibres** *Fibre Conc^n (fml^{-1})*	**AMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**CMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**MMMF** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**NAM Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ASB MG (22/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ASB MG (23/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ASB MG (24/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ASB MG (25/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ASB MG (26/08/22)	1440	2.5	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	2.5 /<0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27631
DATE OF ISSUE: 05.09.22

COMMENTS:

No asbestos fibres were detected during the analysis of any of these samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

[1] UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

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S Clark
Head of Mineralogy

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S27729

DATE OF ISSUE: 13.09.22

DATE ANALYSIS REQUESTED: 07.09.22

DATE ANALYSIS COMPLETED: 13.09.22

SAMPLES: Four airborne dust samples each supplied as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each pair of half membrane filters is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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Tel: 0131 449 8000 Fax: 0131 449 8084 Email: iom@iom-world.org

RESULTS:

Client Ref: PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
ASB MG (30/08/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
ASB MG (31/08/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ASB MG (01/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
ASB MG (02/09/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27729
DATE OF ISSUE: 13.09.22

COMMENTS:

No asbestos fibres were detected during the analysis of any of these samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

Each sample supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY:	Provectus Soils Management Regent House Bath Avenue Wolverhampton WV1 4EG	**CONTRACT NO:** **DATE OF ISSUE:**	S27808 19.09.22

DATE ANALYSIS REQUESTED: 12.09.22

DATE ANALYSIS COMPLETED: 16.09.22

SAMPLES: Eleven airborne dust samples each supplied on whole gridded or as two half gridded MCE membrane filters.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

UKAS TESTING 0374

RESULTS:

Client Ref: PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^{n} (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^{n} (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^{n} (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^{n} (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^{n} (fml^{-1})*
ASB MG (05/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
ASB MG (06/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
(1)MG SCR-01 (07/09/22)	1440	1	300	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02 (07/09/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
(1)MG SCR-03 (07/09/22)	1440	1	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
(1)MG SCR-01 (08/09/22)	1440	6.5	300	0.0011	3.5 / 0.0006	0 / <0.0005*	3 / <0.0005	0 / <0.0005*
MG SCR-02 (08/09/22)	1440	3	150	0.0005	2 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
(1)MG SCR-03 (08/09/22)	1440	2	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-01 (09/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02 (09/09/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
MG SCR-03 (09/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27808
DATE OF ISSUE: 19.09.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of five of the eleven samples supplied for this analysis.

(1)These samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample was made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension was used to prepare a filter suitable for analysis. This dilution factor was taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work was outside the scope of our UKAS accreditation.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

Sample numbers ASB MG 05&06/09/22 supplied for analysis comprised two half membrane filters. These were combined during plasma ashing to form single samples with combined sample volumes of 1440 litres.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark
AUTHORISED BY: ……………………….
S Clark
Head of Mineralogy

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY:	Provectus Soils Management Regent House Bath Avenue Wolverhampton WV1 4EG	**CONTRACT NO:** **DATE OF ISSUE:**	S27958 27.09.22

DATE ANALYSIS REQUESTED: 20.09.22

DATE ANALYSIS COMPLETED: 26.09.22

SAMPLES: Sixteen airborne dust samples each supplied on a gridded MCE membrane filter.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4μm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5μm and diameter <3μm and including fibres in contact with particles >3μm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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CONTRACT NO: S27958
DATE OF ISSUE: 27.09.22

RESULTS:

Client Ref: PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
MG SCR-01(12/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(12/09/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(12/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(13/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(13/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(13/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG PS-01(13/09/22)	1440	3	150	0.0005	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	2 / <0.0005*
MG SCR-01(14/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(14/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-03(14/09/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(15/09/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(15/09/22)	1440	2	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-03(15/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(16/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(16/09/22)	1440	3	150	0.0005	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*	1 / <0.0005*
MG SCR-03(16/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S27958
DATE OF ISSUE: 27.09.22

COMMENTS:

Single asbestos fibres were detected during the analysis of six of the sixteen samples supplied for this analysis.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S28093

DATE OF ISSUE: 28.09.22

DATE ANALYSIS REQUESTED: 26.09.22

DATE ANALYSIS COMPLETED: 28.09.22

SAMPLES: Twelve airborne dust samples each supplied on a gridded MCE membrane filter.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

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0374

RESULTS:

Client Ref: PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
MG SCR-01(20/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(20/09/22)	1440	2	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
MG SCR-03(20/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-01(21/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(21/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-03(21/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(22/09/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(22/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(22/09/22)	1440	2	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-01(23/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-02(23/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(23/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S28093
DATE OF ISSUE: 28.09.22

COMMENTS:

Single asbestos fibres were detected during the analysis of three of the twelve samples supplied for this analysis.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
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WV1 4EG

CONTRACT NO: S28297

DATE OF ISSUE: 11.10.22

DATE ANALYSIS REQUESTED: 05.10.22

DATE ANALYSIS COMPLETED: 10.10.22

SAMPLES: Fifteen airborne dust samples each supplied on a gridded MCE membrane filter.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

RESULTS:

Client Ref: PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n^ (fml^-1^)*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n^ (fml^-1^)*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n^ (fml^-1^)*	MMMF *No. of Resp. Fibres/ Fibre Conc^n^ (fml^-1^)*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n^ (fml^-1^)*
MG SCR-01(26/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(26/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(26/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-01(27/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-02(27/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(27/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(28/09/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-02(28/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(28/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(29/09/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
MG SCR-02(29/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(29/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(30/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(30/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(30/09/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S28297
DATE OF ISSUE: 11.10.22

COMMENTS:

No asbestos fibres were detected during the analysis of any of the samples supplied for this analysis.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S28333

DATE OF ISSUE: 18.10.22

DATE ANALYSIS REQUESTED: 10.10.22

DATE ANALYSIS COMPLETED: 17.10.22

SAMPLES: Thirteen airborne dust samples each supplied on a gridded MCE membrane filter.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

UKAS TESTING
0374

RESULTS:

Client Ref: PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
MG SCR-01(03/10/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
MG SCR-02(03/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(03/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(04/10/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-02(04/10/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
MG SCR-03(04/10/22)	1440	3	150	0.0005	3 / 0.0005	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(06/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(06/10/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
MG SCR-03(06/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG PS-01(06/10/22)	1440	2	150	<0.0005*	2 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^MG SCR-01(07/10/22)	1440	0	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^MG SCR-02(07/10/22)	1440	3	300	0.0005	2 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-03(07/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S28333
DATE OF ISSUE: 18.10.22

COMMENTS:

Small numbers of amphibole asbestos fibres were detected during the analysis of three of the thirteen samples supplied for this analysis.

^ These samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample is made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension used to prepare a filter suitable for analysis. This dilution factor is taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work is outside the scope of our UKAS accreditation.
Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark
AUTHORISED BY: ……………………….
S Clark
Head of Mineralogy

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY:	Provectus Soils Management Regent House Bath Avenue Wolverhampton WV1 4EG	**CONTRACT NO:** **DATE OF ISSUE:**	S28532 24.10.22

DATE ANALYSIS REQUESTED: 18.10.22

DATE ANALYSIS COMPLETED: 24.10.22

SAMPLES: Thirteen airborne dust samples each supplied on a gridded MCE membrane filter.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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Registered Address: Research Avenue North, Riccarton, Edinburgh, EH14 4AP, United Kingdom
Tel: 0131 449 8000 Fax: 0131 449 8084 Email: iom@iom-world.org

RESULTS:

Client Ref: PO – MG184

Sample No.	**Volume (l)**	**(1) No. of Resp. Fibres Found**	**(1) No. of Fields Searched**	**Total Fibres** *Fibre Conc^n (fml^{-1})*	**AMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**CMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**MMMF** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**NAM Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
MG SCR-01(11/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(11/10/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
MG SCR-03(11/10/22)	1440	2	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
^MG SCR-01(12/10/22)	1440	3	300	0.0005	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
^MG SCR-02(12/10/22)	1440	1	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
^MG SCR-03(12/10/22)	1440	5	300	0.0008	2 / <0.0005*	1 / <0.0005*	0 / <0.0005*	2 / <0.0005*
MG SCR-01(13/10/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
MG SCR-02(13/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(13/10/22)	1440	2.5	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	2.5 /<0.0005*	0 / <0.0005*
MG PS-01(13/10/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
MG SCR-01(14/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(14/10/22)	1440	1	150	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(14/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S28532
DATE OF ISSUE: 24.10.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of four of the thirteen samples supplied for this analysis.

^ These samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample is made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension used to prepare a filter suitable for analysis. This dilution factor is taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work is outside the scope of our UKAS accreditation.
Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark
AUTHORISED BY: ………………………
S Clark
Head of Mineralogy

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S28722

DATE OF ISSUE: 29.10.22

DATE ANALYSIS REQUESTED: 26.10.22

DATE ANALYSIS COMPLETED: 29.10.22

SAMPLES: Fifteen airborne dust samples each supplied on a gridded MCE membrane filter.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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RESULTS:

Client Ref: PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres Fibre Conc^n (fml^{-1})	AMX Fibre No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})	CMX Fibre No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})	MMMF No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})	NAM Fibre No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})
MG SCR-01(17/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(17/10/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*
MG SCR-03(17/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^MG SCR-01(18/10/22)	1440	1	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-02(18/10/22)	1440	1	150	<0.0005*	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^MG SCR-03(18/10/22)	1440	0	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
^MG SCR-01(19/10/22)	1440	4	600	0.0007	1 / <0.0005*	0 / <0.0005*	0 / <0.0005*	3 / 0.0005
^MG SCR-02(19/10/22)	1440	0	300	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(19/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(20/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(20/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(20/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(21/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(21/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(21/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S28722
DATE OF ISSUE: 29.10.22

COMMENTS:

Small numbers of asbestos fibres were detected during the analysis of two of the fifteen samples supplied for this analysis.

^ These samples were too dusty to be analysed as received. Following plasma ashing, the residue from each sample is made up in solution using a measured amount of filtered distilled water and an aliquot of the resultant suspension used to prepare a filter suitable for analysis. This dilution factor is taken into account when calculating the results therefore the fibre concentrations reported above reflect the level of fibres on each entire original sample. This aspect of the work is outside the scope of our UKAS accreditation.
Any organic fibres present on the original samples would be destroyed during plasma ashing.

At the client's request, a greater number of screen areas than that used for our standard analysis were analysed in order to achieve a lower limit of detection for any samples that required dilution.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

[(1)] UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

Steve Clark

AUTHORISED BY: ………………………
S Clark
Head of Mineralogy

CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
WV1 4EG

CONTRACT NO: S28877

DATE OF ISSUE: 08.11.22

DATE ANALYSIS REQUESTED: 02.11.22

DATE ANALYSIS COMPLETED: 07.11.22

SAMPLES: Thirteen airborne dust samples each supplied on a gridded MCE membrane filter.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of 1mm^2 has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

CONTRACT NO: S28877
DATE OF ISSUE: 08.11.22

RESULTS:

Client Ref: PO – MG184

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre Conc^n (fml^{-1})*	AMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	CMX Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	MMMF *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	NAM Fibre *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
MG SCR-01(24/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(24/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(24/10/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-01(25/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(25/10/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-03(25/10/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-01(26/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(26/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(26/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG Cont(27/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(28/10/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-02(28/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(28/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S28877
DATE OF ISSUE: 08.11.22

COMMENTS:

No asbestos fibres were detected during the analysis of any of the samples supplied for this analysis.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

K. Parsons-Hewes

AUTHORISED BY: ………………………
K Parsons-Hewes
Senior Laboratory Analyst

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CERTIFICATE OF ANALYSIS

ANALYSIS REQUESTED BY:	Provectus Soils Management Regent House Bath Avenue Wolverhampton WV1 4EG	**CONTRACT NO:** **DATE OF ISSUE:**	S29003 15.11.22

DATE ANALYSIS REQUESTED: 08.11.22

DATE ANALYSIS COMPLETED: 15.11.22

SAMPLES: Fifteen airborne dust samples each supplied on a gridded MCE membrane filter.

ANALYSIS REQUESTED: Fibre Counting using Scanning Electron Microscopy (SEM) with fibre identification by Energy Dispersive X-ray Spectroscopy (EDXS)

METHOD:

Each membrane filter is ashed in a low temperature plasma asher. The residue is recovered using filtered, distilled water and filtered through a 25mm, 0.4µm pore size polycarbonate filter. A portion of each polycarbonate filter is excised and mounted on a 13mm aluminium stub, coated with gold and examined by SEM. Each filter is searched systematically at 2000X magnification until an area of $1mm^2$ has been examined or 50 whole fibres found. All respirable fibres (aspect ratio >3:1, length >5µm and diameter <3µm and including fibres in contact with particles >3µm diameter) detected are analysed by EDXS and identified as closely as possible, by comparing morphology and composition with standard reference materials. Fibre counting rules based on those of ISO14966:2019 were used.

The method used for analysis is documented in IOM instruction manual No.1 and is based on **International Standards Organisation (2019), International Standard 14966, Ambient Air: Determination of numerical concentration of inorganic fibrous particles - Scanning electron microscopy method.**

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IOM CONSULTING LIMITED, registered in Scotland No. SC205670

UKAS TESTING 0374

RESULTS:

Client Ref: PO – MG184

Sample No.	**Volume (l)**	**(1) No. of Resp. Fibres Found**	**(1) No. of Fields Searched**	**Total Fibres** *Fibre Conc^n (fml^{-1})*	**AMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**CMX Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**MMMF** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*	**NAM Fibre** *No. of Resp. Fibres/ Fibre Conc^n (fml^{-1})*
MG SCR-01(31/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(31/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(31/10/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(01/11/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(01/11/22)	1440	2	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	2 / <0.0005*
MG SCR-03(01/11/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(02/11/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(02/11/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-03(02/11/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-01(03/11/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(03/11/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-03(03/11/22)	1440	2	150	<0.0005*	0 / <0.0005*	1 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-01(04/11/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*
MG SCR-02(04/11/22)	1440	1	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	1 / <0.0005*
MG SCR-03(04/11/22)	1440	0	150	<0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*	0 / <0.0005*

AMX-Amphibole Asbestos **CMX-**Chrysotile Asbestos **MMMF-**Machine Made Mineral Fibres **NAM-**Non Asbestos Mineral

*** DETECTION LIMIT**

When no fibres of a given type are detected, the fibre concentration can be reported as less than the concentration equivalent to three fibres (the one sided upper 95% confidence limit of the Poisson distribution). Therefore, when 0, 1 or 2 fibres are detected, 2.99 is used in the calculation of fibre concentrations. It expresses the 95% confidence detection limit for airborne fibre concentrations. When a volume of 1440 litres is used the 95% confidence limit is 0.0005 fml^{-1} for the number of fields searched.

CONTRACT NO: S29003
DATE OF ISSUE: 15.11.22

COMMENTS:

A single chrysotile asbestos fibre was detected on sample MG SCR-03(03/11/22). No asbestos fibres were detected during the analysis of any of the other samples.

Any organic fibres present on the original samples would be destroyed during plasma ashing.

(1) UKAS accreditation for this work is limited to results obtained directly from the analysis. Calculated results based on sampling information provided by the client are out with the scope of this accreditation.

Any opinions and interpretations expressed herein are out with the scope of our UKAS accreditation.

IOM Consulting cannot accept responsibility for samples sent for analysis that have been incorrectly collected or despatched.

AUTHORISED BY: Steve Clark

S Clark
Head of Mineralogy

APPENDIX 5

Edwin Richards Quarry in Rowley Regis – Water Monitoring Data 2021

eurofins Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	21-30077-1		
Initial Date of Issue:	06-Sep-2021		
Client	Provectus Soils Management Ltd		
Client Address:	Regents House Bath Road Wolverhampton WV1 4EG		
Contact(s):	Andy Clee Charlie Gould Jon Owens Sam Gould		
Project	100993 Rowley Regis STC		
Quotation No.:	Q21-25188	**Date Received:**	31-Aug-2021
Order No.:	9/RR	**Date Instructed:**	31-Aug-2021
No. of Samples:	1		
Turnaround (Wkdays):	5	**Results Due:**	06-Sep-2021
Date Approved:	06-Sep-2021		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Water

Project: 100993 Rowley Regis STC

Client: Provectus Soils Management Ltd				**Chemtest Job No.:**	21-30077
Quotation No.: Q21-25188				**Chemtest Sample ID.:**	1269261
Order No.: 9/RR				Client Sample Ref.:	Asb 1
				Sample Location:	Asb Water
				Sample Type:	WATER
				Date Sampled:	27-Aug-2021
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Asbestos Fibres In Water	N	1185	in 100ml	N/A	Not Detected

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	21-31891-1
Initial Date of Issue:	18-Sep-2021
Client	Provectus Soils Management Ltd
Client Address:	Regents House Bath Road Wolverhampton WV1 4EG
Contact(s):	Andy Clee Charlie Gould Paige Lorrain Sam Gould
Project	100993 Rowley Regis STC

Quotation No.:	Q21-25188	**Date Received:**	15-Sep-2021
Order No.:	9/RR	**Date Instructed:**	15-Sep-2021
No. of Samples:	1		
Turnaround (Wkdays):	5	**Results Due:**	21-Sep-2021
Date Approved:	18-Sep-2021		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Water

Project: 100993 Rowley Regis STC

Client: Provectus Soils Management Ltd	**Chemtest Job No.:**				21-31891
Quotation No.: Q21-25188	**Chemtest Sample ID.:**				1278758
Order No.: 9/RR	Client Sample Ref.:				Asb 3
	Sample Location:				Asbestos Water
	Sample Type:				WATER
	Date Sampled:				10-Sep-2021
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Asbestos Fibres In Water	N	1185	in 100ml	N/A	Not Detected

Report Information

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M	MCERTS and UKAS accredited
N	Unaccredited
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SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
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customerservices@chemtest.com

eurofins Chemtest
Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	21-32698-1		
Initial Date of Issue:	24-Sep-2021		
Client	Provectus Soils Management Ltd		
Client Address:	Regents House Bath Road Wolverhampton WV1 4EG		
Contact(s):	Andy Clee Charlie Gould Paige Lorrain Sam Gould		
Project	100993 Rowley Regis STC		
Quotation No.:	Q21-25188	**Date Received:**	21-Sep-2021
Order No.:	9/RR	**Date Instructed:**	21-Sep-2021
No. of Samples:	1		
Turnaround (Wkdays):	5	**Results Due:**	27-Sep-2021
Date Approved:	24-Sep-2021		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Water

Project: 100993 Rowley Regis STC

Client: Provectus Soils Management Ltd				**Chemtest Job No.:**	21-32698
Quotation No.: Q21-25188				**Chemtest Sample ID.:**	1283034
Order No.: 9/RR				Client Sample Ref.:	Asb 4
				Sample Location:	Asbestos Water
				Sample Type:	WATER
				Date Sampled:	17-Sep-2021
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Asbestos Fibres In Water	N	1185	in 100ml	N/A	Not Detected

Report Information

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N	Unaccredited
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If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

APPENDIX 6

CRS Picking Station Specification

Specification
Ref: CRS-045-SITE MASTER

COMPLETE RECYCLING SYSTEMS

T: +44 (0) 28 8076 0496
E: Marketing@crsni.com
W: www.crsni.com

Office Address: 136 Termon Road, Carrickmore, County Tyrone,
BT79 9HW, N.Ireland

CRS NI LTD
COMPLETE RECYCLING SYSTEMS

SALE OR HIRE

UNPARALLELED PERFORMANCE

NEW SITE MASTER

Designed For Building & Construction Sites To Retrieve Valuable Products From Waste Reducing What Goes Into Your Skip.

Features & Benefits

- Mobile 2 - 4 Man pick
- Designed for Building & Construction Sites
- Retrieve Valuable Products from waste
- Cut Down on what goes into your skip
- Adjustable Height
- Canopy for Weather Protection
- Economical Simple Design
- Electric Drive
- Robust & Heavy Duty Build

SALE OR HIRE

UNPARALLELED PERFORMANCE

- Fully Mobile
- Easily Transported Around And Between Sites
- 2 to 4 Man Picking
- Low Cost To Run

- Low Maintenance
- Reduce Skip hire cost

OPTIONS

- Hydraulic Drive
- Air Brakes
- Hard Cover
- Chevron Belt
- Radial Stockpiler

CRS NI LTD COMPLETE RECYCLING SYSTEMS

Sales: +44 (0) 28 80760 496

E: sales@crsni.com

www.crsni.com

1.0 Conveyor

Feature

- Heavy duty profile steel construction
- Specially designed 8mm and 5mm steel profile to produce high strength section
- Typically 3 times stronger than traditional 6mm channel designs

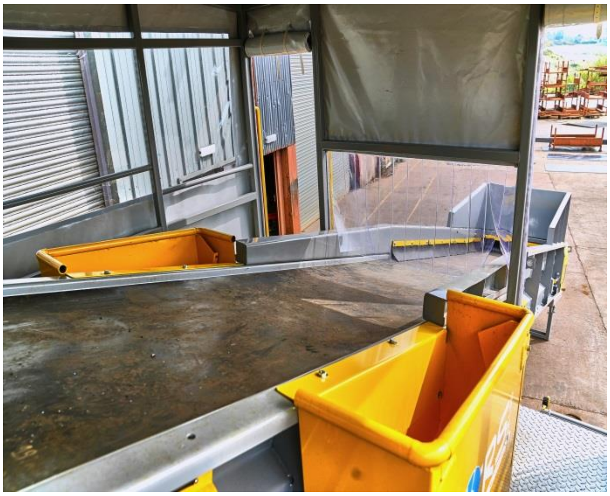
Technical Specification

- 1000mm wide heavy duty rubber belt
- EP500/3ply – 5mm top cover 1.5mm bottom cover
- 8.5m drum centres
- 3.0kW Hi Torque Motovario slip on gear motor drive
- 100mm dia carry rollers placed at 875mm centres
- 100mm dia disc return rollers placed at 2115mm centres
- Head and Tail are fully enclosed to reduce spillage
- High sides incorporated into conveyor with skirting rubber
- Impact bars at infeed boot
- Plough scraper at Tail to reduce material build up
- SKF 50mm bearings (Tail)
- SKF 60mm bearings (Head)
- 288mm dia crowned and lagged drum
- 220mm dia crowned tail drum
- Rosta belt scraper tensioner with polyurethane rubber
- Perspex window at each maintenance point along conveyor
- Dirt chute at tail under plough scraper
- Support legs
- Full guards with emergency stops

2.0 Picking Station

Feature

- 2-4 Man Picking
- 3.5mm Chequered Walkway
- 2 Dropboxes:
  - Width: 900mm
  - Depth: 452mm
  - Height: 989mm
- Access Step Ladders to Picking Station
- Canopy for Weather Protection
- Optional Hard Cover

3.0 Wheel Assembly

Feature

- Adjustable Ram
- Handbrake Lever
- 300x80mm Stud Axle
- Super Single Tyres - 385/65 R22.5

WWW.CAULMERT.COM

Registered Office: InTec, Parc Menai, Bangor, Gwynedd, LL57 4FG
Tel: 01248 672666
Email: contact@caulmert.com
Web: www.caulmert.com