Edwin Richards Quarry – Soil Treatment Centre

Environmental Risk Assessment

Waste Recycling Group (Central) Limited

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Contents

1 Introduction

1.1 Report Objectives

ByrneLooby UK Partners Limited (ByrneLooby) was commissioned by Waste Recycling Group (Central) Limited (WRG) to prepare an application to vary the Environmental Permit reference EPR/HP3632RP to:

- Allow additional 30,000 tonnes per annum to be accepted at the facility and increase overall throughput to 180,000 tonnes per annum inclusive of either hazardous and/or non-hazardous waste.
- Remove the split of hazardous / non-hazardous waste treated at the facility from 89,998 tpa for hazardous waste and 60,002 tpa for non-hazardous waste to 180,000 tonnes per annum inclusive of either hazardous and/or non- hazardous waste. The amended ratio relates to the list of wastes in Table S2.2 and S2.3 of the permit (physical treatment of wastes and wastes for treatment in the bioremediation process respectively). This will impact the following listed activities:
    - AR1 S5.3A(1)(a)(ii) Physical treatment of hazardous waste
    - AR2 S5.3A(1)(a)(ii) Asbestos removal from soils
    - AR3 S5.4A(1)(a)(ii) Physical treatment of non-hazardous waste
    - AR4 S5.3 A(1)(a)(i) Bioremediation of hazardous waste for disposal
    - AR5 S5.3 A(1)(a)(i) Bioremediation of hazardous waste for recovery
    - AR6 S5.4A(1)(a)(i) Bioremediation of non-hazardous waste for disposal
    - AR7 S5.4A(1)(b)(i) Bioremediation of non-hazardous waste for recovery
- Addition of new soil treatment pad for biological treatment and soil washing.
- Addition of a point source emission to air to Table S3.1 to account for the biofilter from the new soil treatment area.
- Addition of soil washing activity for the soil washing of soils contaminated with heavy metals comprising the following listed activities and waste operations to be subject to the 180,000 tonnes per annum inclusive of either hazardous and/or non-hazardous waste.
    - S5.3 A(1)(a)(ii) – recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment via soil washing.
    - S5.3 A(1)(a)(ii) – disposal of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment via soil washing.

  Associated waste operations will be:
    - Treatment of non-hazardous waste soils by soil washing for recovery.
- Amendment to Table S1.1 Activity AR8 regarding the temporary external storage of hazardous soils to increase amount to 20,000 tonnes to include soils contaminated with heavy metals (10,000 tonnes) and activities associated soil washing activity references in the limits of specified activity and waste types.

- Allow the use of a mechanical screener for the pre-screening of soils containing asbestos.
- Remove pre-operational condition 1 as listed in Table S1.3 of the Permit.
- Undertake mechanical screening of non-hazardous soils in the area currently used for storage of non-hazardous soils. It is proposed to use this area for storage and screening of non-hazardous soils. Screening is already regulated under activity reference AR3 physical treatment of non-hazardous waste.
- Amend drawing reference in Table S3.3 of the Permit to remove reference to plan 100993 – Asbestos DWG1 dated January 2018 and replace with reference to an Emissions Monitoring Plan.

The proposed changes to the Permit at the Soil Treatment Centre (STC) better reflect current market conditions and reflect the activities permitted by the extant planning permission.

The new soil treatment pad area will be able to treat 30,000 tonnes via either bioremediation or soil washing dependent on the contract. Soil will be stored on an impermeable surface with sealed drainage. It is occupied by an area of hard standing within the current permit boundary and will use the existing access road from Portway Road. The location of the new soil treatment area is shown on the Site Layout Plan. The operations proposed for the new soil treatment area are identical to those already approved at the Site through existing planning consents and an environmental permit. The Site Permit Boundary is shown on drawing reference K0182.1.002 and remains unchanged as part of this application.

This Environmental Risk Assessment (ERA) report has been prepared to support the Permit variation application. This risk assessment has been undertaken using current Environment Agency (the Agency) Guidance on risk assessments for your environmental permit issued as web-based guidance[1]. The guidance referenced identifies a five-step process to risk assessments which can be summarised as:

- Identify and consider risks and the sources of the risks
- Identify the receptors at risk.
- Identify the possible pathways from the sources of the risks to the receptors.
- Assess risks relevant to the activity and check they are acceptable and can be screened out; and
- State what controls will be in place if the risks are too high.

The guidance indicates that the following parameters require assessing:

- Any discharge, for example trade effluent to surface or groundwater.
- Accidents.
- Odour.

[1] Risk assessments for your environmental permit - GOV.UK (www.gov.uk)

- Noise and vibration.
- Uncontrolled or unintended 'fugitive' emissions e.g. dust, litter, pests and pollutants that should not be in the discharge;
- Visible emissions; and
- Release of bioaerosols.

It is not considered necessary to revise all aspects of the previous ERAs therefore only the activities with proposed changes will be further assessed. For clarity, Table 1 identifies each aspect of the previous ERAs and states whether further consideration is necessary.

Table 1: Review of ERAs

Original ERA Impact Assessment Criteria	Proposed changes which require further assessment	Further assessment required?
Odour	Remove the tonnage split between non-hazardous waste and hazardous waste and increase the annual throughput by 30,000 tonnes to allow 180,000 tonnes per annum to be accepted. Increase in annual throughput for hazardous waste.	**Yes. Increase in quantities of hazardous waste could potentially increase odour due to presence of hydrocarbons. Treatment is limited by the capacity of the bioremediation areas which operate with an air extraction system. All odour is abated via the biofilters.**
Noise	No proposed changes to how waste is delivered / exported / stored. New soil treatment area proposed to comprise bioremediation and soil washing including associated plant and equipment.	**Yes. New soil treatment area proposed could increase noise from the facility. A Noise Impact Assessment (BS 4142) was undertaken by Noise & Vibration Consultants in August 2022. A summary of the conclusions from the noise assessment is provided in the Noise & Vibration Management Plan provided at Appendix B.**
Release of Pollutants from Traffic	No proposed changes to how waste is delivered / exported	**No changes to this aspect.**
Fugitive Emissions from Vehicle Movements	No proposed changes to how waste is delivered / exported	**No changes to this aspect.**
Dust from non-hazardous soil storage	No proposed changes to volume of waste stored.	**No changes to this aspect**
Dust from hazardous soil storage	Increase in hazardous soil storage by 10,000 tonnes to account for soils containing heavy metals	**Yes. Potential increase in dust due to increased storage of hazardous soils however dust control measures are utilised at all times for any externally stored wastes.**
Dust from Waste Handling Operations	New soil treatment area proposed which will treat approximately 30,000 tonnes at any one time, pre-screening of soils containing asbestos and the screening of non-hazardous soils.	**Yes. Potential increase in dust being released from pre-screening operation and storage however this is to be undertaken within the Soil Treatment Building.**

Original ERA Impact Assessment Criteria	Proposed changes which require further assessment	Further assessment required?
Release of dust / bio-aerosols from screening, placement and turning of soil biopiles and soils.	New soil treatment area proposed which will treat approximately 30,000 tonnes at any one time, pre-screening of soils containing asbestos and the screening of non-hazardous soils. Increase in annual throughput for hazardous waste.	**Yes. Potential increase in dust / bioaerosols from placement and turning of soil biopiles associated with the operation of the new soil treatment area proposed. However, the soil to be treated for bioremediation are kept at a moisture content of at least 30% reducing potential for dust/bio-aerosols to be released. Soil washing activities are considered to potentially create fugitive emissions to air when handling the soils prior to washing.** **Potential increase in dust being released from pre-screening operation and storage however this is to be undertaken within the Soil Treatment Building.** **The screening of non-hazardous soils is already a permitted activity under AR3. It is not considered that the screening of non-hazardous soils in the area used for non-hazardous soil storage will increase release of dust.** **Controls are provided in the FEMP for fugitive emissions to air from dust and the Emissions Management and Monitoring Plan for PM10, asbestos fibres**
Point source emissions to air	New proposed soil treatment area with associated biofilter to be installed. A point source emission to air will be added to Table S3.1 of the permit.	**Yes. The biofilter will be constructed consistent with the current biofilter on Site. The biofilter will be subject to the monitoring requirements as stated in Table S3.1 of the permit.**
Release of VOCs from contaminated soils	New proposed soil treatment area which will treat approximately 30,000 tonnes at any one time. Variation will result in the potential increase in the quantities of hazardous waste.	**Yes. The contaminated soils to be accepted and biologically treated have the potential for the release of VOCs . Treatment is limited by the capacity of the treatment pad areas which operate with an air extraction system. All VOCs are therefore extracted and abated via the biofilters. The additional proposed new soil treatment area will have a point source emission from the biofilter.**
Potential Contaminated run-off	New proposed soil treatment area will have an additional drainage point which will drain to the leachate treatment plant prior to discharge to sewer. Soil washing activity also associated with the new proposed bioremediation area, when not in use for bioremediation, with all process water recirculated with limited amounts to be	**Yes. All activities and storage are on hardcore reinforced pads with sealed drainage. Process water from the bioremediation area will drain to an additional drainage point which will subsequently drain to the leachate treatment plant prior to discharge to sewer under trade effluent consent.**

Original ERA Impact Assessment Criteria	Proposed changes which require further assessment	Further assessment required?
	collected and discharged to sewer after treatment.	**Process water from the soil washing process is recirculated as the process is a net user of water. However limited amounts of process water may require discharging from site. Process water from the soil washing process is likely to contain heavy metals and will be treated by the use of flocculants in the water treatment system. The trade effluent consent requires the sampling of metals as part of the consent. The proposed soil washing activity is to be located on the soil treatment area when not used for bioremediation. The process soil water will be treated via flocculation prior to discharge under the trade effluent consent.** **Limits for volume and quality are contained within the trade effluent consent. A H1 assessment undertaken in June 2020 based on the maximum values contained within the trade effluent consent showed no impact. The H1 was updated to include the impact from the soil wash water on the process water discharge and it also showed no impact.** **Provectus Soils Management, who under contract with WRG operate the Soil treatment centre, has submitted a separate trade effluent consent application solely for the Soil treatment centre. The trade effluent consent application proposes a reduction in volume to 100 m3/day and maximum flow rate of 2 litres/second. The effluent discharge, after onsite treatment, flows to and is treated at Severn Trent Ray Hall Sewage Treatment Works which uses biological sand filtration treatment before discharge to the River Tame.**
Birds, vermin and insects attracted to site	No proposed change to waste types which would attract pests to the site.	**No changes to this aspect.**
Mud from vehicle movement and litter escape from site and/or delivery vehicles	No changes to site operations, vehicle transit routes or existing controls to reduce mud being tracked off site. No proposed changes to waste types that will include a source of wind-blown litter.	**No changes to this aspect.**
Leak or spillage of waste soils	No change proposed to how waste is brought to site, bunded areas or spillage containment measures.	**No changes to this aspect.**
Containment Failure	New soil treatment area to be installed comprising impermeable concrete pad with	**The new soil treatment area will be on a bunded tarmac pad with sealed drainage.**

Original ERA Impact Assessment Criteria	Proposed changes which require further assessment	Further assessment required?
	sealed drainage. Same standards and measures applied to prevent and contain spillages applied.	**Drainage channels will drain all process water to a sump. Any process water is treated prior to discharge to sewer.**
Flooding	New soil treatment area to be installed comprising impermeable concrete pad with sealed drainage. Same standards and measures applied to prevent and contain spillages applied. Flood risk classification has not changed.	
Accidental Fires	No proposed changes which result in flammable wastes being brought to site. No change to quantities of existing potentially flammable material (wood chip) stored on site. New soil treatment area to be installed however the soils will be under active treatment and therefore not subject to Fire Prevention controls.	**No change to this aspect.**
Incompatible substances	No proposed changes to waste types to be accepted.	**No change to this aspect.**
Vandalism causing loss of containment/ fire	No changes to security measures	**No changes to this aspect.**

The conclusion of Table 1 is that potential odour, noise & vibration, fugitive and point source emissions require further assessment.

The Agency guidance requires information to be presented in the form of risk assessment tables, one table each for odour, noise and fugitive emissions. Identification of accidents scenarios and their prevention through operation management should also be detailed. Each table should identify the hazard, the potential receptors and the pathway from the hazard to those receptors. The tables should also include the preventative risk management practice to be employed along with an assessment of the mitigated risk.

The Site has the following standalone emission management plans in place which are appended to this ERA:

- Odour Management Plan (Appendix A)
- Noise Impact Assessment and Noise & Vibration Management Plan (Appendix B)
- Fugitive Emissions Management Plan (Appendix C)
- Emissions Management and Monitoring Plan (Appendix D)
- Asbestos Emissions Report (Appendix E)

2 Scope of the Assessment

2.1 Current Operations

The STC is currently permitted to accept a mixture of hazardous and non-hazardous waste for treatment for recovery or disposal off-site at the directly adjacent Edwin Richards non-hazardous landfill site also operated by WRG.

The treatment technologies employed include bioremediation of hazardous waste soils in biopiles and handpicking discrete fragments of asbestos material from soils (not contaminated with asbestos fibres).

2.2 Proposed Additional Operations

The Operator proposes to:

- Add a new soil treatment area.
- Allow additional 30,000 tonnes per annum to be accepted at the facility and increase overall throughput to 180,000 tonnes per annum inclusive of either hazardous and/or non-hazardous waste.
- Addition of a point source emission to air to Table S3.1 to account for the biofilter from the new soil treatment area.
- Addition of soil washing activity for the soil washing of soils contaminated with heavy metals comprising the following listed activities and waste operations to be subject to the 180,000 tonnes per annum inclusive of either hazardous and/or non-hazardous waste.
- Amendment to Table S1.1 Activity AR8 to increase the temporary external storage of hazardous soils to20,000 tonnes to include soils contaminated with heavy metals (10,000 tonnes) and activities associated with soil washing activity references in the limits of specified activity and waste types.
- Allow the use of a mechanical screener for the pre-screening of soils containing asbestos.
- Remove pre-operational condition 1 as listed in Table S1.3 of the Permit.
- Undertake mechanical screening of non-hazardous soils in the area currently used for storage of non-hazardous soils. It is proposed to use this area for storage and screening of non-hazardous soils. Screening is already regulated under activity reference AR3 physical treatment of non-hazardous waste.

New Soil Treatment Area

The new soil treatment area will be able to treat 30,000 tonnes at any one time. Soil will be stored on an impermeable surface with sealed drainage. It is occupied by an area of hard standing within the current permit boundary and will use the existing access road from Portway Road. The location is shown on the Site Layout Plan. The operations proposed for the new soil treatment area are identical to those already approved at the Site through existing planning consents and an environmental permit.

Increase in annual throughput and removal of tonnage split

The increase in annual throughput to 180,000 tonnes per annum inclusive of either hazardous and/or non-hazardous waste is based on the capacity of the Site to be increased by the soil treatment area. The removal of the split between hazardous / non-hazardous waste treated at the facility from 89,998 tpa for hazardous waste and 60,002 tpa for non-hazardous waste to 180,000 tonnes per annum inclusive of either hazardous and/or non- hazardous waste is to allow flexibility in the soils to be accepted. The amended ratio relates to the list of wastes in Table S2.2 and S2.3 of the permit (physical treatment of wastes and wastes for treatment in the bioremediation process respectively).

Soil storage

The soil storage area for hazardous soils is to increase by 10,000 tonnes per annum to 20,000 tonnes in total to account for the soils containing heavy metals that are to be accepted for soil washing. The hazardous soil storage pad comprises a kerbed impermeable surface with sealed drainage. This storage area provides temporary storage for soils awaiting treatment. The soils awaiting treatment will be stored separately dependent on contaminants. Dust controls will be applied to the soil storage area as currently undertaken on Site.

Soil washing

The soil washing activity will comprise the treatment of up to 30,000 tonnes per batch. Soils contaminated with heavy metals will be bought in for treatment in the soil wash plant. The soil wash plant is to be located on an area of hardstanding with sealed drainage which is the proposed new soil treatment area when not utilised for bioremediation. The duration of treatment is likely to be 6-8 weeks for each batch. The soil wash plant is to be intermittently located on the new bioremediation pad area based on the contract arrangements.

The process soil water will be treated via flocculation prior to discharge under the trade effluent consent.

Pre-screening of soils containing asbestos

Pre-screening and handpicking of soils containing asbestos is carried out within the Soil Treatment Building.

A permanently installed dust suppression system is present in the Soil Treatment Building and can be operated when required. Surfactant is added to the suppression system as a precautionary measure in the unlikely event of amphibole asbestos fibres being present (Amphibole fibres are hydrophobic (unlike chrysotile fibres) and this makes the fibres more difficult to remove from airborne suspension or likewise immobilise them on soil surfaces with water alone). In addition to the installed dust suppression system there are mobile atomisers and dust cannons. Dust suppression of stockpiles is proposed prior to screening.

The Operator has restrictions placed on soils contaminated with asbestos as stated in Table S2.4 of the permit. This is to limit the potential for airborne respirable asbestos fibres. Once reception analysis is received to confirm that soils have no potential to generate airborne asbestos fibres they will be moved to the asbestos shed. Any soils received that have the potential to generate airborne asbestos fibres above the permit limits will be rejected from site. Soils containing asbestos accepted on site will then be pre-screened within the building to allow the removal of oversized and fine fractions which have the potential to damage the picking station along with the fines that can conceal smaller bound asbestos debris.

Only soils with a moisture content >15% are to be pre-screened. Generally, soil moisture content is ~20% or above on received soils. Soils are dampened down when required prior to pre-screening. This further limits any potential for liberation of fibres through handling / treatment.

The conveyor belt on the screener will be set at the lowest height level to limit the drop height of material after screening. The deposit point from the picking station is used as one of the monitoring points to ensure the method does not result in asbestos fibres emissions.

The pre-screening will increase the efficiency of the soil processing and will not result in airborne asbestos fibres above existing levels. It will also significantly decrease the timescales for picking thereby significantly reducing exhaust emissions from mobile plant. Waste Soil containing >0.1% w/w asbestos is classified as hazardous waste. The Operator restricts asbestos in soil to less than 0.1% w/w for chrysotile fibrous asbestos and 0.01% w/w for other forms of fibrous asbestos below the hazardous limit. This is to limit the potential for airborne respirable asbestos fibres which is limited to 0.01 fibres/ml. This concentration was determined as the concentration at where the generation of elevated levels of asbestos fibres was highly unlikely in laboratory conditions. Air monitoring will be undertaken to monitor any asbestos fibre emissions and dust suppression measures are available to ensure fibre generation is never above the air quality target of 0.01f/ml. This process is monitored in accordance with the procedures and monitoring regime detailed in the Emissions Management and Monitoring Plan attached as Appendix D. Monitoring within the Soil Treatment Building has confirmed that the airborne asbestos emissions have never exceeded the WHO air quality guidance levels of <0.0005f/ml which is several orders of magnitude below the permit threshold.

The Soil Treatment Building in which the screen will operate is maintained with daily housekeeping. Areas are emptied of treated soil as soon as validation results are obtained to allow reuse elsewhere on site.

The screener, conveyor belt and associated plant are cleaned as required when accumulations of cohesive soils are observed on the screener decks during the working day.

2.3 Potential Hazards

The proposed changes to the facility result in the potential hazards of odour, noise & vibration, fugitive emissions of dust and point source emissions requiring further assessment to assess the impacts on human health or the environment. Each hazard will be addressed with regards to the process that causes the hazard.

2.3.1 Discharges

All treatment pad surfaces used to treat or store waste comprise impermeable hardstanding excluding non-hazardous soil storage which meets the reuse criteria. Water is reused on site where possible with any surplus disposed to foul sewer after treatment. The new soil treatment area will have an additional drainage point and pumping chamber which will be pumped to the water treatment plant prior to discharge to sewer.

There are no direct releases off-site other than via the engineered surface water management system. All collected surface water outside of the treatment pads drains to settlement tanks located to the south east of the Site. The water from the tanks is then pumped to a combined sewer outfall located to the east of the tanks. In the event the pump was unable to perform, water from the settlement tank can drain to the surface water sewer under a surface water discharge consent. Surface water volume and quality is monitored in accordance with the existent Permit. The surface water drainage system has cut-off values that can be isolated in the event of a spill or contamination.

All drainage infrastructures will be inspected, maintained and repaired as necessary.

All areas within the Soil Treatment Centre where soil is stored or treated, including the Soil Treatment Building, have sealed drainage systems and impermeable hardstanding to collect the process water. The new soil treatment area will comprise impermeable hardstanding with sealed drainage.

Any accumulated water within the building is pumped from the drainage sump to the primary settlement tank. The tank is fitted with high level alarms to ensure it does not overfill. The proposed external storage area for soils containing asbestos will comprises a geotextile clay liner and kerbing to ensure all process water is collected and sent to a pumping chamber. This process water is either recirculated where possible or discharged off-site to foul sewer after treatment.

Process water from the biopiles is collected from the treatment pads via appropriate falls to allow all process water to be collected in a precast concrete covered gully which ultimately is pumped out and either recirculated back into the biopile or discharged to the on-site foul water drainage system. Treatment comprises two $50m^3$ storage tank, sediment settlement/oil water separator tanks and carbon/sand filters prior to discharge. The treatment system will remove the majority of suspended solids, any free phase hydrocarbons as well as dissolved hydrocarbons.

The wash water from soil washing containing the sand / silt will be pumped through a hydra cyclone where the silt is separated before the sand is dewatered and stockpiled adjacent to the plant. The water containing the washed silt fines from the overflow of the cyclone will be pumped to the water treatment plant, this is mixed with flocculant and allowed to separate in the bespoke lamella system. The clean overflow water then passes into the clean water tank where it is stored ready to be pumped under pressure back to the log-washer unit for washing again. The thickened sludge that has settled in the lamella thickener will then pumped to the centrifuge for further processing.

The thickened sludge is then mixed with flocculant again and fed into the centrifuge where high G-Force separates solid from liquid, the liquid phase will be returned to the water treatment plant for use again whilst the solid is conveyed out of the machine to a stockpiling auger.

Provectus Soils Management, who under contract with WRG operate the Soil Treatment Facility, has submitted a separate trade effluent consent application solely for the Soil Treatment Facility. The trade effluent consent application proposes a reduction in volume to 100 m^3/day. The effluent discharge will comprise process water from bioremediation post treatment and soil wash water post treatment.

In accordance with Agency guidance ‘Surface water pollution risk assessment for your environmental permit’ an assessment was undertaken based on additional process water to be added from the soil washing activity. The discharge for conservativism was based on the cumulative chemical analysis of the effluent from the bioremediation process and from soil wash water data taken from a Provectus Site after treatment. The assessment was undertaken on the effluent based on the following assumptions/information:

- Current chemical analysis of the effluent from the Site to determine average and maximum concentrations and soil wash water data post treatment taken from a Provectus Site.
- average and maximum effluent flow rates were calculated based on the maximum daily discharge limit of 100 m^3/day proposed in the trade effluent consent application.
- the effluent discharge flows to and is treated at Severn Trent Ray Hall Sewage Treatment Works which uses biological sand filtration treatment before discharge to the River Tame.
- sewage treatment reduction factors were taken from the Agency spreadsheet for filtration.
- Q95 is taken from Bescot upstream of Ray Hall STW which is 1.5590 m^3/s.
- background concentration is conservatively assumed to be 50% of the EQS in polluted water.

The assessment showed all substances passed Test 3 of the screening tool.

Provectus Soils Management, who under contract with WRG operate the Soil Treatment Facility, has submitted a separate trade effluent consent application solely for the Soil Treatment Facility. The trade effluent consent application proposes a reduction in volume to 100 m^3/day and maximum flow rate of 2 litres/second.

2.3.2 Odour / VOC emissions

A comprehensive Air Quality Assessment produced by Amec (Report Ref: rr533il) in support of the original permit application assessed the potential odour emissions from the STC. This identified that primary potential source of odour at the STC is from potential Volatile Organic Compounds (VOC) release from soils contaminated with solvents or other organic residues.

The following sources / activities associated with the STC have the potential to produce odorous emissions:

- Delivery of waste to the STC and initial pre-acceptance assessment;
- Transfer of soils to appropriate storage area (biopiles, external and internal asbestos soils storage);
- Bioremediation of hydrocarbon contaminated soils including initial placement, aeration and turning;
- Pre-screening of soils containing asbestos fragments which may be contaminated with hydrocarbons;
- Handpicking of asbestos fragments of soil with potential hydrocarbon contamination and subsequent storage prior to further treatment in biopiles;
- Storage and transfer of residual material; and,
- Removal of contaminated residues from treatment process.

2.3.2.1 Hazardous Soils Increase and new soil treatment pad

This application proposes to remove the tonnage split between non-hazardous waste and hazardous waste. and proposes to increase the total throughput by 30,000 tonnes per annum. The total annual throughput will be 180,000 tonnes inclusive of either hazardous and / or non-hazardous waste. The new soil treatment area will be able to treat 30,000 tonnes at any one time and will use the same techniques and identical equipment that are already permitted onsite.

All waste awaiting its pre-acceptance assessment is deposited on the impermeable external pad with a sealed drainage system. Soils contaminated with hydrocarbons only will be transferred to the soil reception area which comprises the northern section of the bioremediation areas.

The potential for odour release during the bioremediation process will be effectively controlled through an odour abatement unit for the biopiles comprising an air extraction system which will be installed and designed for full occupation of the bioremediation area. The network of perforated aeration pipes to be installed beneath the soil biopiles will be linked to a high-performance vacuum blower system. The biopiles will be operated using vacuum technology that means that >99% of volatile contaminants within soil pore spaces are collected and treated at the adjacent biofilter. The blower will be located within an insulated and secure shipping container. The exhaust to air extraction system will be connected to the biofilter to capture and treat the degradation products and reduce particulate and odour emissions. A woodchip medium filter will be used for the biofilter using the same retention times and design as the existing biofilter.

The Operator has advised that it is unlikely that soil accepted for treatment to remove asbestos fragments will also be contaminated with hazardous concentrations of hydrocarbons, as these waste streams are largely from different types of source sites. Processing material heavily contaminated with hydrocarbons through the screen / handpicking line is not envisaged as it presents significant operational difficulties such as contamination and protection of personnel and plant. For this reason, the residual material removed from the screen is equally unlikely to be contaminated with levels of hydrocarbons that could cause an odour. Soil which has been subjected to screening and picking is unlikely to be contaminated with solvents or organic residues limiting the potential for VOC release if disturbed. Soils containing hydrocarbons are therefore limited in their ability to release odours / VOCs due to the control measures in place pending treatment and during treatment.

The removal of the tonnage split between non-hazardous and hazardous soils and overall tonnage increase in tonnage per annum by 30,000 to 180,000 tonnes per annum is driven by market conditions to allow flexibility of the facility to accept different proportions in tonnages of non-hazardous and hazardous soils as well as reflect the tonnages in the extant planning permission.

The Site has an Emissions Management and Monitoring Plan in place which sets out the measures taken to manage and control emissions of dust, PM10, asbestos fibres and VOCs/odours (Appendix D). VOCs are monitored weekly using a handheld calibrated Photo Ionisation Detector (PID) at the biotreatment areas and biofilters as detailed in the Emissions Management and Monitoring Plan.

To date it has been confirmed by the Operator there has been no odour complaints at the STC.

The risk assessment for odour including mitigation controls is provided in Table 3. An Odour Management Plan (Report Ref: K0182-BLA-R-ENV-00006) is provided at Appendix A.

2.3.2.2 Soil washing activity

Soil contaminated with heavy metals have limited odour potential. In the event that hydrocarbons were assessed as being present there is the flexibility to allow biotreatment to take place on the soils initially followed by soil washing. This would need to be undertaken in a discrete batch to avoid cross contamination. However, with the expansion of the soil treatment centre footprint the ability to manage discrete batches of soil is more easily facilitated.

2.3.3 Noise and Vibration

The current sources of noise and vibration associated with the STC result primarily from the movement and operation of site plant during operational hours and continual operation of biopile management plant. The most likely sources of noise and vibration would be fans, pumps and motors, along with general noise associated with vehicle movement. A Noise Impact Assessment (NRA) was undertaken by Noise and Vibration Consultants Ltd in September 2022 (Report ref:

R22.0905/DRK) to specifically address the proposed activities as detailed in Section 2.1.2. The NIA was undertaken in accordance with BS4142:2014+A1:2019. A copy is provided at Appendix B.

The NIA stated that the results of noise predictions of the STF site determined by the construction of a noise model using the empirical noise measurements recorded on site has shown the following:

a) The predicted noise levels vary between 20dB to 44dB $LAeq_{1hr}$ at NSRs.

b) The noise prediction results show that the rating noise levels at the NSRs are shown to be between 4dB and 27dB below representative background sound levels and therefore a **low impact** would occur in accordance with BS4142:2014+A1:2019.

c) The predicted noise levels are between 11dB and 32dB below the residual LAeq levels at NSRs.

2.3.3.1 Mechanical screening of Soils

Whilst physical treatment of soils using a screener is permitted at the site, it has only occasionally been implemented for soils after biotreatment to recover oversize materials. The introduction of screening equipment into the asbestos building is the only change to the noise and vibration source term from the previous assessments. This equipment will process soils potentially containing fragments of hardcore and stone which are too large to send through the handpicking station. Such items have caused damage to the station previously and posed risk to site personnel. The noise associated with any granular material passing through a screen may be elevated but this will be operated inside a building to mitigate any elevated noise levels. The noise associated with running processed material through the picking line will be significantly less as the larger fragments have been removed along with the fines fraction resulting in materials that will be easier to pick. Therefore, after the initial screening the timescales for hand picking and supporting plant and therefore overall noise emissions are significantly reduced compared to the operation on the existing permit.

The screen will be located inside the building and only run as required. There are already strict controls on the operation of this aspect of the installation i.e. handpicking can only take place when personnel are in appropriate PPE and air monitoring is being carried out. The same controls will apply to the screening activity. The building and surrounding topography both offer an acoustic barrier to noise emissions. A Noise Management Plan is already in place and includes measures to mitigate noise from plant equipment.

2.3.3.2 Additional soil treatment pad

The new soil treatment pad area will be located on the existing footprint of the STC. The plant complement would consist of modern machinery fitted with efficient silencers / insulation designed to minimise noise levels that are generated during operations. Mobile plant would have noise emission levels that comply with limit levels as defined by the EC Directive 2000/14/EC and subsequent amendments.

The plant would be properly serviced, maintained, and operated in accordance with the manufacturer's instructions to ensure that the occurrence of malfunctions which can give rise to elevated noise levels is reduced and any malfunctions that do occur are swiftly repaired.

The effectiveness of acoustic insulation and silencers fitted to equipment and plant will be qualitatively assessed and recorded as part of the Site Manager's Weekly Report. Any items of plant with defective insulation or silencers will be identified for immediate investigation and remediation.

Any pumps used onsite will be powered by electricity wherever practicable, and all pumps and generators will be placed at locations to minimise noise emissions to sensitive receptors.

With the exception of acoustically enclosed generators, pumps and electric plant, all static plant should be shut down when not in use.

The soil wash plant will be located when required on the new soil treatment pad. The soil wash plant would be properly serviced, maintained, and operated in accordance with the manufacturer's instructions to ensure that the occurrence of malfunctions which can give rise to elevated noise levels is reduced and any malfunctions that do occur are swiftly repaired.

The southern boundary and the southeast and southwest boundary of the proposed soil treatment area would be fitted with an acoustic screen. The screen height would be 5m in height and the location shown in Figure 3. The screen can be formed from a solid material having a minimum mass of 15kg/m2 (e.g. concrete, brickwork, close-boarded fencing etc.)

The risk assessment for noise and vibration is discussed further in Table 4. A Noise Impact Assessment (Report Ref R22.0905/DRK) and Noise & Vibration Management Plan (Report Ref: K0182-BLA-R-ENV-00007 are provided at Appendix B.

2.3.4 Fugitive Emissions of Dust

The main changes to site operations which may result in the generation of additional dust emissions include the new soil treatment pad and the pre-screening in the building of soils contaminated with discrete fragments of asbestos to remove large aggregate or other fractions. Screening of non hazardous soils is regulated under activity reference AR3 Physical treatment consisting of sorting, separation, screening and crushing of non-hazardous waste in the extant Environmental Permit.

The Site has a Fugitive Emissions Management Plan in place (Report Ref: K0182-BLA-R-ENV-00005) which has been updated for the permit variation application. This is provided at Appendix C. The Site also has an Emissions Management and Monitoring Plan in place which sets out the measures taken to manage and control emissions of dust, PM10, asbestos fibres and VOCs/odours (Appendix D).

2.3.4.1 Pre-screening of asbestos soils

The Operator has restrictions placed on soils contaminated with asbestos as stated in Table S2.4 of the permit. This is to limit the potential for airborne respirable asbestos fibres. Once reception analysis is received to confirm that soils have no potential to generate airborne asbestos fibres they will be moved to the asbestos shed. Any soils received that have the potential to generate airborne asbestos fibres above the permit limits will be rejected from site. Soils containing asbestos accepted on site will then be pre-screened within the building to allow the removal of oversized and fine fractions which have the potential to damage the picking station along with the fines that can conceal smaller bound asbestos debris.

The pre-screening will increase the efficiency of the soil processing and will not result in airborne asbestos fibres above permitted limits. It will also significantly decrease the timescales for picking thereby significantly reducing exhaust emissions from mobile plant. Waste Soil containing >0.1% w/w asbestos is classified as hazardous waste. The Operator restricts asbestos in soil to less than 0.1% w/w for chrysotile fibrous asbestos and 0.01% w/w for other forms of fibrous asbestos below the hazardous limit. This is to limit the potential for airborne respirable asbestos fibres which is limited to 0.01 fibres/ml. This concentration was determined as the concentration at where the generation of elevated levels of asbestos fibres was highly unlikely in laboratory conditions.

A permanently installed dust suppression system is present in the Soil Treatment Building and can be operated when required. Surfactant is added to the suppression system as a precautionary measure in the unlikely event of amphibole asbestos fibres being present (Amphibole fibres are hydrophobic (unlike chrysotile fibres) and this makes the fibres more difficult to remove from airborne suspension or likewise immobilise them on soil surfaces with water alone). In addition to the installed dust suppression system there are mobile atomisers and dust cannons. Dust suppression of stockpiles is proposed prior to screening.

Only soils with a moisture content >15% are to be pre-screened. Generally, soil moisture content is ~20% or above on received soils. Soils are dampened down when required prior to pre-screening. This further limits any potential for liberation of fibres through handling / treatment.

The conveyor belt on the screener will be set at the lowest height level to limit the drop height of material after screening. The deposit point from the picking station is used as one of the monitoring points to ensure the method does not result in asbestos fibres emissions.

The Soil Treatment Building in which the screen will operate is maintained with daily housekeeping. Areas are emptied of treated soil as soon as validation results are obtained to allow reuse elsewhere on site.

The screener, conveyor belt and associated plant are cleaned as required when accumulations of cohesive soils are observed on the screener decks during the working day.

Air monitoring will be undertaken to monitor any asbestos fibre emissions and dust suppression measures are available to ensure fibre generation is never above the air quality target of 0.01f/ml. This process is monitored in accordance with the procedures and monitoring regime detailed in the Emissions Management and Monitoring Plan attached as Appendix D. Monitoring within the Soil Treatment Building has confirmed that the airborne asbestos emissions have never exceeded the WHO air quality guidance levels of <0.0005f/ml which is several orders of magnitude below the permit threshold.

A detailed technical document highlighting the background to the approach for determining the asbestos acceptance criteria as well as the monitoring data obtained from operations under the Environmental Permit are included in Appendix E.

2.3.4.2 New Soil Treatment Area

The moisture content of the biopiles is maintained at a constant level (~30%) to allow the bioremediation and subsequently minimise the dust potential. Operational controls during the bioremediation process are in place to ensure no turning of the biopiles is undertaken during high winds. The planning consent imposes a 5m height limit. The soil treatment area will be limited to treating a maximum of 30,000 tonnes at any one time due to treatment limitations for both bioremediation and soil washing activities.

The soil washing activity is considered unlikely to contribute to fugitive emissions of dust. A dust cannon will be utilised when necessary.

2.3.4.3 Screening of non-hazardous soils

The screening of non-hazardous soils in the area utilised for storage is not considered to pose an additional risk of fugitive emissions to air. Dust controls are in place comprising the dust cannons which will be utilised during any screening activities as required. Regular housekeeping will be undertaken to minimise the spread of dust and ensure effective containment and all site staff, including contractors, will receive appropriate training in order to ensure that employees are conversant with the dust control and management procedures onsite. Screening of non-hazardous soils is already regulated under activity reference AR3 Physical treatment consisting of sorting, separation, screening and crushing of non-hazardous waste in the extant Environmental Permit. The location of the non-hazardous soils storage and treatment area is centrally located to the Site away from sensitive receptors.

2.3.4.4 Soil storage

The soil storage area for hazardous soils is to increase by 10,000 tonnes per annum to 20,000 tonnes in total to account for the soils containing heavy metals that are to be accepted for soil washing. The hazardous soil storage pad comprises a kerbed impermeable surface with sealed drainage. This storage area provides temporary storage for soils awaiting treatment. The soils awaiting treatment will be stored separately dependent on contaminants. Dust controls are in place and currently utilised on the pad comprising the dust cannons. The location of the temporary hazardous soils storage area is centrally located to the Site away from sensitive receptors.

2.3.5 Ambient Air Monitoring

The STC is permitted to accept waste soils containing mixed forms of asbestos with soil fibre concentrations <0.01% w/w and chrysotile asbestos with soil fibre concentrations <0.1% w/w. The application of these soil asbestos fibre limits is to remove the potential for airborne emissions of asbestos fibres. Asbestos air monitoring is currently undertaken at several locations at the Site in accordance with Table S3.3 of the Permit and the data assessed against the method detection limit of 0.01 fibres/ml (HSE clearance limit). The sampling methodology follows HSG 248 Asbestos: *The analysts guide for sampling, analysis and clearance procedures* and TGN M17: Monitoring Particulate Matter in Ambient Air around Waste Facilities.

Data collected by the Operator from ambient air monitoring confirms that the reception and handling of soil containing asbestos fibres meet the Permit limits. The monitoring data is attached in a detailed technical report as Appendix E. Monitoring of the soil treatment activity since the commencement of treatment in 2018 has demonstrated that the waste acceptance provisions have been entirely effective in preventing airborne asbestos fibres being elevated above the permit thresholds. The reason for this is that the site does not accept asbestos products or asbestos concentrations in soil that could give rise to airborne asbestos above the air monitoring method detection limit of 0.01f/ml or 0.0005f/ml. Monitoring will continue onsite in accordance with the Permit as shown below.

Permit Table S3.3 Process monitoring requirements extract

Emission point reference or source or description of point of measurement	Parameter	Limit	Monitoring frequency	Monitoring standard or method
Air testing within the building for the duration of the asbestos handpicking works and, at all times when the mechanical screening of waste soil is taking place.	Asbestos fibres	0.01 fibres/ml Where total fibre concentration exceeds 0.01 fibres/ml in any sample, that sample must be submitted for electron microscopy to confirm the concentration of asbestos fibres present	During the asbestos hand picking works 1 hour at 8 l/min	In line with M17 monitoring guidance While asbestos is being treated. • Pumped sampling • 1m above ground level • Flow rate = 8 litres/ minute • Minimum sample volume = 480 litres • Filter pore size = 0.8-1.2µm Asbestos fibre limit of detection = 0.001 fibres/ml
Outside air testing when asbestos contaminated soils are being received, handled and moved within the site Outside Sampling points as detailed in drawing **no.100993 –HS Expansion DWG3/Rev1 dated June 2022.**	Asbestos fibres	0.01 fibres/ml Where total fibre concentration exceeds 0.01 fibres/ml in any sample, that sample must be submitted for electron microscopy to confirm the concentration of asbestos fibres present	During receipt, handling and movement of asbestos contaminated soil within the site 1 hour at 8 l/min or other agreed period in writing.	In line with M17 monitoring guidance While asbestos is being treated. • Pumped sampling • 1m above ground level • Flow rate = 8 litres/ minute • Minimum sample volume = 480 litres • Filter pore size = 0.8-1.2µm Asbestos fibre limit of detection = 0.001 fibres/ml

Additional air monitoring for asbestos fibres is undertaken on a quarterly basis via scanning electro microscopy (SEM) to ensure baseline level of asbestos emissions to air is generally <0.0005 fibres/ml.

Current additional dust management and suppression measures comprise a mobile 'Dust Cannon' atomiser that directs a fine mist at a specific point or activity over a wide space. Surfactant is added as a precautionary measure in the unlikely event of amphibole asbestos fibres being present (Amphibole fibres are hydrophobic (unlike chrysotile fibres) and this makes the fibres more difficult to remove from airborne suspension or likewise immobilise them on soil surfaces with water alone). Low levels of surfactant is added to water (1 part surfactant to 15 parts water) for dust suppression. This mitigation measure is present for use but has not been shown to have been required to reduce airborne asbestos concentrations to below detection limit levels within the building due to the strict acceptance criteria and the efficiency of pre-acceptance procedures employed at the STC.

Screening of material will only occur at designated times and within a building. During screening all operative will wear the correct PPE, daily dust monitoring will be carried out, and appropriate dust mitigation measures (i.e. misting sprays are operational and with due regard to avoiding this activity during windy conditions) will be in place. Monitoring is detailed in the Fugitive Emissions Management Plan for Dust provided at Appendix C. The Site also has an Emissions Management and Monitoring Plan in place which sets out further emissions monitoring (Appendix D).

2.4 Point Source Emissions to Air

The new soil treatment area will have a network of perforated aeration pipes installed beneath the soil biopiles which will be linked to a high performance vacuum blower system. The biopiles will be operated using vacuum technology which means that >99% of volatile contaminates within soil pore spaces are collected and treated at an adjacent biofilter. The blower will be located within an insulated and secure shipping container. The exhaust to air extraction system will be connected to the biofilter to capture and treat the degradation products and reduce particulate and odour emissions. The biofilters comprise a woodchip medium filter.

The biofilters are maintained on a regular basis to ensure conditions for removal of odours/volatile organic compounds (VOCs) are optimal. A point source emission to air will be added to Table S3.1 to account for the biofilter from the new soil treatment area. As with the other biofilter, its performance will be monitored in accordance with Table S3.1 which requires Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene and Xylenes (BTEX), and Polycyclic Aromatic Hydrocarbons (PAHs) to be monitored monthly. Remedial action can be implemented based on analysis of the monitoring information. Strict controls including maintaining ideal moisture and temperature conditions, nutrient concentrations, pH and matrix particle size for the biofilters is in place.

The emissions monitoring programme is provided in the Emissions Management and Monitoring Plan in place for the Site, provided at Appendix D.

2.5 Point Source Emissions to Water / Sewer

Reference has been made to appropriate measures for point source emissions to water and sewer.

The volume of effluent generated by the activities on Site is limited by prioritising the reuse and recirculation of process water.

The following principles are to be applied to control emissions to water:

- water use should be minimised and wastewater be reused where possible.
- contamination risk of process or surface water should be minimised
- Where any potentially harmful materials are used, measures should be taken to prevent them entering the water circuit.

2.5.1 Point source emissions to water

There are no direct releases off-site other than via the engineered surface water drainage system. Which accepts uncontaminated site source water from roofs and other non-operational areas. All collected surface water drains to settlement tanks located to the southeast of the Site. The water from the tanks is reused in the processes where possible. Water from the tanks if required can be pumped to a combined sewer outfall located to the east of the tanks. In the event the pump was unable to perform, water from the settlement tank can drain to the surface water sewer under a surface water discharge consent. Surface water volume and quality is monitored in accordance with the Environment Permit. The surface water drainage system has cut-off values that can be isolated in the event of a spill or contamination.

2.5.2 Point source emissions to sewer

All areas within the Soil Treatment Centre where soil is stored or treated, including the Soil Treatment Building, have sealed drainage systems and impermeable hardstanding to collect the process water.

Any accumulated water within the building is pumped from the drainage sump to the primary settlement tank. The tank is fitted with high level alarms to ensure it does not overfill. The proposed external storage area for soils containing asbestos will comprises a geotextile clay liner and kerbing to ensure all process water is collected and sent to a pumping chamber. This process water is either recirculated where possible or discharged off-site to foul sewer after treatment.

Process water from the biopiles is collected from the treatment pads via appropriate falls to allow all process water to be collected in a precast concrete covered gully which ultimately is pumped out and either recirculated back into the biopile or discharged to the on-site foul water drainage system.

Treatment comprises two 50m^3 storage tank, sediment settlement/oil water separator tanks and carbon/sand filters prior to discharge. The treatment system will remove the majority of suspended solids, any free phase hydrocarbons as well as dissolved hydrocarbons.

The treated water discharges to foul sewer near entrance to Portway Road and is regularly sampled to ensure compliance with the trade effluent consent and the Environmental Permit. The drainage plan (drawing ref: Figure 1. Drainage Plan) is provided with this document.

The wash water containing the sand / silt is pumped through a hydra cyclone where the silt is separated before the sand is dewatered and stockpiled adjacent to the plant. The water containing the washed silt fines from the overflow of the cyclone is pumped to the water treatment plant, this is mixed with flocculant and allowed to separate in the bespoke lamella system. The clean overflow water then passes into the clean water tank where it is stored ready to be pumped under pressure back to the log-washer unit for washing again. The thickened sludge that has settled in the lamella thickener is then pumped to the centrifuge for further processing.

The thickened sludge is then mixed with flocculant again and fed into the centrifuge where high G-Force separates solid from liquid, the liquid phase is returned to the water treatment plant for use again whilst the solid is conveyed out of the machine to a stockpiling auger.

Provectus Soils Management, who under contract with WRG operate the Soil treatment centre, has submitted a separate trade effluent consent application solely for the Soil treatment centre. The trade effluent consent application proposes a reduction in volume to 100 m^3/day. The effluent discharge will comprise process water from bioremediation post treatment and soil wash water post treatment.

In accordance with Agency guidance 'Surface water pollution risk assessment for your environmental permit' an assessment was undertaken based on additional process water to be added from the soil washing activity. The discharge for conservativism was based on the cumulative chemical analysis of the effluent from the bioremediation process and from soil wash water data taken from a Provectus Site after treatment. The assessment was undertaken on based on the following assumptions/information:

- Current chemical analysis of the effluent from the Site to determine average and maximum concentrations and soil wash water data post treatment taken from a Provectus Site.
- average and maximum effluent flow rates were calculated based on the maximum daily discharge limit of 100 m^3/day proposed in the trade effluent consent application
- the effluent discharge flows to and is treated at Severn Trent Ray Hall Sewage Treatment Works which uses biological sand filtration treatment before discharge to the River Tame
- sewage treatment reduction factors were taken from the Agency spreadsheet for filtration
- Q95 is taken from Bescot upstream of Ray Hall STW which is 1.5590 m^3/s

– background concentration is conservatively assumed to be 50% of the EQS in polluted water.

The assessment showed all substances excluding mercury passed Test 3 and all substances passed Test 4 of the screening tool.

The Operator carries out an ongoing inspection and maintenance programme for all infrastructure associated with the Soil Treatment Centre. External and internal drainage is inspected no less frequently than annually. All process water collected is treated through the water treatment plant for reuse within the biopiles or soil wash plant. Only excess process water will be discharged to foul sewer once treated to within the limits specified in the trade effluent consent.

The Site is not within a Groundwater Source Protection Zone. There are no major surface watercourses within 500 m of the Site. The closest surface water feature is the Dudley Canal located approximately 1.2km to the southwest of the site running in a south easterly direction. The historical quality of the canal has been classified as Grade A for chemistry and Grade C for biology. There are no groundwater abstraction licences within 2 km of the site. There are no point source emissions of hazardous or non-hazardous substances to groundwater e.g., soakaways, nor is there a direct connection to the surface water or sewer systems where effluent could be discharged deliberately or accidentally.

There is sufficient capacity within the above ground process water storage tanks adjacent to the biopile areas (110% of total volume of liquid stored on site) to contain the liquid if one of the tanks or vessels were to fail and all liquid contained within was to discharge.

There is no link to external drainage.

2.6 Potential Pathways

The transit mechanism for potential odour, noise and fugitive emission reaching potentially sensitive receptors is through the air. This will be determined by:

- The quantity of waste at source;
- The ability of waste to leave the treatment building;
- Wind direction and speed;
- Intervening obstacles; and,
- Exposure of receptor to waste.

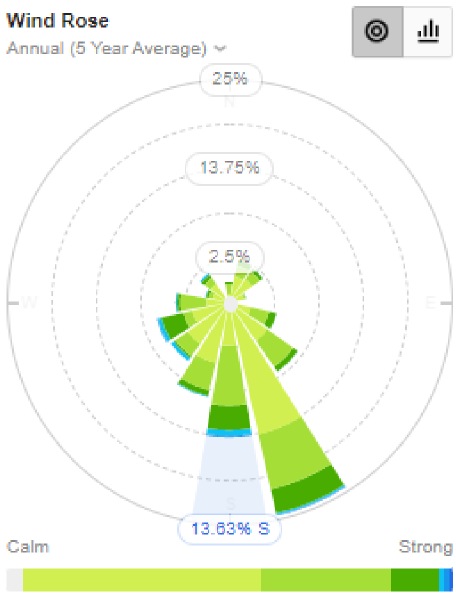
Meteorological data from Rowley Regis[2] which is located approximately 400 m to the south of the Site and is expected to provide representative meteorological data for the area. The windrose reproduced as Figure 1 indicates a wind direction from the prevailing south-south-east.

[2] Rowley Regis Wind Forecast, West Midlands B65 9 - WillyWeather

2.7 Potential Receptors

For consistency the receptors identified in Table 2 of the original ERA have been referenced and updated were relevant. This assessment will reference the distance from the STC permit boundary to the sensitive receptor.

Figure 1: Windrose, Rowley Regis



The probability of exposure is determined by the distance of the receptor to the site and the likelihood of the hazard reaching a receptor (e.g. frequency of prevailing wind in the direction). This stage of the assessment assumes that exposure has resulted from an uncontrolled emission i.e. without mitigation. The distance of these receptors to the site boundary, their direction relative to the site and the frequency the wind blows in the direction of the receptor is detailed in Table 2. The locations of most concern are those regularly or permanently occupied by human receptors. Human receptors up to 500 m and sensitive habitats within 1 km of the STC have been identified and are shown on the Sensitive Receptors Plan (Drawing Ref: K0182.1.001).

Table 2: Potentially Sensitive Receptors

No.	Receptor Description	Receptor Type	Direction from Site	Distance to Building	Frequency downwind of site
1	Tower Road off Portway Hill	Residential properties	NNE	360 m	6.3 %
2	Dudley Golf Club House	Recreational facility	NNW	125 m	22.1 %
3	Portway Hill	Residential and Commercial Properties	NE	10 m	7.4 %
4	Old Portway House and Barn	Listed building	NE	10 m	7.4 %

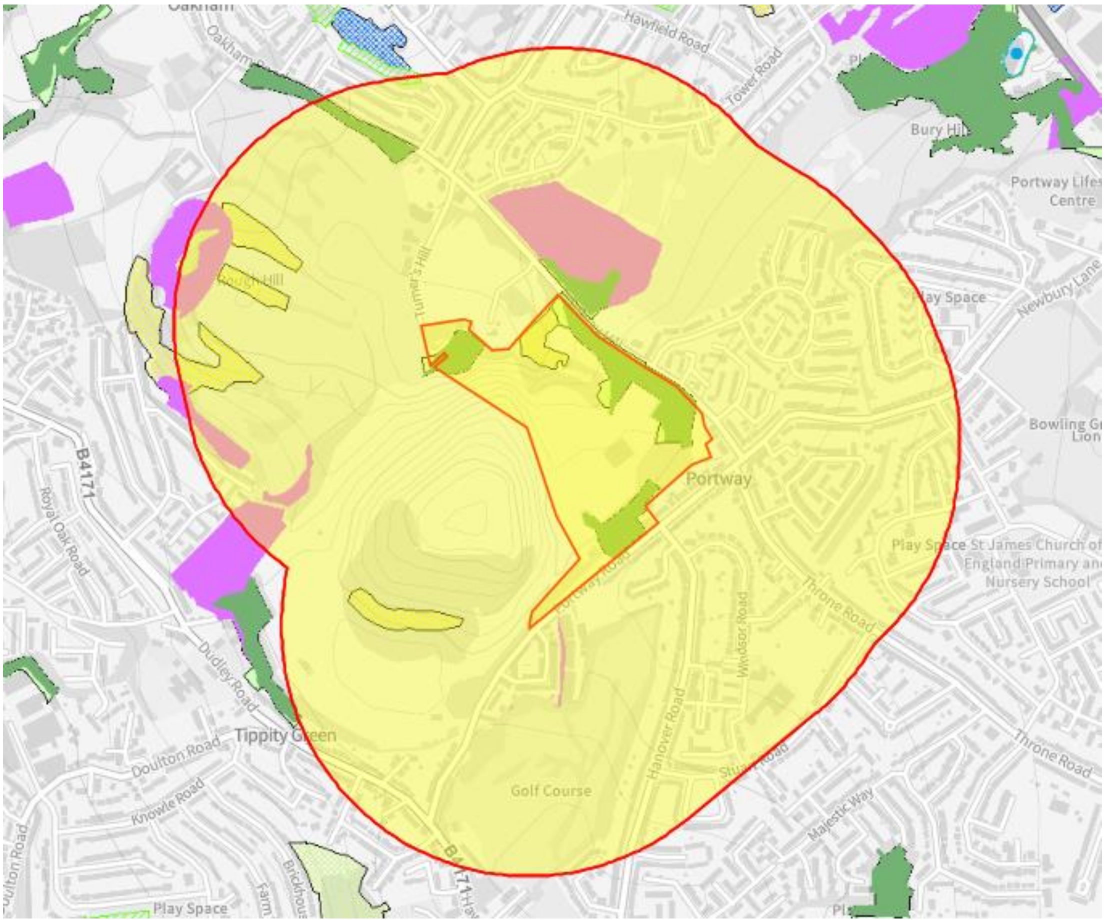
No.	Receptor Description	Receptor Type	Direction from Site	Distance to Building	Frequency downwind of site
5	Portway Road	Residential and Commercial Properties	E to S	10 m	5.5 % to 2.1 %
6	Warren Hall Country Park	Local Nature Reserve	W	610 m	0.7 %
7	Bumble Hole	Local Nature Reserve	W	990m	0.7 %
8	Rowley Hills	Local Wildlife Site	NE	225 m	7.4 %
9	Dudley Golf Course	Recreational	W to NW	40 m	0.7 % to 8.6 %
10	Rowley Regis Golf Course	Recreational	SE to S	120 m	3.6 % to 2.1 %
11	Rowley Hall Primary School	School	SE	360 m	3.6 %
12	Grace Mary Primary School	School	NNE	420 m	6.3 %
13	Dudley Road	Residential and Commercial Properties	SW	440 m	4.2 %
14	Deciduous woodland, woodland, good quality semi-improved grassland (nonpriority)	Priority Habitats	NE, S & W	0-500m	4.2 % to 0.7 %

2.8 Potentially Sensitive Habitats

A ‘Nature and Heritage Conservation Screen’ (referenced: EPR/HP3632RP/V004) was requested and provided by the Agency. The Screen identified that the Fens Pools of Special Area of Conservation (SAC) is located 4.5 km west of the site. Local Nature Reserve’s Warren’s Hall Country Park and Bumble Hole are located 610 m and 990m west of the Site. Numerous Local Wildlife Sites were also identified and the Screen is attached as Appendix F.

A review of Magic maps (https://magic.defra.gov.uk/magicmap.aspx, last accessed December 2022) showed there are three priority habitats located within 500 m the STC comprising deciduous woodland, good quality semi-improved grassland (non-priority) and woodland. The closest deciduous woodland is within the site boundary, the closest good quality semi-improved grassland is 50m north-east and the closest woodland is 160m west. Figure 2 shows the extent of priority habitats.

Figure 2: Extent of Habitats



Fens Pools SAC is located >1km from the site and will not be considered any further in this ERA.

Noise and vibration has the potential to disturb local wildlife and dissuade it from using the adjacent habitats. If emitted in high quantities and for sustained period of time, dust may settle on the adjacent land and smother flora. It is very unlikely that the site will be capable of producing sufficiently high levels of dust and for prolonged period of time. Odour is not considered a risk to wildlife.

3 Risk Assessment and Accident Management Plans

3.1 Risk Assessments

The specific risk assessments completed for Odour, Noise and Dust Fugitive Emissions are provided in Tables 3 to 5 below. In many cases there is an inter-relationship between these specific risk assessments and meteorological conditions and where relevant this has been identified. The pathway is determined by the location of the receptor relative to the site, the distance from the site boundary (m) and the frequency (likelihood) the prevailing wind will blow in the direction of the receptor (%) as determined by windrose data.

3.1.1 Mitigated Risk

The Mitigated Risk is the residual risk presented by the Hazard after control measures have been instigated.

3.1.2 Environmental Accidents

The Agency guidance requires the completion of an Accidents Risk Assessment and Management Plan. This should assess potential hazards associated with the proposed activity not described in the sections above. An accident management plan is detailed in Table 6.

Table 3: Odour Risk Assessment and Management Plan

Hazard / Pathway	Receptor No.	Dist.	Direc.	Freq.	Probability of exposure	Unmitigated Consequence	Initial Risk / Reason	Risk Management	Mitigated Risk
Odour through the Air from: Waste storage. Bioremediation process.	1	360 m	NNE	6.3 %	Medium – proximity to site, occasionally downwind	High - Odour nuisance to residents	Medium – odour nuisance, proximity to site	Strict waste acceptance procedures are in place to ensure that no non-conforming materials are accepted which may contain malodorous waste. Bioremediation management controls are in place including an air extraction system, biopiles only being turned during appropriate meteorological conditions. Air drawn from the biopiles passed through carefully managed biofilter and malodorous compounds removed. Within the Soil Treatment Building operational controls utilised for the control of asbestos soils also control the potential release of odour such as preventing unnecessary agitation of the material. Regular olfactory monitoring will be conducted and will take account of meteorological conditions. An Odour Management Plan is attached as Appendix A	Low
	2	125 m	NNW	22.1 %	High - close to site, frequently downwind	High - Odour nuisance to users of golf course	High – odour nuisance		
	3	10 m	NE	7.4 %	High – close to site, infrequently downwind	High - Odour nuisance to residents	High – odour nuisance		
	4	10 m	NE	7.4 %	High – close to site, infrequently downwind	High - Odour nuisance to residents	High – odour nuisance		
	5	10 m	E to S	5.5 % to 2.1 %	High close to site, occasionally downwind	High - Odour nuisance to residents	High – odour nuisance		
	6	610 m	W	0.7 %	Low - distant from site, occasionally downwind	Low – not a nuisance to habitats	Low – not a nuisance to habitats		
	7	990m	W	0.7 %	Low - distant from site, occasionally downwind	Low – not a nuisance to habitats	Low – not a nuisance to habitats		
	8	225 m	NE	7.4 %	Medium - proximity to site, infrequently downwind	Low – not a nuisance to habitats	Low – not a nuisance to habitats		
	9	40 m	W to NW	0.7 % to 8.6 %	High - close to site, infrequently to occasionally downwind	High - Odour nuisance to users of open space	High – odour nuisance		
	10	120 m	SE to S	3.6 % to 2.1 %	High - close to site, occasionally downwind	High - Odour nuisance to users of open space	High – odour nuisance		
	11	360 m	SE	3.6 %	Low – distant from site, occasionally downwind	High - Odour nuisance to students	Medium – odour nuisance, distant from site		
	12	420 m	NNE	6.3 %	Low – distant from site, occasionally downwind	High - Odour nuisance to students	Medium – odour nuisance, distant from site		
	13	440 m	SW	4.2 %	Low – distant from site, occasionally downwind	High - Odour nuisance to residents	Medium – odour nuisance, distant from site		
	14	0-500m	NE, S & W	4.2 % to 0.7 %	High – close to site and occasionally downwind	Low – not a nuisance to habitats	Low – not a nuisance to habitats		

Table 4: Noise and Vibration Risk Assessment and Management Plan

Hazard / Pathway	Receptor				Probability of exposure	Unmitigated Consequence	Initial Risk / Reason	Risk Management	Mitigated Risk
	No.	Dist.	Direc.	Freq.					
Noise through air and Vibration through ground from: Vehicle movements associated with the delivering and handling of waste on site. Site plant.	1	360 m	NNE	6.3 %	Low – distant from site	High - noise nuisance to residents	Medium – potential noise nuisance	The Noise Impact Assessment applies noise limit criteria derived from measure background sound levels. On site speed limits will be enforced and internal site roads will be maintained to minimise noise / vibration. Appropriate maintenance of site vehicles in accordance with the manufacturer's or supplier's instructions. Silencers will be used on vehicles. Should it prove necessary alternatives to reversing bleepers on site vehicles will also be considered. With the exception of acoustically enclosed generators, pumps and electric plant, all static plant should be shut down when not in use. Avoid unnecessary revving of engines and switch off mobile plant and equipment when not required. If necessary and practicable, emissions from sources of significant noise can be controlled using acoustic enclosures." Where possible pumps and mechanical plant shall be located behind existing screening mounds and be electrically powered. The air circulation plant will be enclosed in an acoustically treated shipping container, which would minimise noise. A Noise and Vibration Management Plan is attached as Appendix B.	Low
	2	125 m	NNW	22.1 %	High – close to site	Medium – some nuisance to users of golf course	Medium – potential noise nuisance		
	3	10 m	NE	7.4 %	High – close to site	High - noise nuisance to residents	High – potential noise nuisance		
	4	10 m	NE	7.4 %	High – close to site	High - noise nuisance to residents	High – potential noise nuisance		
	5	10 m	E to S	5.5 % to 2.1 %	High – close to site	High - noise nuisance to residents	High – potential noise nuisance		
	6	610 m	W	0.7 %	Low – distant from site	Medium – disturb local wildlife	Low – distance from site		
	7	990m	W	0.7 %	Low – distant from site	Medium – disturb local wildlife	Low – distance from site		
	8	225 m	NE	7.4 %	Medium – proximity to site	Medium – disturb local wildlife	Medium – potential noise nuisance		
	9	40 m	W to NW	0.7 % to 8.6 %	High – close to site	Medium – some nuisance to users of golf course	Medium – potential noise nuisance		
	10	120 m	SE to S	3.6 % to 2.1 %	High – close to site	Medium – some nuisance to users of golf course	Medium – potential noise nuisance		
	11	360 m	SE	3.6 %	Low – distant from site	High - noise nuisance to students	Medium – potential noise nuisance		
	12	420 m	NNE	6.3 %	Low – distant from site	High - noise nuisance to students	Medium – potential noise nuisance		
	13	440 m	SW	4.2 %	Low – distant from site	High - noise nuisance to residents	Medium – potential noise nuisance		
	14	0-500m	NE, S & W	4.2 % to 0.7 %	High – close to site	Medium – disturb local wildlife	Medium – potential noise nuisance		

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Table 5: Dust and Fugitive Emission Risk Assessment and Management Plan

Hazard / Pathway	Receptor				Probability of exposure	Unmitigated Consequence	Initial Risk / Reason	Risk Management	Mitigated Risk
	No.	Dist.	Direc.	Freq.					
Dust through air from: Vehicle movements. Waste storage. Pre-screening activity. Bioremediation process.	1	360 m	NNE	6.3 %	Medium – proximity to site, occasionally downwind	High - dust nuisance to residents	Medium –dust nuisance, proximity to site	On site vehicle speed limit enforced to ensure that vehicle movements do not generate excessive dust. Dust suppression system that directs a fine mist within the asbestos building and mobile units for general dust suppression externally for non-hazardous soil storage and screening. Bioremediation management controls are in place including an air extraction system, biopiles only being turned during appropriate meteorological conditions. Weighbridge will conduct assessment of waste inputs and impose controls and restriction on potentially dusty waste (e.g. bagging, rapid cover following placement, refusal to tip). Daily visual inspection by appropriate site staff at suitable locations taking account of the prevailing wind direction. All vehicles will use wheel wash to prevent mud / dust being trailed onto adjacent roads and creating a hazard / nuisance. A street sweeper will regularly clean site roads of any mud trailed on from site vehicles. Dampening of site roads/surfaces as necessary using a tanker during dry periods. A Fugitive Emissions Management Plan is attached as Appendix C.	Low
	2	125 m	NNW	22.1 %	High - close to site, frequently downwind	High - dust nuisance to users of golf course	High – dust nuisance		
	3	10 m	NE	7.4 %	High – close to site, infrequently downwind	High - dust nuisance to residents	High – dust nuisance		
	4	10 m	NE	7.4 %	High – close to site, infrequently downwind	High - dust nuisance to residents	High – dust nuisance		
	5	10 m	E to S	5.5 % to 2.1 %	High close to site, occasionally downwind	High - dust nuisance to residents	High – dust nuisance		
	6	610 m	W	0.7 %	Low - distant from site, occasionally downwind	High – dust nuisance and potential to smother vegetation	Low – significant distance, occasionally downwind		
	7	990m	W	0.7 %	Low - distant from site, occasionally downwind	High – dust nuisance and potential to smother vegetation	Low – significant distance, occasionally downwind		
	8	225 m	NE	7.4 %	Medium - proximity to site, infrequently downwind	High – dust nuisance and potential to smother vegetation	Medium – dust nuisance, proximity to site		
	9	40 m	W to NW	0.7 % to 8.6 %	High - close to site, infrequently to occasionally downwind	High - dust nuisance to users of open space	High – dust nuisance		
	10	120 m	SE to S	3.6 % to 2.1 %	High - close to site, occasionally downwind	High - dust nuisance to users of golf course	High – dust nuisance		
	11	360 m	SE	3.6 %	Low – distant from site, occasionally downwind	High - dust nuisance to students	Medium – dust nuisance, distant from site		
	12	420 m	NNE	6.3 %	Low – distant from site, occasionally downwind	High - dust nuisance to students	Medium – dust nuisance, distant from site		
	13	440 m	SW	4.2 %	Low – distant from site, occasionally downwind	High - dust nuisance to residents	Medium – dust nuisance, distant from site		
	14	0-500m	NE, S & W	4.2 % to 0.7 %	High – close to site and occasionally downwind	High – dust nuisance and potential to smother vegetation	High – dust nuisance		

Table 6: Accident Management Plan

Hazard	Receptor	Pathway	Probability	Consequence	Overall Risk	Risk Management	Mitigated Risk
Liquid Pollutant Leak or damage to portable fuel bowser, static fuel storage tank or site vehicles. Leak or damage to bioremediation equipment.	Groundwater	Through ground	Low	High - pollution of groundwater	Medium	Fuels, lubricants and process water tanks will be stored in bunded areas with 110% capacity. Site vehicles and plant will be subject to regular maintenance to ensure the risk of leaks of potentially harmful liquids are minimised. Waste management activities at the site will continue to be carried out on an impermeable surface with sealed drainage with discharge to on-site foul water drainage system. Spill kits are located within the Site Office. In the event of the spillage of polluting materials, immediate action will be taken to contain the spillage. The Site surface, covered buildings, roofed areas, fixed / temporary bays and containers are visually inspected at least weekly to ensure continuing integrity and fitness for purpose. The inspection and any necessary maintenance required will be recorded.	Low
	Surface Water	Lateral	Low	High - pollution of surface water	Medium		
Fire Uncontrolled burning of residual wastes or site vehicles.	Groundwater	Through ground	Low	High - pollution of groundwater through firewater run-off or leaks from damaged equipment	Medium	Wastes to be accepted at site will have a low organic content and inherently non-combustible in nature. Site vehicles and plant subject to regular preventative maintenance in line with site EMS procedures. Fire control equipment will be on hand, with major incidents to be dealt with by the Fire Brigade in accordance with site EMS Procedures.	Low
	Receptors listed in Table 2 above	Airborne	Low	Medium - smoke / odour annoyance	Medium		
Explosion Compressed gas cylinders, combustion of fuel storage tank	Site staff	Airborne	Low	High - danger of serious injury	Medium	Fuel is stored in separate installation with appropriate controls to prevent fire or explosion (i.e., no smoking on site); Compressed gases not required and therefore present for operation of installation. Site workshop located away from installation with appropriate controls in accordance with EMS procedures;	Low
	Groundwater	Through ground	Low	High - pollution of groundwater through leaks from damaged equipment	Medium		
Wastes storage Chemical reaction of incompatible wastes	Receptors listed in Table 2 above	Airborne	Low	Medium - odour annoyance or smoke from oxidising agents	Medium	Any potentially polluting substances will be appropriately stored.	Low
Vandalism Damage to site vehicles, fuel bowsers, air extraction system	Groundwater	Through ground	Low	High - pollution of groundwater through leaks from damaged equipment	Medium	Existing site security will prevent access by unauthorised persons. Vehicles will be kept overnight in a secure area with appropriate security measures.	Low
	Receptors listed in Table 2 above	Airborne	Low	Medium - odour annoyance	Medium		

4 Conclusions

The operational hazards associated with the proposed changes have been considered in the tables above. It has been concluded that with the use of appropriate mitigating controls where necessary, the installation will not present a significant risk to surrounding receptors.

The Site has adequate controls in place to limit the potential risk of emissions to the surrounding environment and receptors. The revised standalone emission management plans, which form part of the management system procedures at the Site, are appended to this ERA:

- Odour Management Plan (Appendix A)
- Noise Impact Assessment and Noise & Vibration Management Plan (Appendix B)
- Fugitive Emissions Management Plan (Appendix C)
- Emissions Management and Monitoring Plan (Appendix D)

Appendix A – Odour Management Plan

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Edwin Richards Quarry – Soil Treatment Centre

Odour Management Plan

Waste Recycling Group (Central) Limited

Report No. K0182-BLA-R-ENV-00006
September 2023
Revision 2

Document Control

Project: Edwin Richards Quarry – Soil Treatment Centre

Document: Odour Management Plan

Client: Waste Recycling Group (Central) Limited

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Document Checking:

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Disclaimer: Please note that this report is based on specific information, instructions, and information from our Client and should not be relied upon by third parties.					

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REVISION LIST

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Revision 2: K0182-BLA-R-ENV-00006	WRG	September 2023	WRG

Contents

1 Introduction

1.1 Current and Proposed Activities

The Soil Treatment Centre (STC) is currently permitted to accept a mixture of hazardous and non-hazardous waste for treatment for recovery, pending disposal off-site at the directly adjacent Edwin Richards Landfill Site also operated by WRG or reused on site as restoration soils. The treatment technologies employed include pre-screening of soils, bioremediation of hazardous soils in biopiles and handpicking discrete fragments of asbestos material from soils (not contaminated with asbestos fibres).

The entirety of the area inside the current permit boundary, including inside the building comprises approximately 8.6 ha comprising a large hard surfaced level platform, which was used as part of the quarrying activities and now the STC. The STC is currently accessed via the entrance on Portway Road.

This Odour Management Plan (OMP) supports an application by Waste Recycling Group (Central) Limited (WRG) to vary the current permit referenced EPR/HP3632RP to:

- Allow additional 30,000 tonnes per annum to be accepted at the facility and increase overall throughput to 180,000 tonnes per annum inclusive of either hazardous and/or non-hazardous waste.
- Remove the split of hazardous / non-hazardous waste treated at the facility from 89,998 tpa for hazardous waste and 60,002 tpa for non-hazardous waste to 180,000 tonnes per annum inclusive of either hazardous and/or non- hazardous waste. The amended ratio relates to the list of wastes in Table S2.2 and S2.3 of the permit (physical treatment of wastes and wastes for treatment in the bioremediation process respectively). This will impact the following listed activities:
    - AR1 S5.3A(1)(a)(ii) Physical treatment of hazardous waste
    - AR2 S5.3A(1)(a)(ii) Asbestos removal from soils
    - AR3 S5.4A(1)(a)(ii) Physical treatment of non-hazardous waste
    - AR4 S5.3 A(1)(a)(i) Bioremediation of hazardous waste for disposal
    - AR5 S5.3 A(1)(a)(i) Bioremediation of hazardous waste for recovery
    - AR6 S5.4A(1)(a)(i) Bioremediation of non-hazardous waste for disposal
    - AR7 S5.4A(1)(b)(i) Bioremediation of non-hazardous waste for recovery
- Addition of new soil treatment pad for biological treatment and soil washing.
- Addition of a point source emission to air to Table S3.1 to account for the biofilter from the new soil treatment area.
- Addition of soil washing activity for the soil washing of soils contaminated with heavy metals comprising the following listed activities and waste operations to be subject to the 180,000 tonnes per annum inclusive of either hazardous and/or non-hazardous waste.

- S5.3 A(1)(a)(ii) – recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment via soil washing
- S5.3 A(1)(a)(ii) – disposal of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment via soil washing

Associated waste operations will be:

- Treatment of non-hazardous waste soils by soil washing for recovery.

- Amendment to Table S1.1 Activity AR8 regarding the temporary external storage of hazardous soils to increase amount to 20,000 tonnes to include soils contaminated with heavy metals (10,000 tonnes) and activities associated soil washing activity references in the limits of specified activity and waste types.
- Allow the use of a mechanical screener for the pre-screening of soils containing asbestos.
- Remove pre-operational condition 1 as listed in Table S1.3 of the Permit.
- Undertake mechanical screening of non-hazardous soils in the area currently used for storage of non-hazardous soils. It is proposed to use this area for storage and screening of non-hazardous soils. Screening is already regulated under activity reference AR3 physical treatment of non-hazardous waste.
- Amend drawing reference in Table S3.3 of the Permit to remove reference to plan 100993 – Asbestos DWG1 dated January 2018 and replace with Monitoring Emissions Point Plan (MEPP).

The proposed changes to the Permit at the STC better reflect current market conditions and reflect the activities permitted by the extant planning permission.

This OMP will also discharge Condition 3.a) of Planning Permission DC/21/66058 which approves the new soil treatment area. Condition 3.a) is reproduced below for reference.

Soil treatment works should not begin on this part of the site until information is submitted to and approved in writing by the local planning authority confirming the mitigation measures that will be employed to contain fugitive emissions of dust and odour from this activity. This information could be either a specific dust management plan or details of the conditions in the Environmental Permit issued by the Environment Agency which adequately demonstrates the measures in place to ensure that there will be no adverse impact on local amenity from dust.

The new soil treatment area will be within the boundary of the existing waste management facility, to treat up to 30,000 tonnes at any one time of soil contaminated with hydrocarbons or heavy metals through the process of bioremediation or soil washing dependent on the contract. The bioremediation of soils has been undertaken at the Site since 2016.

The purpose of this OMP is to address the current and proposed activities at the waste management facility which have the potential to cause emissions of odour and how these emissions will be minimised and managed.

1.2 Maintenance and review of the OMP

The Site Manager is responsible for the OMP and ensuring staff are suitability trained in the content of the OMP. A copy of this OMP will be included in the Site Management System held at the Site Office and all members of staff will have access to this document.

1.3 Relevant sector guidance

Reference has been made to the following guidance documents:

- H4 Odour Management: How to comply with your environmental permit (Environment Agency, March 2011).
- Sector Guidance Note IPPC S5.06: Guidance for the Recovery and disposal of hazardous and non-hazardous waste. Issue 5. May 2013.
- Environment Agency: Chemical waste: appropriate measures for permitted facilities. 18 November 2020
- Best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council. 10 August 2018.

2 Receptors

2.1 Receptor List

When choosing the receptors, the closest or the most sensitive (if different from the closest) have been considered in each direction from the STC. The most sensitive receptors are within 500 m radius of the STC making the assessment conservative for other potential receptors located further away. Receptors are considered sensitive where people have the potential to be adversely affected by the odour emissions. The nearest sensitive receptors to the Site are identified in the Sensitive Receptor Plan.

The probability of exposure is determined by the distance of the receptor to the Site and the likelihood of the hazard reaching the receptor (e.g. frequency of prevailing wind in that direction). This stage of the assessment assumes that exposure has resulted from an uncontrolled emission i.e. without mitigation.

The distance of these receptors to the Site boundary, their direction relative to the Site and the frequency the wind blows in the direction of the receptor is detailed in Table 1 below. The sensitivity to odour of the individual receptor types identified in the third column of Table 1 is further detailed in Table 2.

Table 1 – Potential Sensitive Receptors

No.	Receptor Description	Receptor Type	Direction from Site	Approximate distance from site boundary	Frequency downwind of site	Sensitivity to odour
1	Tower Road off Portway Hill	Residential properties	NNE	360 m	6.3 %	High
2	Dudley Golf Club House	Recreational facility	NNW	125 m	22.1 %	Medium
3	Portway Hill	Residential and Commercial Properties	NE	10 m	7.4 %	Medium / High
4	Old Portway House and Barn	Residential / Listed building	NE	10 m	7.4 %	High
5	Portway Road	Residential and Commercial Properties	E to S	10 m	5.5 % to 2.1 %	High
6	Warren Hall Country Park	Local Nature Reserve	W	610 m	0.7 %	Low
7	Bumble Hole	Local Nature Reserve	W	990m	0.7 %	Low
8	Rowley Hills	Local Wildlife Site	NE	225 m	7.4 %	Low
9	Dudley Golf Course	Recreational	W to NW	40 m	0.7 % to 8.6 %	Low
10	Rowley Regis Golf Course	Recreational	SE to S	120 m	3.6 % to 2.1 %	Low
11	Rowley Hall Primary School	School	SE	360 m	3.6 %	High
12	Grace Mary Primary School	School	NNE	420 m	6.3 %	High
13	Dudley Road	Residential and Commercial Properties	SW	440 m	4.2 %	Medium / High

Table 2 – Types of Receptors Sensitive to Odour

Receptor Type	Sensitivity to Odour
Residential	High
Recreational	High
Commercial	High
Highway	Low
Habitat	Low
School	High

2.1.1 Residential, recreational, industrial, commercial, and educational premises

The potential emissions from the STC are likely to have a similar impact on persons occupying residential, recreations, industrial, commercial or educational premises. Exposure of emissions to persons in industrial or commercial premises may be lower as they are more likely to be inside during the working day or they may be transient visitors to the premises. Certain industrial activities may generate similar emissions to the Site and the employees may be desensitised as a result.

The closest residential areas to the STC are properties on Portway Hill, Portway Road and Dudley Road. Two primary schools are also within the 500 m radius of the STC. It is likely that the combination of waste types and operational controls, physical barriers (building, treeline and fences), and distance to the receptor prevent most potential emissions from reaching receptors.

2.1.2 Highways and footpaths

The transitory nature of highways means receptors using those locations will be exposed to potential emissions from the Site for shorter (albeit variable) periods of time than residences or businesses. Pedestrians will have longer and more direct exposure to emissions compared to vehicle users.

The highways and footpaths are close to the STC, and this places a more immediate need for the operational effectiveness of Site controls. WRG has confirmed that no odour complaints have been received at the STC. The roads and footpaths to the north east are upwind of the Site for the majority of the time.

2.1.3 Public Amenity

Persons using the Golf Courses and Rowley Hills (Local Wildlife Site) may be exposed to potential odour emissions from the STC. The potential emissions and their effects are the same as human receptors at fixed locations or pedestrians on nearby highways and paths.

2.2 Meteorological Conditions

The principle mechanism for the transit of odorous emissions from site operations to adjacent sensitive receptors is via ambient air. The distance and direction that these emissions will be carried is determined by the following factors:

- Source Related Pathways
- Meteorological Conditions; and
- Topography

2.2.1 Wind Direction

The prevailing wind direction will determine which receptors will be affected and at what frequency. The main controlling factor in determining the pathway of odour is the ambient meteorological conditions. This is fundamental to the transportation of odour to sensitive receptors.

2.2.2 Wind Velocity

Wind velocity will affect the distance an odour emission will travel. Conversely, increased wind speed could also beneficially improve dispersal. Those receptors closest to the installation are still at the highest risk of a potential negative impact however.

Meteorological data from Rowley Regis[1] which is located approximately 400 m to the south of the Site and is expected to provide representative meteorological data for the area. The windrose reproduced as Figure 1 indicates a wind direction from the prevailing south-south-east.

[1] Rowley Regis Wind Forecast, West Midlands B65 9 - WillyWeather

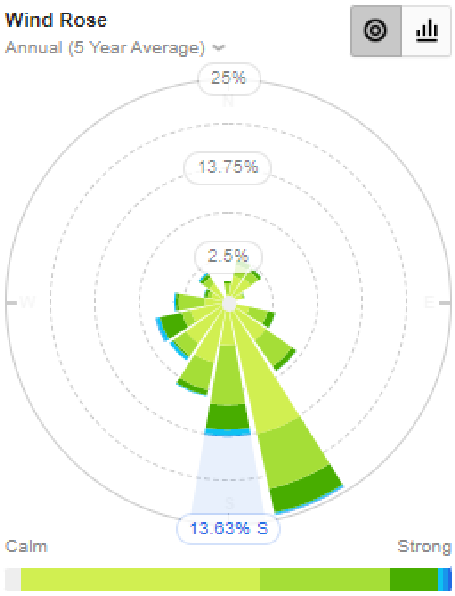


Figure 1 – Windrose, Rowley Regis

2.2.3 Air Temperature

Warm air may carry odours upwards by convection for their dispersal away from the site. However, warm weather will encourage the onset of biodegradation of exposed or temporarily stored wastes and therefore increase odour potential.

2.2.4 Adverse Weather Conditions

Unusual weather conditions may increase the risk of odour emissions from the site. Site staff will be vigilant to unusual trends in the meteorological data or forecasts which may indicate strong winds or extremes of temperature which may cause a potential problem. The types of weather conditions that may impact on odour generation and emissions and appropriate contingency actions are detailed in section 6 below.

3 Odour Source Term Characterisation

3.1 Odour Sources and materials

The current and proposed activities associated with the Soil Treatment Centre (STC) that have the potential to produce odorous emissions are:

- Delivery of waste to site and initial pre-acceptance assessment.
- Transfer of soils to appropriate storage area (biopiles).
- Storage of hazardous soils awaiting treatment.
- Bioremediation of hydrocarbon contaminated soils including initial placement, aeration and turning.
- Pre-screening of soils containing asbestos fragments which may be (albeit unlikely) contaminated with hydrocarbons.
- Storage and transfer of residual material removed from screen.
- Handpicking of asbestos fragments soil with potential hydrocarbon contamination and subsequent storage prior to further treatment in biopiles; and
- Removal of contaminated residues from treatment process.

The contaminated soils accepted on site may contain odorous organic substances due to the presence of hydrocarbons compounds. Odour may present a nuisance to surrounding human receptors or cause an adverse impact to the environment.

The waste types to be accepted at Site are set out in Schedule 2 of the permit. No changes are proposed as part of this variation.

WRG propose to remove the tonnage split between non-hazardous waste and hazardous waste to and increase the annual throughput by 30,000 tonnes to allow 180,000 tonnes per annum to be accepted. WRG also propose to add a new soil treatment area with a 30,000 tonnes treatment capacity. The bioremediation area has adequate controls for odour that are based on full occupation of the bioremediation area.

Soils accepted for biological treatment contain the following contaminants:

- Range of petroleum hydrocarbons (petrol, heating fuel, diesel, used oils, crude oil etc.).
- Polycyclic Aromatic Hydrocarbons (PAHs).
- Creosote.
- Phenols; and

- Chlorinated Solvents and other Volatile Organic Compounds (VOCs).

Absence of oxygen during the bioremediation process may lead to anaerobic conditions developing in the soils and potential generation of odorous compounds. Optimum conditions are maintained to avoid anaerobic decomposition. The current bioremediation procedures maintains optimum aerobic conditions in waste by extracting air through the soil continuously with regular monitoring to ensure optimal oxygen levels are present at all times. The Air Extraction System has been designed and installed to account for full occupation of the bioremediation area.

Extracted air is passed through a biofilter to remove odorous contaminants. The biofilter is maintained on a regular basis to ensure conditions for removal of odours / VOCs are optimal. The performance of the biofilter is monitored as previously agreed in the existing permit and remedial action can be implemented based on analysis of the monitoring information. Strict controls including maintaining ideal moisture and temperature conditions, nutrient concentrations, pH and matrix particle size for the biofilter are in place.

The new soil treatment area will adopt the same bioremediation procedures. In addition, a point source emission to air will be added to Table S3.1 to account for the biofilter at the new soil treatment area.

4 Odour Risk Assessment

4.1 Site Odour Emissions

The risk potential to each receptor from odour generated at the STC is presented in Table 3 below. This table evaluates the nuisance to sensitive receptors from odour emissions and the control measures to be implemented at the STC in order to minimise this risk, producing a revised residual risk to receptors.

Table 3 – Odour Risk Assessment and Management Plan

Hazard / Pathway	Receptor No.	Dist.	Direc.	Freq.	Probability of exposure	Unmitigated Consequence	Initial Risk / Reason	Risk Management	Mitigated Risk
Odour through the Air from: Waste storage. Bioremediation process.	1	360 m	NNE	6.3 %	Medium – proximity to site, occasionally downwind	High - Odour nuisance to residents	Medium – odour nuisance, proximity to site	Strict waste acceptance procedures are in place to ensure that no non-conforming materials are accepted which may contain malodorous waste. Bioremediation management controls are in place including an air extraction system, biopiles only being turned during appropriate meteorological conditions. Air drawn from the biopiles passed through carefully managed biofilter and malodorous compounds removed. Within the Soil Treatment Building operational controls utilised for the control of asbestos soils also control the potential release of odour such as preventing unnecessary agitation of the material. Regular olfactory monitoring will be conducted and will take account of meteorological conditions and potential impacts of odour (however unlikely) on receptors.	Low
	2	125 m	NNW	22.1 %	High - close to site, frequently downwind	High - Odour nuisance to users of golf course	High – odour nuisance		
	3	10 m	NE	7.4 %	High – close to site, infrequently downwind	High - Odour nuisance to residents	High – odour nuisance		
	4	10 m	NE	7.4 %	High – close to site, infrequently downwind	High - Odour nuisance to residents	High – odour nuisance		
	5	10 m	E to S	5.5 % to 2.1 %	High close to site, occasionally downwind	High - Odour nuisance to residents	High – odour nuisance		
	6	610 m	W	0.7 %	Low - distant from site, occasionally downwind	Low – not a nuisance to habitats	Low – not a nuisance to habitats		
	7	990m	W	0.7 %	Low - distant from site, occasionally downwind	Low – not a nuisance to habitats	Low – not a nuisance to habitats		
	8	225 m	NE	7.4 %	Medium - proximity to site, infrequently downwind	Low – not a nuisance to habitats	Low – not a nuisance to habitats		
	9	40 m	W to NW	0.7 % to 8.6 %	High - close to site, infrequently to occasionally downwind	High - Odour nuisance to users of open space	High – odour nuisance		
	10	120 m	SE to S	3.6 % to 2.1 %	High - close to site, occasionally downwind	High - Odour nuisance to users of open space	High – odour nuisance		
	11	360 m	SE	3.6 %	Low – distant from site, occasionally downwind	High - Odour nuisance to students	Medium – odour nuisance, distant from site		
	12	420 m	NNE	6.3 %	Low – distant from site, occasionally downwind	High - Odour nuisance to students	Medium – odour nuisance, distant from site		
	13	440 m	SW	4.2 %	Low – distant from site, occasionally downwind	High - Odour nuisance to residents	Medium – odour nuisance, distant from site		
	14	0-500m	NE, S & W	4.2 % to 0.7 %	High – close to site and occasionally downwind	Low – not a nuisance to habitats	Low – not a nuisance to habitats		

5 Control measures and process monitoring

5.1 Waste Pre-Acceptance and Acceptance

The Technical Standards Report (Document referenced: K0182-BLA-R-ENV-00004) details the waste acceptance procedure for the Site. Strict waste acceptance procedures are in place to ensure that no non-conforming materials are accepted which may contain malodorous waste not suited for treatment at the facility. Any potentially odorous soils identified will be subject to pre-determined handling requirements arranged as a consequence of the pre-acceptance assessment.

5.2 Bioremediation Process

Bioremediation of soils refers to the biological treatment of contaminated soils by creating optimal conditions for the biodegradation of organic contaminants. To enable biodegradation to occur the following parameters are monitored and manipulated:

- pH
- temperature,
- moisture content,
- oxygen level
- nutrient concentrations

Decomposition of the organic contaminants is carried out by microorganisms in the soil. This can be enhanced by addition of inorganic nutrients such as ammonium nitrate and organic material such as woodchip. Moisture is also essential for microbial activity; low moisture content will inhibit microbial growth but excessive moisture restricts airflow. The perforated aeration pipes located beneath the waste are able to extract air from the biopile. This allows effective control of the waste oxygen levels and moisture content in the waste to maintain aerobic conditions. This reduces the potential for anaerobic conditions to develop which can cause odorous emissions.

Biodegradation is optimised by maintaining a temperature in the biopiles 30°C and 40°C to ensure predominantly mesophilic microflora are stimulated.

The stages of the bioremediation process is detailed below:

i. **Initial Placement**: The soil is placed on the treatment pad by a dump truck where an excavator will form the biopile.

ii. **Addition of Nutrients**: Based on the contaminants present within the soil, nutrients are added to facilitate the biological degradation of the hydrocarbon compounds.

iii. **Chemical Analysis**: Approximately every 4 weeks the soil is tested to analyse the contaminant concentrations to determine whether the biological treatment of the soil is adequately reducing the hazardous contaminants to non-hazardous concentrations. Additional nutrients and/or organic inputs may be added to expedite the process

iv. **Nutrients testing:** Every 2-4 weeks the soil is tested to analyse the levels of nutrients within the soil to ensure that there is sufficient inorganic and organic material to facilitate the biodegradation process. This is supported by the chemical analysis of the soil for contaminant concentrations. Soils are tested in accordance with Provectus procedure STC-F006-Soil Analysis.

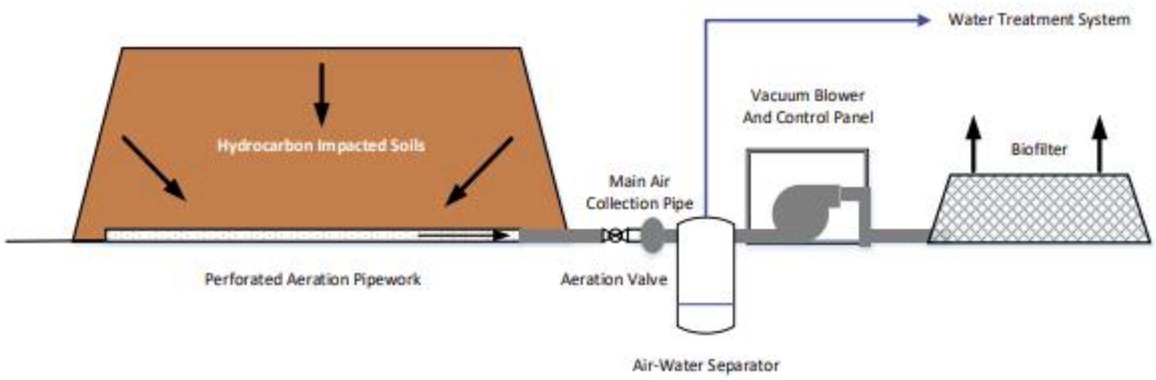
v. **De-compaction of the soil**: Every 4-8 weeks the biopile will be turned to facilitate aeration of the soil.

vi. **Validation testing:** Once the soil meets the re-use criteria, the soil is removed from the treatment pad and transferred to the non-hazardous soils storage area or directly to the non-hazardous landfill void on site.

The biopile Air Extraction System comprises a network of perforated aeration pipes installed beneath the waste biopiles which are linked to a high performance vacuum blower system. The biopiles are operated using vacuum technology that means that >99% of volatile contaminants within soil pore spaces are collected and treated at the adjacent biofilter. The Air Extraction System has been designed and installed to account for full occupation of the bioremediation area. The blower is located within an insulated secure shipping container. An air/water separator is fitted within the collection system to remove liquid from the process air extracted from the biopile. The process water is pumped from the separators via an automated pump with automatic level detection system to a process water tank for primary settlement and carbon filtration prior to discharge to foul sewer.

The air extraction system is connected to a biofilter to capture and treat the degradation products and reduce particulate and odour emissions. The biofilter comprises a woodchip medium filter. The biofilter medium has exhaust holes to allow gaseous emissions to be released.

Figure 2 Biopile Air / Water Flow Diagram



The air extraction system is regularly monitored and maintained. Table S3.1 of the Permit requires the biofilter to be monitored for Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene and Xylenes (BTEX), and Polycyclic Aromatic Hydrocarbons (PAHs) on a monthly basis. The biofilter added to the new soil treatment area will be added to Table S3.1 and monitored monthly in accordance with the Permit. Table S3.3 of the Permit also requires the biofilter to be regularly checked and maintained to ensure appropriate temperature and moisture content. Equipment must be calibrated on a 4 monthly basis or as agreed with the Environment Agency. These procedures ensure the air extraction system is effective at reducing odour emissions and any leaks or damage are detected and repaired. Compliance with this requirement is demonstrated by the monthly biofilter monitoring and regular VOCs monitoring results at the site. VOCs are monitored weekly using a handheld calibrated Photo Ionisation Detector (PID) at the biotreatment areas and biofilters as detailed in the Emissions Management and Monitoring Plan.

Operational controls during the bioremediation process are in place to ensure no turning of the biopiles is undertaken during high winds. It is understood that there is no distinguishable odour at the site boundary from the biopiles under treatment.

5.3 Pre-Screening and Picking Station

The Operator has advised that it is unlikely that soil accepted for treatment to remove asbestos fragments will also be contaminated with hazardous concentrations of hydrocarbons, as these waste streams are largely from different types of source sites. Processing material heavily contaminated with hydrocarbons through the screen / picking line is not envisaged as it presents significant operational difficulties such as contamination and protection of personnel and plant. Soil which has been subjected to screening and picking is unlikely to be contaminated with solvents or organic residues limiting the potential for VOC release if disturbed. Therefore, odour is expected to be negligible.

Nevertheless, a number of operational controls utilised for the control of asbestos soils within the Soil Treatment Building will also control the potential release of odour such as preventing unnecessary agitation of the material.

5.4 Housekeeping Practices

All Site roads and surfaces will be inspected on a daily basis. A street sweeper will regularly clean site roads of any mud trailed on from site vehicles. Dampening of site roads / surfaces as necessary using a tanker during dry periods will minimise odour.

All vehicles would arrive sheeted and would only remove their sheets once at the point of material inspection / deposition to prevent odour nuisance along the access route and beyond. Empty vehicles containing odorous residues should, whenever possible, be hosed out to prevent releases occurring whilst using the public highway.

Drop heights will be minimised as far as practicable during the loading and unloading of materials to reduce the likelihood of dispersion and minimise the potential for odour release as a consequence of agitation.

All treatment will take place on maintained hardstanding to reduce dispersion and control measures will be implemented to minimise odour release. Any soils that could pose an odour can be covered temporarily either with tarpaulins or other soils that have nil odour potential whilst initial treatment is taking place.

Regular housekeeping will be undertaken to minimise the spread of odorous residues and ensure effective containment and all site staff, including contractors, will receive appropriate training in order to ensure that employees are conversant with the odour control and management procedures.

5.5 Drainage

Water is reused on site where possible with any surplus disposed to foul sewer after treatment. All surfaces used to treat or store waste comprise impermeable hardstanding. There are no direct releases off-site other than via the engineered surface water management system. All collected surface water drains to settlement tanks located to the south east of the Site. The water from the tanks is then pumped to a combined sewer outfall located to the east of the tanks. In the event the pump was unable to perform, water from the settlement tank can drain to the surface water sewer under a trade effluent consent. The Operator has submitted a separate trade effluent consent application. Volume and quality is and will be monitored in accordance with the Environment Permit and trade effluent consent. The surface water drainage system has cut-off values that can be isolated in the event of a spill or contamination.

All drainage infrastructures will be inspected, maintained and repaired as necessary.

In the highly unlikely event that odour should become an issue as a result of the on-site drainage system, a full review of the infrastructure will be conducted and cleaning and inspection frequencies adjusted accordingly.

6 Odour Reporting

6.1 Overview

Prevention will be viewed as the most effective means of controlling odour before an impact occurs. The Source → Pathway → Receptor model determined above allows for the identification of the critical control points where odour can arise, how it can travel to a receptor and the likely impact.

The performance of an odour management system will ultimately be judged by the impact of the site on the receptors. Should complaints be received, a procedure will be in place to effectively deal with the issue in a sensitive, efficient and auditable manner.

The controls are detailed in previous sections of this report. The management of those controls will be based on the on-going monitoring regime on Site. The monitoring regime can work as an early warning system against potential problems (e.g. meteorological monitoring) or a diagnostic tool to establish the cause of an odour event (e.g. perimeter monitoring).

6.2 Complaints reporting

6.2.1 Complaints procedure

Any complaints received at the STC or via the Regulatory bodies including the Environment Agency and Local Authority, will be recorded using the Odour Compliant Report Form contained in the Site Management System. This will instigate further olfactory monitoring at the location of the complaint and on site to determine the extent of the odour and whether a mobile mister should be employed. Where possible, as much information and detail about the complaint will be recorded, whether this is from the relevant authority or complaint direct to site. This information will assist in the investigation and determining the source of the odour e.g. differentiating between potential off-site odours.

All complaints and queries will be logged in accordance with the management system as soon as is practicably possible. All complaints logged will be subject to investigation and complainants responded to within 48 hours of receipt, where possible.

In the event that a substantiated odour complaint is received arising from the site, additional monitoring will be undertaken at the nearest sensitive receptors to determine any off-site odour emissions.

Complaints regarding odour from the Site will be investigated in accordance with the protocol, and appropriate records maintained which may include:

- Complaints received including name and contact details of complainant (if known), and complainants description of the odour.

- Nature of problem including date, time, duration, prevailing weather conditions and cause of the problem.
- Onsite activities and operational condition at the time of the complaint.
- Records of the likely source of the odour even if it is clearly not from the Site.
- Details on the corrective action taken, and any subsequent changes to monitoring and operational procedures.

The Environment Agency will be informed by WRG of the complaint and WRG will confirm to the best of its knowledge the information described above.

WRG will ensure that the complainant has all the relevant contact details of the site (i.e. the Site Manager) and the officer responsible at the Environment Agency. WRG will be in regular contact with the complainant and the Environment Agency whilst the cause of the odour is being investigated and remediated.

An evaluation of the effectiveness of the techniques used will be carried out on completion of any remedial measures or if the complaints persist. Records of the above will be retained by site for future reference.

6.2.2 Complaints Investigation

As part of each odour complaint received, these will be objectively assessed against the wider environment to ensure that the source of the emission is traced back to the correct source. As discussed earlier in this OMP, it is essential that the source is correctly identified in order that mitigating measures can be applied effectively and correctly. The complaint will also be assessed against previous records to place the nature of the complaint into context.

6.3 Community engagement

The Site will be readily contactable to outside organisations and to members of the public. The Site signage board (placed in a readily visible location) will contain the necessary contact details for both the Site operations and Environment Agency. The company website also contains the necessary contact details for each individual Site.

Any complaints received directly to Site will be notified to the Environment Agency. Should an off-site issue arise, therefore, the complainant has a readily available means of getting in touch with WRG.

6.4 Monitoring

6.4.1 Off-Site Olfactory

The Site has an Emissions Management and Monitoring Plan and a Fugitive Emissions Management Plan for Dust (Report Ref: K0182-BLA-R-ENV-00005) in place which sets out the measures taken to manage and control emissions of dust, PM10, asbestos fibres and VOCs/odours (Appendix C and Appendix D of the Environmental Risk Assessment). To date it has been confirmed by the Operator there has been no odour complaints at the STC.

The Site Manager will be responsible for ensuring that daily odour monitoring is undertaken at the Site and its perimeter in order to identify any sources of odour and to establish whether any odours are discernible. Due to the potential for de-sensitisation to odours, odour monitoring will only be carried out by personnel who do not regularly work at the site. These personnel will be the most suitable to detect any fugitive odour outside the STC.

Off-site olfactory monitoring will also be carried out with reference to the protocol in Appendix 1 of the Environment Agency H4 Odour Management Guidance. All site operatives will be responsible for reporting any odour problems as soon as practicable to the Site Manager or the next level of management if the manager is not available.

The following locations will be targeted for odour monitoring by the nominated site personnel:

- Weighbridge or waste reception area (continuous monitoring of vehicles).
- Point of waste deposition.
- Bioremediation area, particularly during initial placement, aeration and turning; and
- Subject to prevailing wind direction (i.e. up and down wind), appropriate areas of the site perimeter.

The indicative monitoring locations are shown drawing entitled Revised Treatment Layout and Monitoring appended at Appendix A.

The following information will be recorded during each round of monitoring:

- Name and job position of assessor.
- Nature of any problem identified including location / source, date, time, duration, prevailing weather conditions and likely cause.
- On-site activities and operational condition at the time of the monitoring visit (this should include any abnormal events detailed in Section 6.6 below).
- Records of the likely source of any odour even if it is not from the Site.
- Details on the corrective action taken, realistic timeframes for remedial works and any subsequent changes to monitoring and operational procedures.

The Site Manager will be informed immediately of any findings of odour attributed to the Site and will authorise remedial measures to be taken.

6.5 Abnormal Events and Contingency Procedures

6.5.1 Temperature Inversions

Temperature is one of the parameters that is monitored and manipulated in the bioremediation process. Biodegradation is optimised by maintaining a temperature of 30 and 40°C in the biopiles to ensure the mesophilic microflora are predominately stimulated. These management controls reduce the impact of external temperature changes on the soils being treated and limit the potential of temperature inversions on the potential for causing odour. The air extraction system effectively controls odour emissions by capturing and treating volatile compounds to reduce odour emissions.

6.5.2 Strong Winds

Daily visual inspection of the site infrastructure will be undertaken and recorded. Additional inspection for damage resulting from high wind events will also be undertaken and contingency actions identified below considered should high wind conditions result in escape of significant odours. A mobile mister may be employed to limit the potential for any odour emissions.

6.5.3 Snow / Ice

Severe cold weather may result in disruption to waste deliveries and removal of materials from site however due to the nature of the soils to be treated it is unlikely to cause an increase in odour.

6.5.4 Hot Conditions

The warmer the waste the greater the potential to generate odour therefore an increase in ambient air temperature may result in increased odour from the biopiles due to the promotion of the biodegradation process. However, the biopiles are maintained at a temperature of between 30 and 40°C therefore hot conditions will not impact this process. The air extraction system will enable control any potential odour by capturing and treating volatile compounds reducing odour emissions from the soils. A mobile mister may be employed to limit the potential for any odour emissions.

6.5.5 Unscheduled unavailability

Unscheduled unavailability should only take place due to unscheduled maintenance, emergency situations and for Health and Safety reasons such as a fire at the site. In such cases the site operative will initially inform the manager who will in turn inform the Site manager, the Authority and the Environment Agency. WRG will implement measures to store or divert soils as required.

6.6 Records and Review

A daily record relating to the management and monitoring of odour will be maintained. It will include the following details:

- The results of inspections and olfactory monitoring carried out by installation personnel.
- Weather conditions including atmospheric pressure, wind speed and wind direction.
- Problems including date, time, duration, prevailing weather conditions and cause of the problem.
- Complaints received including address of complainant; and
- Details of the corrective action taken, and any subsequent changes to operational procedures.

The OMP will be reviewed on an annual basis with the scheduled review of the site management system or with every major increase, or alteration to the odour generated at site (i.e. a change to odour source term, pathways or receptors).

Appendix A – Drawings

GENERAL NOTES

1. SURVEY INFORMATION SUPPLIED BY THE WASTE RECYCLING GROUP .
2. DO NOT SCALE
3. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM
4. ANY ANOMALIES ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF BYRNE LOOBY

KEY

PERMIT BOUNDARY

NEW BIOREMEDIATION AREA

85.0
86.0
EXISTING GROUND CONTOURS

BUFFER ZONE

9 RECEPTOR MARKER

Rev	Date	Description	By	Chk	App
01	23/12	BOUNDARIES ADDED	GH	EG	CF

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CLIENT
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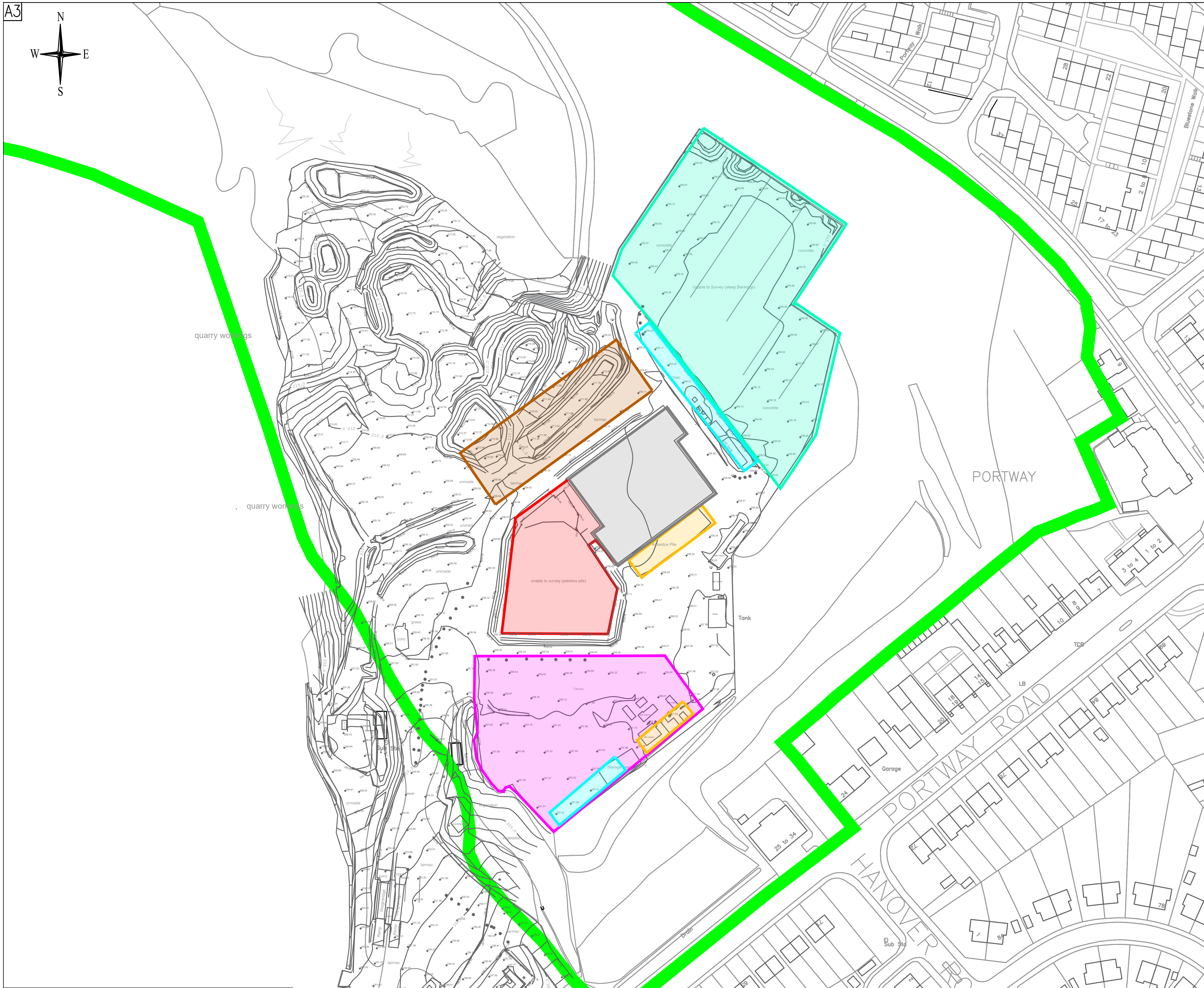
PROJECT
EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

DRAWING TITLE
SENSITIVE RECEPTOR PLAN

STATUS
FINAL

Date: 21.12.22	Scale: N/A	Drawn: JM	Chk: JW	App: JW
Project No: K0182	Drg. No: K0182.1.001			Rev: 01

A3



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KEY

- PERMIT BOUNDARY
- NON-HAZARDOUS SOIL STORAGE AND SCREENING AREA
- BIOLOGICAL TREATMENT AREA
- BIOFILTERS
- HAZARDOUS SOILS STORAGE AREA
- BIOLOGICAL TREATMENT AREA/SOIL WASHING AREA
- WATER TREATMENT PLANTS
- SOIL TREATMENT BUILDING

Rev	Date	Description	By	Chk	App

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PROJECT
EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

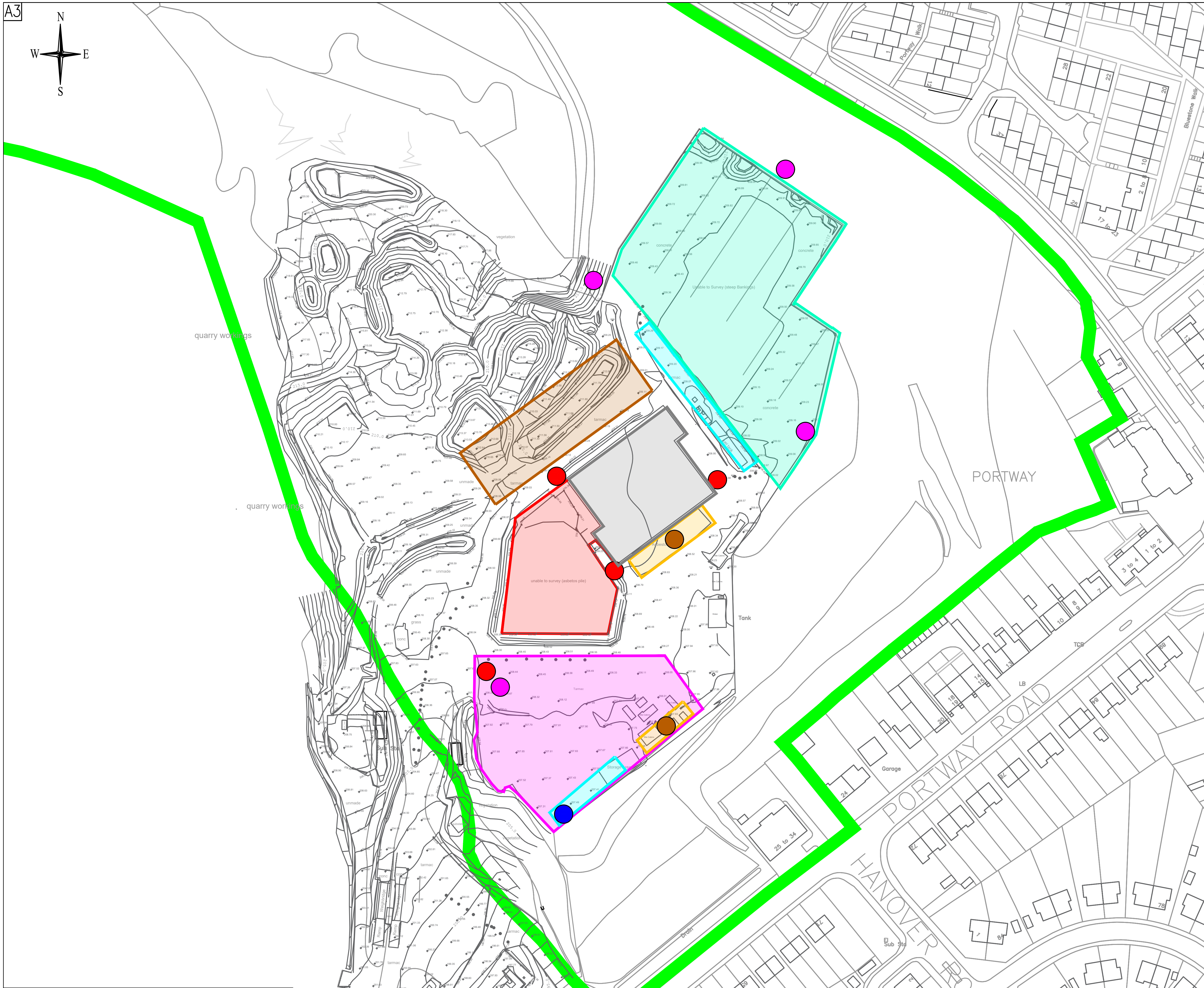
DRAWING TITLE
SITE LAYOUT PLAN

STATUS
FINAL

Date: 20.06.23	Scale: 1:1500	Drawn: JM	Chk: JW	App: JW

Project No:	Drg. No:	Rev:
K0182	K0182.2.002	01

A3



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KEY

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- BIOLOGICAL TREATMENT AREA
- BIOFILTERS
- HAZARDOUS SOILS STORAGE AREA
- BIOLOGICAL TREATMENT AREA/SOIL WASHING AREA
- WATER TREATMENT PLANTS
- SOIL TREATMENT BUILDING
- AIR SAMPLING: ASBESTOS/PM10
- AIR SAMPLING: TPH/BTEX/PAH'S
- AIR SAMPLING: DUST/NOISE/ODOUR
- WATER SAMPLING: SEVERN TRENT

Rev	Date	Description	By	Chk	App

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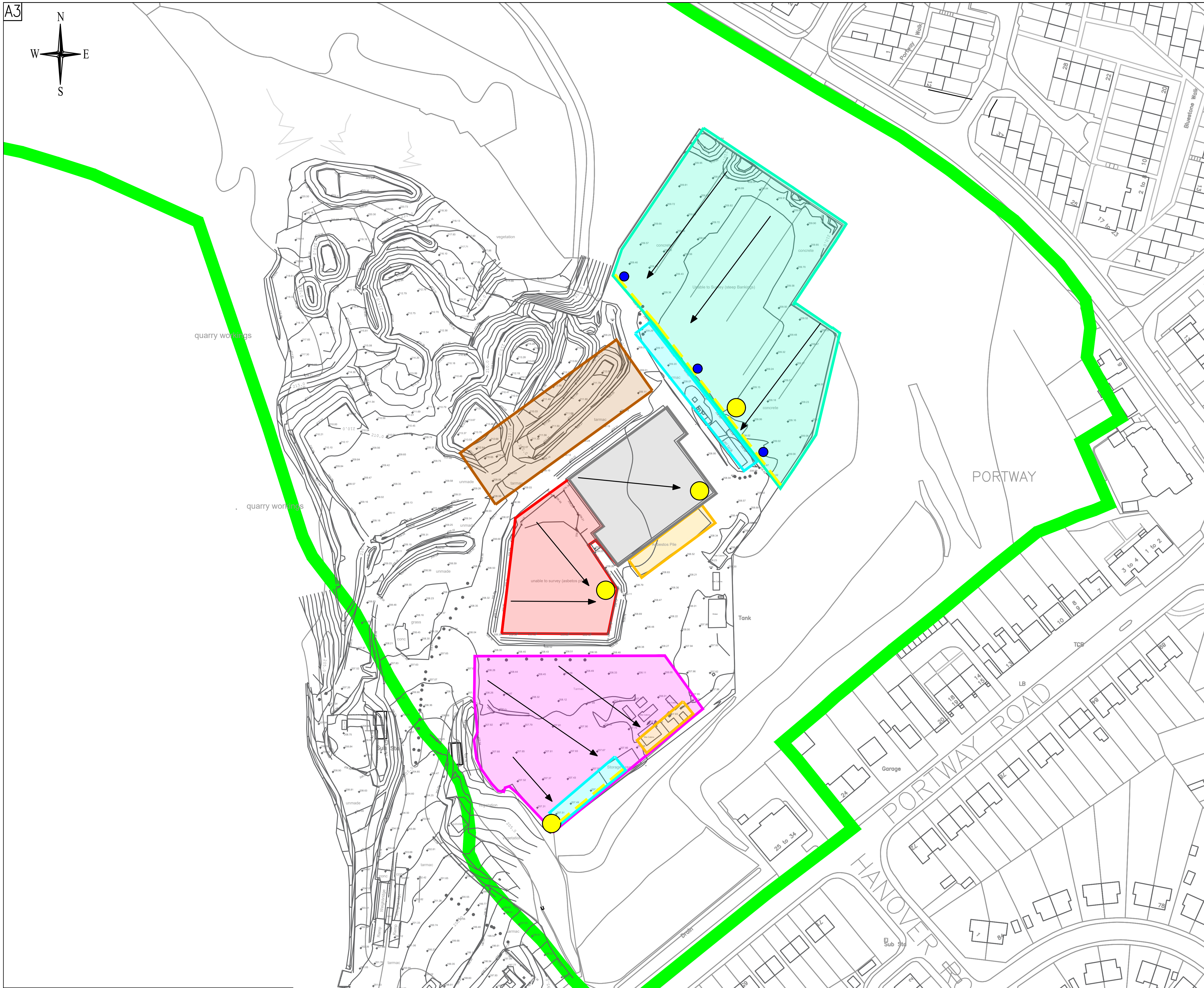
PROJECT
EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

DRAWING TITLE
EMMISIONS MONITORING PLAN

STATUS
FINAL

Date: 20.06.23	Scale: 1:1500	Drawn: JM	Chk: JW	App: JW

Project No:	Drg. No:	Rev:
K0182	K0182.2.003	01



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KEY

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- BIOLOGICAL TREATMENT AREA
- BIOFILTERS
- HAZARDOUS SOILS STORAGE AREA
- BIOLOGICAL TREATMENT AREA/SOIL WASHING AREA
- WATER TREATMENT PLANTS
- SOIL TREATMENT BUILDING
- PUMPING CHAMBERS
- DRAINAGE GULLY
- DRAINAGE DIRECTION
- SURFACE WATER DRAINAGE PIPE

Rev	Date	Description	By	Chk	App

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PROJECT
EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

DRAWING TITLE
DRAINAGE PLAN

STATUS
FINAL

Date: 20.06.23	Scale: 1:1500	Drawn: JM	Chk: JW	App: JW

Project No:	Drg. No:	Rev:
K0182	K0182.2.004	01

Technology | Engineering | Consulting

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Appendix B – Noise Impact Assessment and Noise & Vibration Management Plan

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Edwin Richards Quarry – Soil Treatment Centre

Noise and Vibration Management Plan

Waste Recycling Group (Central) Limited

Report No. K0182-BLA-R-ENV-00007
September 2023
Revision 02

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Document Control

Project: Edwin Richards Quarry – Soil Treatment Centre

Document: Noise and Vibration Management Plan

Client: Waste Recycling Group (Central) Limited

Report Number: K0182-BLA-R-ENV-00007

Document Checking:

Revision	Revision/ Review Date	Details of Issue	Authorised		
			Prepared By	Checked By	Approved By
01	23 December 2022	Final issued	E Greenhalgh	C Finney	C Finney
02	September 2023	Reissued	E Greenhalgh	C Finney	C Finney
Disclaimer: Please note that this report is based on specific information, instructions, and information from our Client and should not be relied upon by third parties.					

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Contents

1 Introduction

1.1 Report Objectives

This Noise and Vibration Management Plan supports an application by Waste Recycling Group (Central) Limited (WRG) to vary the current permit referenced EPR/HP3632RP to:

- Allow additional 30,000 tonnes per annum to be accepted at the facility and increase overall throughput to 180,000 tonnes per annum inclusive of either hazardous and/or non-hazardous waste.
- Remove the split of hazardous / non-hazardous waste treated at the facility from 89,998 tpa for hazardous waste and 60,002 tpa for non-hazardous waste to 180,000 tonnes per annum inclusive of either hazardous and/or non- hazardous waste. The amended ratio relates to the list of wastes in Table S2.2 and S2.3 of the permit (physical treatment of wastes and wastes for treatment in the bioremediation process respectively). This will impact the following listed activities:
  - AR1 S5.3A(1)(a)(ii) Physical treatment of hazardous waste
  - AR2 S5.3A(1)(a)(ii) Asbestos removal from soils
  - AR3 S5.4A(1)(a)(ii) Physical treatment of non-hazardous waste
  - AR4 S5.3 A(1)(a)(i) Bioremediation of hazardous waste for disposal
  - AR5 S5.3 A(1)(a)(i) Bioremediation of hazardous waste for recovery
  - AR6 S5.4A(1)(a)(i) Bioremediation of non-hazardous waste for disposal
  - AR7 S5.4A(1)(b)(i) Bioremediation of non-hazardous waste for recovery
- Addition of new soil treatment pad for biological treatment and soil washing.
- Addition of a point source emission to air to Table S3.1 to account for the biofilter from the new soil treatment area.
- Addition of soil washing activity for the soil washing of soils contaminated with heavy metals comprising the following listed activities and waste operations to be subject to the 180,000 tonnes per annum inclusive of either hazardous and/or non-hazardous waste.
  - S5.3 A(1)(a)(ii) – recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment via soil washing
  - S5.3 A(1)(a)(ii) – disposal of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment via soil washing

  Associated waste operations will be:
  - Treatment of non-hazardous waste soils by soil washing for recovery.
- Amendment to Table S1.1 Activity AR8 regarding the temporary external storage of up to 20,000 tonnes to include soils contaminated with heavy metals (10,000 tonnes) and activities AR9 and AR10 in the limits of specified activity and waste types.
- Allow the use of a mechanical screener for the pre-screening of soils containing asbestos.

- Remove pre-operational condition 1 as listed in Table S1.3 of the Permit.
- Undertake mechanical screening of non-hazardous soils in the area currently used for storage of non-hazardous soils. It is proposed to use this area for storage and screening of non-hazardous soils. Screening is already regulated under activity reference AR3 physical treatment of non-hazardous waste.
- Amend drawing reference in Table S3.3 of the Permit to remove reference to plan 100993 – Asbestos DWG1 dated January 2018 and replace with reference to an Emissions Monitoring Plan.

The proposed changes to the Permit at the Soil Treatment Centre (STC) better reflect current market conditions and reflect the activities permitted by the extant planning permission.

This Noise and Vibration Management Plan will also discharge Condition 5.a) and b) of Planning Permission DC/21/66058 which approves the new bioremediation area. The conditions are reproduced below for reference.

5.a) Before the development is brought into use a noise assessment shall be carried out in accordance with BS4141: 2014+A1:2019 to identify and quantify the noise impacts associated with the soil treatment plant. The assessment shall identify appropriate mitigation measures to limit noise to nearby residents and may include an acoustic barrier and enclosures for external plant and equipment. The assessment shall be submitted to and approved in writing by the local planning authority.

5.b) The approved mitigation measures shall be implemented before the development is brought into use

The new bioremediation area will be within the boundary of the existing waste management facility, to manage up to 30,000 tonnes at any one time of contaminated soil (classified as hazardous) through the process of bioremediation and physical treatment. The bioremediation and physical treatment of soils has been undertaken at the Site since 2016. The operations proposed for the extension are identical to those already approved at the Site through existing planning consents and an environmental permit.

A Noise Management Plan (Report Ref: 33012rr726i1, October 2016) was submitted with a previous planning application. A Planning Statement (Report Ref: 2596-01, August 2021) was submitted with this planning application for the new bioremediation area and includes measures for controlling noise.

The proposed changes to the Permit at the STC are to better reflect current market conditions and reflect the activities permitted by the extant planning permission.

In accordance with Environment Agency guidance a noise assessment is required where it is considered likely that there may be a risk of noise and vibration pollution beyond the site boundary.

A Noise Impact Assessment (NIA) was undertaken by Noise and Vibration Consultants Ltd in September 2022 (Report ref: R22.0905/DRK) to specifically address the new bioremediation area. The NIA was undertaken in accordance with BS4142:2014+A1:2019. A copy is provided at Appendix B.

The results of noise predictions of the STC site determined by the construction of a noise model using the empirical noise measurements recorded on site has shown the following:

a) The predicted noise levels vary between 20dB to 44dB $LAeq_{1hr}$ at Nearest Sensitive Receptors (NSRs).

b) The noise prediction results show that the rating noise levels at the NSRs are shown to be between 4dB and 27dB below representative background sound levels and therefore a **low impact** would occur in accordance with BS4142:2014+A1:2019.

c) The predicted noise levels are between 11dB and 32dB below the residual LAeq levels at NSRs.

The NIA has been utilised to develop this Noise and Vibration Management Plan. Reference has also been made to Environment Agency guidance[1] (dated 31 January 2022).

[1] Noise and vibration management: environmental permits - GOV.UK (www.gov.uk)

2 Scope of the Activities

2.1 Operational Overview

2.1.1 Current Activities

The STC is currently permitted to accept a mixture of hazardous and non-hazardous waste for treatment pending disposal off-site at the directly adjacent Edwin Richards Landfill Site also operated by WRG or reused on site as restoration soils. The treatment technologies employed include bioremediation of hazardous waste soils in biopiles and handpicking discrete fragments of asbestos material from soils (not contaminated with asbestos fibres).

The entirety of the area inside the current permit boundary, including inside the building comprises approximately 8.6 ha comprising a large hard surfaced level platform, which was used as part of the quarrying activities and now the STC. The STC is currently accessed via the entrance on Portway Road.

2.1.2 Proposed Activities

WRG propose to add a new soil treatment area which will be located to the southeast of the existing STC within the permit boundary. It is occupied by an area of hard standing within the current permit boundary and will use the existing access road from Portway Road. The location is shown on the Site Layout Plan.

The new soil treatment pad area will be able to treat 30,000 tonnes via either bioremediation or soil washing dependent on the contract. Soil will be treated on an impermeable surface with sealed drainage. It is occupied by an area of hard standing within the current permit boundary and will use the existing access road from Portway Road. The new soil treatment area will be within the boundary of the existing waste management facility, to treat up to 30,000 tonnes at any one time of soil contaminated with hydrocarbons or heavy metals through the process of bioremediation or soil washing dependent on the contract. The bioremediation of soils has been undertaken at the Site since 2016.

The Site Permit Boundary is shown on drawing reference K0182.1.002 and remains unchanged as part of this application.

The material to be treated at the STC is predominantly classified as hazardous. WRG would first consider the description of the soils provided by the customer. If the soils are permitted and likely to be capable of treatment the customer would be issued with the terms and conditions for acceptance of the soils.

The materials will predominantly arrive at the Site in articulated vehicles. All vehicles would arrive sheeted and would only remove their sheets once at the point of material inspection / deposition.

All vehicles would pass over the existing weighbridge before travelling along the internal access road and entering the STC. Soils delivered to the STC would be visually inspected. If the soils are provisionally accepted based upon the initial visual assessment, chemical sampling would be undertaken by an accredited laboratory as deemed necessary by WRG. If the soils are rejected for treatment at the STC they would be required to be taken away by the customer for disposal at a suitable facility. All activities would take place on the soil treatment pads, with the exception of the samples which are sent for chemical testing.

The biotreatment area works by biologically treating contaminated soils to reduce the concentrations of hydrocarbons to levels that would not pose a risk to the environment and allow a suitable restoration soil to be generated. The process utilises industry standard static technology and works by stockpiling soil impacted by hydrocarbons on an impermeable hardstanding surface. The soil is placed on a pipework system that creates a vacuum to aerate the soil and allow the natural soil bacteria to grow on the hydrocarbons and convert them to common by-products such as water vapour and carbon dioxide.

The air that is extracted from the soils is treated using a biofilter. The biofilter comprises a relatively simple air filter system. The effluent pipe from the blower connects to a manifold with several perforated pipes covered in stone. An oversize compost or woodchip mixture, nutrients and small amount of hydrocarbon impacted soil (<5%) is placed on top of the pipes to an average height of 1.5m. Above this is an irrigation pipe network to maintain the moisture content and a tarpaulin to ensure the biofilter does not dry out.

Water resulting from the bioremediation process, along with rainwater that falls on the wider soil treatment area, would be collected by the drainage gully and pipe and treated through primary settlement and sand/carbon filtration in the existing water treatment plant before being discharged to the foul sewer under the existing consent.

Soils accepted for biotreatment would be subject to a process of bioremediation for a period of 8-12 weeks. Once the soil has commenced treatment the soil is turned to aerate settled soils, typically every 4-8 weeks. Occasionally there may be a need to add an organic additive such as a woodchip to clayey soils to break up the cohesive nature and aid aeration. When the bioremediation process has been completed the soils would either be disposed of in the Edwin Richards Landfill Site or removed from site for use in land reclamation projects.

The soil washing activity will comprise the treatment of up to 30,000 tonnes per batch. Soils contaminated with heavy metals will be bought in for treatment in the soil wash plant. The soil wash plant is to be located on an area of hardstanding with sealed drainage which is the proposed new soil treatment area when not utilised for bioremediation. The duration of treatment is likely to be 6-8 weeks for each batch. The soil wash plant is to be intermittently located on the new bioremediation pad area based on the contract arrangements.

The physical screening of material (treated and untreated) using a mechanical screener would allow for the removal of oversize fractions. Any hazardous substances remaining in the soil after screening will be treated either by bioremediation or on the picking station within the asbestos treatment building on site. Pre-screening of soils containing asbestos is proposed within the Soil

Treatment Building. The pre-screening will increase the efficiency of the soil processing. It will also significantly decrease the timescales for picking thereby significantly reducing exhaust emissions from mobile plant.

On-site noise sources associated with the activities are discussed in section 3.1.1.

3 Potential Emissions

3.1 Noise and Vibration

3.1.1 On-Site Sources

The current and proposed activities associated with the STC that have the potential to produce noise and vibration emissions are:

- Vehicle movements to, from and within the Site;
- Waste deposition;
- Operation of plant as part of the bioremediation and physical treatment process (e.g. dumper, lorry, excavator, screener);
- Operation of soil wash plant;
- Containerised air extraction blower and associated pipework; and,
- Water treatment system.

Noise and vibration emissions are also associated with operations associated with Edwin Richards Landfill Site. These are not the subject of this assessment or this management plan however the control measures provided are applied to the landfill activities where applicable.

Condition 6 of Planning Permission DC/21/66058 details specific noise limits for the Site and is reproduced below:

6. The rating level of operational noise from the site, when measured as a 60- minute LAeq between the hours of 07:00 and 23:00, shall not exceed the background 60-minute LA90 by more than 5 dBA on any day. The rating level of operational noise, when measured as a 15-minute LAeq between the hours of 23:00 and 07:00, shall not exceed the background 15-minute LA90 on any day. All measurements are to be taken in accordance with BS4142:2014+A1:2019 at the nearest noise sensitive premises. In case of doubt, the background level LA90 shall be determined or agreed by the local planning authority in each case.

An Emissions Management and Monitoring Plan is already in place onsite and is attached as Appendix C. Noise monitoring is undertaken weekly at the Site.

Condition 8 of Planning Permission DC/21/66058 details the operational hours of the STC and is reproduced below:

The soil treatment facility hereby approved shall only operate between the hours of 06:30 and 17:30 Monday to Saturday and shall not operate at any time on Sundays or public or bank holidays. This restriction also applies to deliveries to the site.

A NIA was undertaken in September 2022 in accordance with BS4142:2014+A1:2019. The noise levels associated with the on-site activities are summarised below.

Noise prediction results show that the rating noise levels at the Nearest Sensitive Receptors (NSRs) are shown to be below background sound levels and therefore a low impact is predicted in accordance with BS4142:2014+A1:2019.

The NIA assessed the cumulative effect from the soil wash plant, biofilter and pumping chamber and general STC plant.

Noise prediction results show that noise levels at the NSRs during the highest likely noise generation show that the rating noise levels do not exceed the representative background sound levels and therefore a low impact is concluded in accordance with BS4142:2014+A1:2019.

The results of the survey and analysis have shown the following:

- Subjective observations of the background noise climate during daytime operating periods at the NSRs show that non-site noise sources are generally formed by local and distant road traffic noise.
- Background sound levels at the north-eastern to south-eastern NSRs are 48dB LA90 and at greater distance to the west 47dB LA90. Corresponding residual levels at NSRs vary between 51dB to 59dB LAeq.
- Subjective observations at NSR monitoring positions when the STC plant was operating normally, showed no significant perceptible noise or no perceptible or distinctive noise character from Site and therefore no noise character penalty was deemed to be required.
- Due to the ambient noise levels at NSRs being too high to be able to measure the noise contribution from the STC site, it has been necessary to undertake noise prediction modelling using computer-based modelling software with appropriate settings in accordance with ISO9613-2 and industry.
- On-site noise monitoring has been undertaken of fixed and mobile plant noise sources to inform the noise prediction modelling.
- The results of noise predictions of the STC site determined by the construction of a noise model using the empirical noise measurements recorded on site has shown the following:
    - The predicted noise levels vary between 20dB to 44dB LAeq1hr at NSRs.
    - The noise prediction results show that the rating noise levels at the NSRs are shown to be between 4dB and 27dB below representative background sound levels and therefore a low impact would occur in accordance with BS4142:2014+A1:2019.
    - The predicted noise levels are between 11dB and 32dB below the residual LAeq levels at NSRs.

- The soil washing plant would be utilised on a temporary basis and treatment of stockpiled soils would occur approximately 6-8 weeks for each batch of soil, which is likely to occur once a year. The washing plant would only be brought onto site when the temporary activity is required.
- The cumulative effect of the temporary soil washing activity and the day-to-day operation of the STF plant has been assessed (with mitigation measures proposed) and a noise prediction model generated to calculate the noise impact and the results show the following: a)The cumulative noise levels at the NSRs during the highest likely site noise generation during the temporary use of the Soil Washing Plant show rating noise levels are between 28dB and 48dB LAeq1hr.
- The rating levels do not exceed the representative background sound levels and therefore a low impact would occur in accordance with BS4142:2014+A1:2019.

3.1.2 Off-Site Sources

Edwin Richards Landfill Site is located to the southwest and commercial premises are located to the south on Portway Road. There are several roads surround the Site including the B4171 (Dudley Road) 650 m to the southwest. The industrial / commercial facilities and the roads surrounding the Site have the potential for generating noise.

4 Potential Receptors and Pathways

4.1 Site Setting

The Site is situated in a suburban location, with two golf courses located to the northwest and southeast. The Site is located at an elevated level behind a belt of mature trees which screens the Site from residential properties, including those closest to the north and east of the Site. Edwin Richards Landfill Site is located to the southwest and commercial premises are located to the south on Portway Road. Portway Hill, Portway Road and Dudley Road are located to the north, east and south of the site. Rowley Hills Local Wildlife Site is located to the north and consists of deciduous woodland, woodland and semi-improved grassland.

4.2 Receptor Locations

When choosing the receptors, the closest or the most sensitive (if different from the closest) have been considered in each direction from the hazard. Account has been taken of the mechanism of transport to the sensitive receptor e.g. wind direction or a physical connection to the Site. The probability of exposure is determined by the distance of the receptor to the Site and the likelihood of the hazard reaching the receptor. This stage of the assessment assumes that exposure has resulted from an uncontrolled emission i.e. without mitigation.

The nearest sensitive receptors to the Site and the distance of these receptors to the Site boundary and their direction relative to the Site is detailed in Table 1.

Meteorological data from Rowley Regis[2] which is located approximately 400 m to the south of the Site and is expected to provide representative meteorological data for the area has been used to determine the prevailing wind direction which is from the south-southeast.

Table 1 – Potential Sensitive Receptors

No.	Receptor Description	Receptor Type	Direction from Site	Distance to Building	Frequency downwind of site
1	Tower Road off Portway Hill	Residential properties	NNE	360 m	6.3 %
2	Dudley Golf Club House	Recreational facility	NNW	125 m	22.1 %
3	Portway Hill	Residential and Commercial Properties	NE	10 m	7.4 %
4	Old Portway House and Barn	Listed building	NE	10 m	7.4 %
5	Portway Road	Residential and Commercial Properties	E to S	10 m	5.5 % to 2.1 %
6	Warren Hall Country Park	Local Nature Reserve	W	610 m	0.7 %
7	Bumble Hole	Local Nature Reserve	W	990m	0.7 %
8	Rowley Hills	Local Wildlife Site	NE	225 m	7.4 %
9	Dudley Golf Course	Recreational	W to NW	40 m	0.7 % to 8.6 %

[2] Rowley Regis Wind Forecast, West Midlands B65 9 - WillyWeather

No.	Receptor Description	Receptor Type	Direction from Site	Distance to Building	Frequency downwind of site
10	Rowley Regis Golf Course	Recreational	SE to S	120 m	3.6 % to 2.1 %
11	Rowley Hall Primary School	School	SE	360 m	3.6 %
12	Grace Mary Primary School	School	NNE	420 m	6.3 %
13	Dudley Road	Residential and Commercial Properties	SW	440 m	4.2 %
14	Deciduous woodland, woodland & good quality semi-improved grassland (nonpriority)	Priority Habitats	NE, S & W	0-500m	4.2 % to 0.7 %

4.3 Receptor Types

4.3.1 Residential, recreational, industrial, commercial and educational premises

The potential noise emissions from the Site are likely to have a similar impact on persons occupying residential, recreational, industrial, commercial or educational premises. Exposure of emissions to persons at industrial or commercial premises may be lower as they are more likely to be inside during the working day or they may be transient visitors to the premises. Certain industrial premises may generate similar emissions similar to the STC.

The closest residential areas to the STC are properties on Portway Hill, Portway Road and Dudley Road. Two primary schools are also within the 500 m radius of the STC. It is likely that the combination of waste types and operational controls, physical barriers (building, treeline and fences), and distance to the receptor prevent most potential emissions from reaching receptors.

4.3.2 Highways and footpaths

The transitory nature of highways means receptors using those locations will be exposed to potential emissions from the Site for shorter (albeit variable) periods of time than residences or businesses. Pedestrians will have longer and more direct exposure to emissions compared to vehicle users. The highways and footpaths are close to the STC, and this places a more immediate need for the operational effectiveness of Site controls.

4.3.3 Habitats

The potential noise emissions from the Site are likely to have similar impacts on wildlife occupying Local Wildlife Sites (LWS), Local Nature Reserves (LNR) and Priority Habitats. Studies suggest that disturbances such as noise can have an impact on wildlife.

The closest habitats are the woodlands and grasslands to the north of the site and associated with LWS, Rowley Hills. The LNR, Warren Hall Country Park and Bumble Hole are over 500 m from the Site. It is likely that the combination of waste types and operational controls, physical barriers (building, treeline and fences), and distance to the receptor prevent most potential emissions from reaching receptors.

5 Noise Risk Assessment

The risk potential to each receptor from noise and vibration generated at the is presented in Table 2 below. This table evaluates the nuisance to sensitive receptors from noise and vibration emissions and the control measures to be implemented at the STC in order to minimise this risk, producing a revised residual risk to receptors.

A NIA was undertaken by Noise and Vibration Consultants Ltd in September 2022 (Report ref: R22.0905/DRK) to specifically address the proposed activities as detailed in Section 2.1.2. The NIA was undertaken in accordance with BS4142:2014+A1:2019. A copy is provided at Appendix B.

The NIA stated that the results of noise predictions of the STF site determined by the construction of a noise model using the empirical noise measurements recorded on site has shown the following:

a) The predicted noise levels vary between 20dB to 44dB $LAeq_{1hr}$ at NSRs.

b) The noise prediction results show that the rating noise levels at the NSRs are shown to be between 4dB and 27dB below representative background sound levels and therefore a **low impact** would occur in accordance with BS4142:2014+A1:2019.

c) The predicted noise levels are between 11dB and 32dB below the residual LAeq levels at NSRs.

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Table 2 – Noise and Vibration Risk Assessment and Management Plan

Hazard / Pathway	Receptor				Probability of exposure	Unmitigated Consequence	Initial Risk / Reason	Risk Management	Mitigated Risk
	No.	Dist.	Direc.	Freq.					
Noise through air and Vibration through ground from: Vehicle movements associated with the delivering and handling of waste onsite. Site plant.	1	360 m	NNE	6.3 %	Low – distant from site	High - noise nuisance to residents	Medium – potential noise nuisance	Noise and Vibration Controls provided in Section 6.	Low
	2	125 m	NNW	22.1 %	High – close to site	Medium – some nuisance to users of golf course	Medium – potential noise nuisance		
	3	10 m	NE	7.4 %	High – close to site	High - noise nuisance to residents	High – potential noise nuisance		
	4	10 m	NE	7.4 %	High – close to site	High - noise nuisance to residents	High – potential noise nuisance		
	5	10 m	E to S	5.5 % to 2.1 %	High – close to site	High - noise nuisance to residents	High – potential noise nuisance		
	6	610 m	W	0.7 %	Low – distant from site	Medium – disturb local wildlife	Low – distance from site		
	7	990 m	W	0.7 %	Low – distant from site	Medium – disturb local wildlife	Low – distance from site		
	8	225 m	NE	7.4 %	Medium – proximity to site	Medium – disturb local wildlife	Medium – potential noise nuisance		
	9	40 m	W to NW	0.7 % to 8.6 %	High – close to site	Medium – some nuisance to users of golf course	Medium – potential noise nuisance		
	10	120 m	SE to S	3.6 % to 2.1 %	High – close to site	Medium – some nuisance to users of golf course	Medium – potential noise nuisance		
	11	360 m	SE	3.6 %	Low – distant from site	High - noise nuisance to students	Medium – potential noise nuisance		
	12	420 m	NNE	6.3 %	Low – distant from site	High - noise nuisance to students	Medium – potential noise nuisance		
	13	440 m	SW	4.2 %	Low – distant from site	High - noise nuisance to residents	Medium – potential noise nuisance		
	14	0-500 m	NE, S & W	4.2 % to 0.7 %	High – close to site	Medium – disturb local wildlife	Medium – potential noise nuisance		

6 Noise and Vibration Controls

6.1 Overview

The bioremediation and physical treatment of soils has been undertaken at the Site since 2016. The Site is located at an elevated level behind a belt of mature trees. Existing Planning Permission DC/21/66058 specifies noise limits, requires noise monitoring and stipulates operational hours. The NIA provides recommendations for further controls related to the proposed activities and these are provided below.

6.2 Controls

As part of the site development and operation, the following measures are in place to minimise noise and vibration from the Site:

- The new soil treatment area will be located on the existing footprint of the STC.
- All plant on Site consists of modern machinery fitted with efficient silencers / insulation designed to minimise noise levels that are generated during operations. Mobile plant would have noise emission levels that comply with limit levels as defined by the EC Directive 2000/14/EC and subsequent amendments.
- The mechanical screen to be used for pre-screening of soils containing asbestos will be undertaken within the Soil Treatment Building.
- All plant is properly serviced, maintained, and operated in accordance with the manufactures' instructions to ensure that the occurrence of malfunctions which can give rise to elevated noise levels is reduced and any malfunctions that do occur are swiftly repaired.
- The effectiveness of acoustic insulation and silencers fitted to plant will be qualitatively assessed and recorded as part of the Site Manager's Weekly Report. Any items of plant with defective insulation or silencers will be identified for immediate investigation and remediation.
- All reasonable steps will be taken to limit the amount of vehicle queuing or waiting to enter / exit the Site, this will be achieved through the management of the weighbridge at Site.
- Internal haul roads are, where possible, routed to allow maximum acoustic screening and separation distances to noise sensitive receptors. Haul roads are kept clean and maintained in a good state of repair and subject to a 10 mph speed limit so as to avoid unwanted noise and vibration from vehicles.
- Local communities to be kept informed of general site activities, including working hours via the Edwin Richards Quarry Liaison Committee.

- Any pumps used onsite will be powered by electricity wherever practicable, and all pumps and generators will be placed at locations to minimise noise emissions to sensitive receptors.

- With the exception of acoustically enclosed generators, pumps and electric plant, all static plant should be shut down when not in use.

- Appointment of a site contact to whom complaints or queries about operational activities can be directed. Any complaints to be investigated and action taken where appropriate (see Section 7.3).

- Where possible, use equipment with lowest sound power level and without any dominant tonal or impulsive characteristics available for the required purpose.

- If necessary and practicable, emissions from sources of significant noise can be controlled using acoustic enclosures.

- All mobile plant fitted with non-tonal reversing alarms when operating on site (i.e. broadband, SMART or `white noise' type reversing alarms).

- The site boundary retaining wall and embankment to be retained that exists around the Biotreatment area.

- Wherever practicable maintain the one-way system for dump trucks to move around the Site and minimise reversing for HGVs offloading soils in the Biotreatment area.

- The southern boundary and the southeast and southwest boundary of the proposed soil treatment area would be fitted with an acoustic screen. The screen height would be 5m in height and the location shown in Figure 3. The screen can be formed from a solid material having a minimum mass of 15kg/m2 (e.g. concrete, brickwork, close-boarded fencing etc.)

Additional controls are in place for vehicles. Vehicles arriving or exiting the Site or drivers of mobile should consider the following general management procedures based on guidance within the 'quiet deliveries demonstration scheme':

- Consideration to noise and the neighbours is shown as you approach the site and manoeuvring in the facility.

- The vehicle horn is not to be used to alert the site on your arrival/waiting at the entrance to the Site.

- Wherever practicable avoid reversing of vehicles.

- Engines are switched off when not manoeuvring.

- Radios are switched off and doors not slammed when alighting the cab.

- Load retaining straps/bars/chains are carefully restrained or placed in stowage points and not allowed to drop onto the floor.

- Minimise excessive air braking noise.
- Switch off engines for prolonged stops but minimize unnecessary start-ups and engine revving. Start-up plant and vehicles sequentially rather than simultaneously.
- Minimise drop height of materials.
- Always unload in the designated delivery area, unless instructed by the site management to do otherwise.
- Report any circumstances to management where adherence to these instructions cannot be fulfilled.
- Where front loaders are being used to move waste, driver's instructed to avoid unnecessary scraping, `rattling' or `banging' of loading bucket to minimise impact noise.

7 Community Engagement, Reporting and Contingencies

7.1 Overview

Prevention will be viewed as the most effective means of controlling noise and vibration before an impact occurs. The Source → Pathway → Receptor model determined above allows for the identification of the critical control points where noise and vibration can arise, how it can travel to a receptor and the likely impact.

The performance of a Noise and Vibration Management Plan will ultimately be judged by the impact of the site on the receptors. Should complaints be received, a procedure will be in place to effectively deal with the issue in a sensitive, efficient and auditable manner.

The controls are detailed in previous sections of this report. The management of those controls will be based on the on-going monitoring regime on Site. The monitoring regime can work as an early warning system against potential problems (e.g. meteorological monitoring) or a diagnostic tool to establish the cause of a noise or vibration event (e.g. perimeter monitoring).

7.2 Noise Monitoring

This section provides the procedures, instrumentation and specification for undertaking noise monitoring where required.

Noise monitoring may be undertaken where the following occur:

- Complaints are received with no substantiated on-site activities to account for noise and vibration emission i.e. faulty plant for example
- Emissions limits in the NIA are exceeded
- Introduction of new plant or activities that could create more emissions
- New receptors around the Site are developed therefore changing the site setting.

7.2.1 Noise Monitoring Instrumentation

Ambient noise levels would be monitored using an integrating-averaging sound level meter (SLM) or equivalent system of BS EN 61672-1 & 2 (or the equivalent UK adopted standard in force at the time of the monitoring). This would be set to monitor using the fast time weighted response as specified in BS EN 61672-1 & 2 (or the equivalent UK adopted standard in force at the time of the monitoring).

The SLM would be field calibrated before and at the end of each survey by applying the acoustic calibrator or pistonphone conforming to Type 1 of the current versions of BS EN 60942 (Electroacoustics – Sound Calibrators) or any subsequent update, to the microphone to check the sensitivity of the measuring equipment. Any drift in calibration levels would be noted and survey repeated where necessary in the event that the drift was outside of acceptable tolerances.

The equipment used for the noise monitoring should also have undergone more extensive independent laboratory test of performance within 2 year period as specified in BS EN 61672 (Electroacoustics. Sound level meters - Pattern evaluation tests) or any subsequent update, although 1 ear is advisable for acoustic calibrators.

Monitoring of meteorological parameters (including wind speed and direction) should be made by the use of a handheld anemometer or a site based meteorological station if available.

7.2.2 Noise Survey Specification

Noise monitoring during site operations would be the responsibility of the Site Manager or their appointed representatives. If noise monitoring would only be undertaken by suitably experienced or qualified personnel.

Noise monitoring would be undertaken during the normal working day. Periods would be chosen to avoid meal breaks and times when plant and equipment on site is not operating.

The microphone heigh would be between 1.2 m and 1.5 m above ground level. To minimise the influence of reflections the microphone position would be at least 3.5 m from any reflecting surface other than the ground. In the event of monitoring having to be made within 3.5 m of reflecting facades, a correction of 3 dB would be made to all results to convert them to free-field levels.

To minimise the influence of extraneous sources of physical interference on monitored noise levels, the following would be adopted:

- Providing a suitable foam windshield is fitted to the microphone, monitoring would only be undertaken when wind speeds were below $5ms^{-1}$;
- No monitoring would be undertaken during periods of heavy precipitation; and
- No monitoring would be undertaken immediately adjacent to sources of electrical interference such as overhead power cables or radio transmitters.

At each monitoring location, noise levels would be measured in sample periods of not less than 15 minutes during the daytime. Sufficient sample periods would be accumulated to determine the site attributable L_{Aeq}, other additional noise parameters would also be simultaneously measured in order to more accurately define the acoustic environment. These would include L_{A90}, $L_{A10, T}$ and L_{AFmax}.

Wherever possible noise monitoring would be made during calm conditions (average wind speeds of less than 5 m/s) or at location with a positive wind component from the site operations. However, due to the variability of the British climate, the latter may not always be possible and such occasions should make a note of the uncertainty introduced by weather conditions on monitored sound levels and repeated where necessary.

Notwithstanding the above, as part of the monitoring schedule, a note of the prevailing weather conditions during the monitoring period would be made. This would include details such as wind speed, wind direction, estimate of cloud cover, presence of precipitation or fog and details of any other factors such as conditions likely to lead to a temperature inversion. These observations would be corroborated by data from the onsite meteorological station if available.

A note of the type of instrumentation used for the surveys would be made including manufactures model and serial number and any calibration details.

Observations would be made regarding the audibility of the site and the items of plant operating at the time of the surveys. A detailed log of any extraneous events affecting noise levels would also be made. Any use of the ‘pause’ feature on the SLM to limit the influence of extraneous noise events on the monitoring results would be recorded.

7.2.3 Frequency of Monitoring

As a minimum, noise monitoring would be undertaken for the following activities:

- Construction Operations;
- Normal Operations every month;
- In response to any complaint, if the complaint has not been fully resolved by the initial visit by staff.

The frequency and / or duration of monitoring may be amended once sufficient data has been gathered to indicate that operations comply with the relevant noise limit criteria. This would be agreed in writing with the Local Planning Authority.

7.2.4 Noise Limit Criteria

The Noise Limit Criteria for occupational exposure monitoring in close proximity to working plant id 85 dBA.

7.2.5 Noise Limit Criteria Exceedance Reaction Process

In the unlikely event that unacceptable noise emissions arise from the Site, as indicated by a noise complaint or by noise monitoring, one or more of the following remedial actions will be undertaken:

- An investigation will be undertaken to identify the operations and/or plant that is causing the unacceptable noise emission;
- Operations identified as generating unacceptable noise will be reduced or suspended until effective remedial actions have been taken to limit the noise emissions from the site;

- Additional noise monitoring will be undertaken to determine whether the noise levels are exceeding the noise limit criteria;
- On Site vehicle movement routes may be reconsidered with regard to location (i.e. relocating further from the receptor at risk), speed limits may be further reduced,
- Additional inspection of vehicles may be undertaken to ensure that all vehicular noise and vibration controls are being applied;
- Waste handling procedures may be altered to further limit placement to specific hours of operation; and
- Provision of temporary acoustic barriers to be erected at the Site if noise cannot be further limited.

A record of all complaints and / or exceedances will be kept by WRG, and it shall include a record of the investigation and the remedial measures taken. All communication will also be kept as a record.

7.3 Complaint Process

Any complaints received at the STC or via the Regulatory bodies including the Environment Agency and Local Authority, will be recorded using the Compliant Report Form contained in the Site Management System. This will instigate further monitoring at the location of the complaint and on site to determine the extent of the noise and / vibration and whether any of the actions outlined in Section 7.2 should be employed. Where possible, as much information and detail about the complaint will be recorded, whether this is from the relevant authority or complaint direct to site. This information will assist in the investigation and determining the source of the noise and / or vibration e.g. differentiating between potential off-site sources.

All complaints and queries will be logged in accordance with the management system as soon as is practicably possible. All complaints logged will be subject to investigation and complainants responded to within 48 hours of receipt, where possible.

In the event that a substantiated noise complaint is received arising from the site, additional monitoring will be undertaken at the nearest sensitive receptors to determine any off-site noise emissions.

Complaints regarding noise and / or vibration from the Site will be investigated in accordance with the protocol, and appropriate records maintained which may include:

- Complaints received including name and contact details of complainant (if known), and complainants description of the noise and / or vibration;
- Nature of problem including date, time, duration, prevailing weather conditions and cause of the problem;
- Onsite activities and operational condition at the time of the complaint;

- Records of the likely source of the emission even if it is clearly not from the Site;
- Details on the corrective action taken, and any subsequent changes to monitoring and operational procedures;

The Environment Agency will be informed by WRG of the complaint and WRG will confirm to the best of its knowledge the information described above.

WRG will ensure that the complainant has all the relevant contact details of the site (i.e. the Site Manager) and the officer responsible at the Environment Agency. WRG will be in regular contact with the complainant and the Environment Agency whilst the cause of the emission is being investigated and remediated.

An evaluation of the effectiveness of the techniques used will be carried out on completion of any remedial measures or if the complaints persist. Records of the above will be retained by site for future reference.

7.4 Means of Contact

The Site will be readily contactable to outside organisations and to members of the public. The Site signage board (placed in a readily visible location) will contain the necessary contact details for both the Site operations and Environment Agency. The company website also contains the necessary contact details for each individual Site.

Any complaints received directly to Site will be notified to the Environment Agency. Should an off-site issue arise, therefore, the complainant has a readily available means of getting in touch with WRG.

7.5 Complaints Investigation

As part of each complaint received, these will be objectively assessed against the wider environment to ensure that the source of the emission is traced back to the correct source. As discussed earlier, it is essential that the source is correctly identified in order that mitigating measures can be applied effectively and correctly. The complaint will also be assessed against previous records to place the nature of the complaint into context.

7.6 Records and Review

A daily record relating to the management and monitoring of noise and / vibration will be maintained. It will include the following details:

- The results of inspections and noise monitoring carried out by installation personnel;
- Weather conditions including atmospheric pressure, wind speed and wind direction;

- Problems including date, time, duration, prevailing weather conditions and cause of the problem;
- Complaints received including address of complainant; and
- Details of the corrective action taken, and any subsequent changes to operational procedures.

The Noise and Vibration Management Plan will be reviewed on an annual basis with the scheduled review of the site management system or with every major increase, or alteration to the noise and / or vibration generated at site (i.e. a change to source term, pathways or receptors).

Appendix A – Drawings

A3

GENERAL NOTES

1. SURVEY INFORMATION SUPPLIED BY THE WASTE RECYCLING GROUP .
2. DO NOT SCALE
3. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM
4. ANY ANOMALIES ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF BYRNE LOOBY

KEY

PERMIT BOUNDARY

NEW BIOREMEDIATION AREA

85.0
86.0
EXISTING GROUND CONTOURS

BUFFER ZONE

9 RECEPTOR MARKER

Rev	Date	Description	By	Chk	App
01	23/12	BOUNDARIES ADDED	GH	EG	CF

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CLIENT

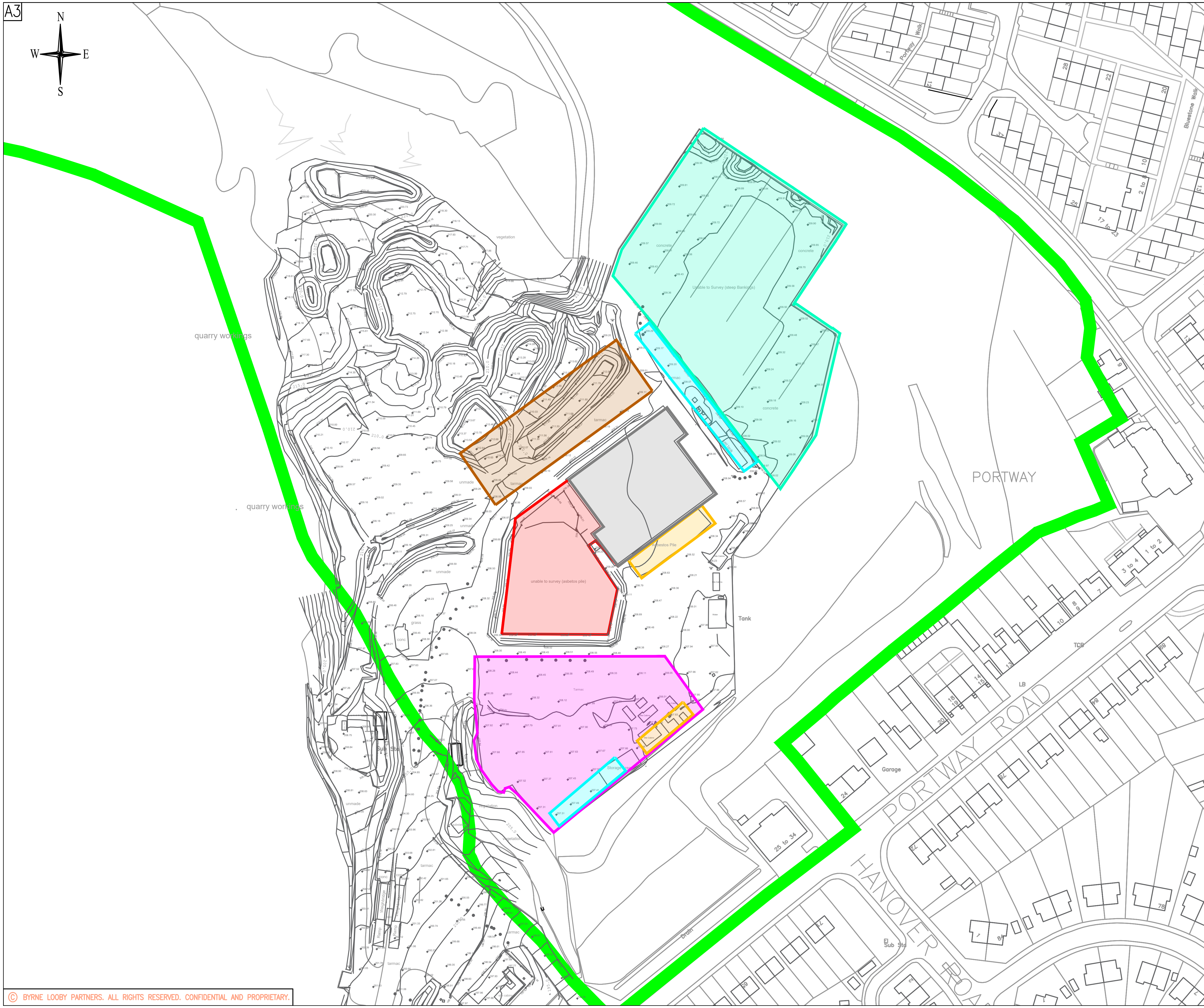
waste recycling GROUP

PROJECT
EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

DRAWING TITLE
SENSITIVE RECEPTOR PLAN

STATUS
FINAL

Date: 21.12.22	Scale: N/A	Drawn: JM	Chk: JW	App: JW
Project No: K0182	Drg. No: K0182.1.001			Rev: 01



GENERAL NOTES

1. SURVEY INFORMATION SUPPLIED BY THE WASTE RECYCLING GROUP .
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3. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM
4. ANY ANOMALIES ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF BYRNE LOOBY

KEY

- PERMIT BOUNDARY
- NON–HAZARDOUS SOIL STORAGE AND SCREENING AREA
- BIOLOGICAL TREATMENT AREA
- BIOFILTERS
- HAZARDOUS SOILS STORAGE AREA
- BIOLOGICAL TREATMENT AREA/SOIL WASHING AREA
- WATER TREATMENT PLANTS
- SOIL TREATMENT BUILDING

Rev	Date	Description	By	Chk	App

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CLIENT
waste recycling GROUP

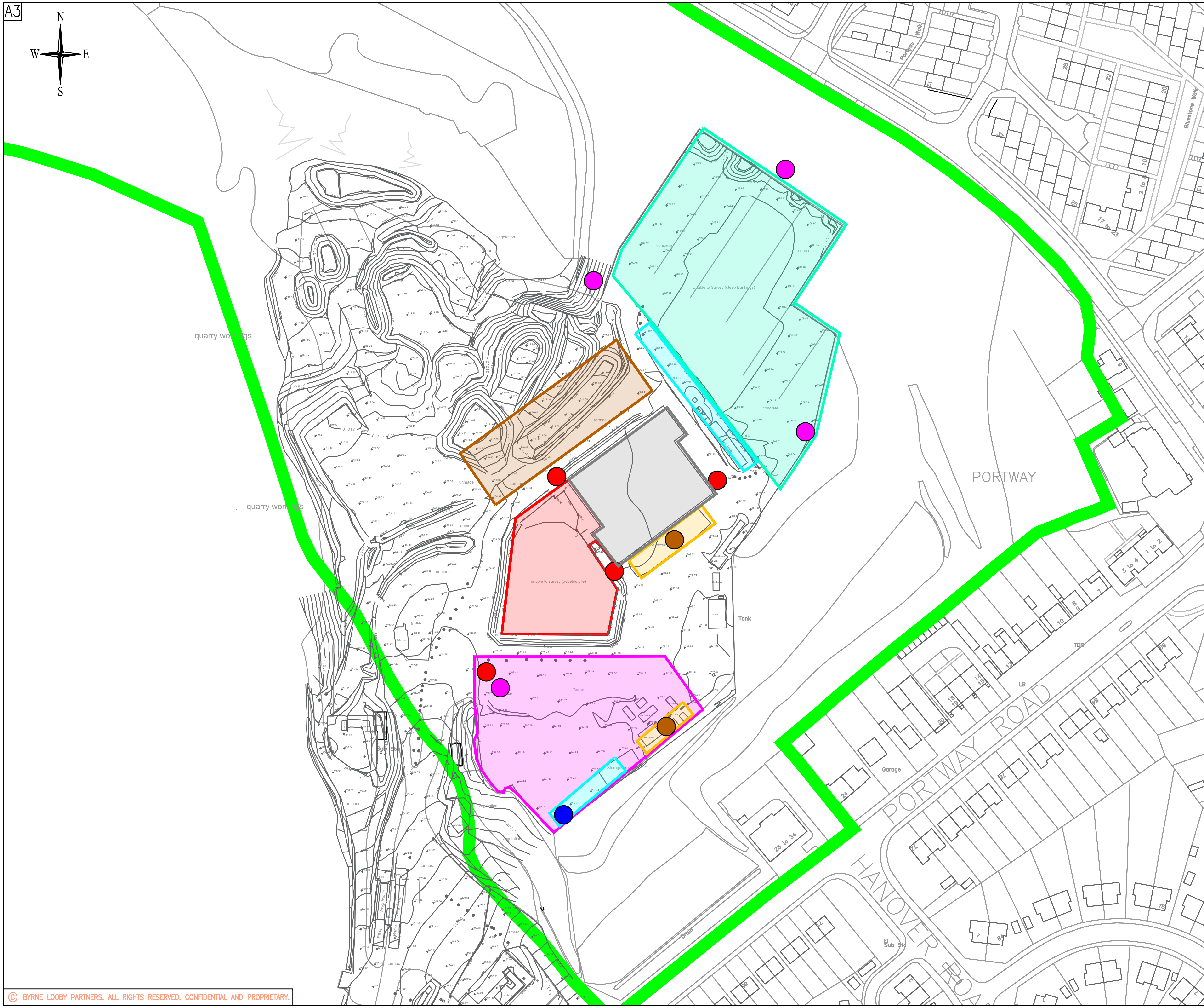
PROJECT
EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

DRAWING TITLE
SITE LAYOUT PLAN

STATUS
FINAL

Date: 20.06.23	Scale: 1:1500	Drawn: JM	Chk: JW	App: JW

Project No:	Drg. No:	Rev:
K0182	K0182.2.002	01



GENERAL NOTES

1. SURVEY INFORMATION SUPPLIED BY THE WASTE RECYCLING GROUP .
2. DO NOT SCALE
3. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM
4. ANY ANOMALIES ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF BYRNE LOOBY

KEY

- PERMIT BOUNDARY
- NON-HAZARDOUS SOIL STORAGE AND SCREENING AREA
- BIOLOGICAL TREATMENT AREA
- BIOFILTERS
- HAZARDOUS SOILS STORAGE AREA
- BIOLOGICAL TREATMENT AREA/SOIL WASHING AREA
- WATER TREATMENT PLANTS
- SOIL TREATMENT BUILDING
- AIR SAMPLING: ASBESTOS/PM10
- AIR SAMPLING: TPH/BTEX/PAH'S
- AIR SAMPLING: DUST/NOISE/ODOUR
- WATER SAMPLING: SEVERN TRENT

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PROJECT

EDWIN RICHARDS QUARRY SOIL TREATMENT CENTRE

DRAWING TITLE

EMMISIONS MONITORING PLAN

STATUS

FINAL

Date: 20.06.23	Scale: 1:1500	Drawn: JM	Chk: JW	App: JW

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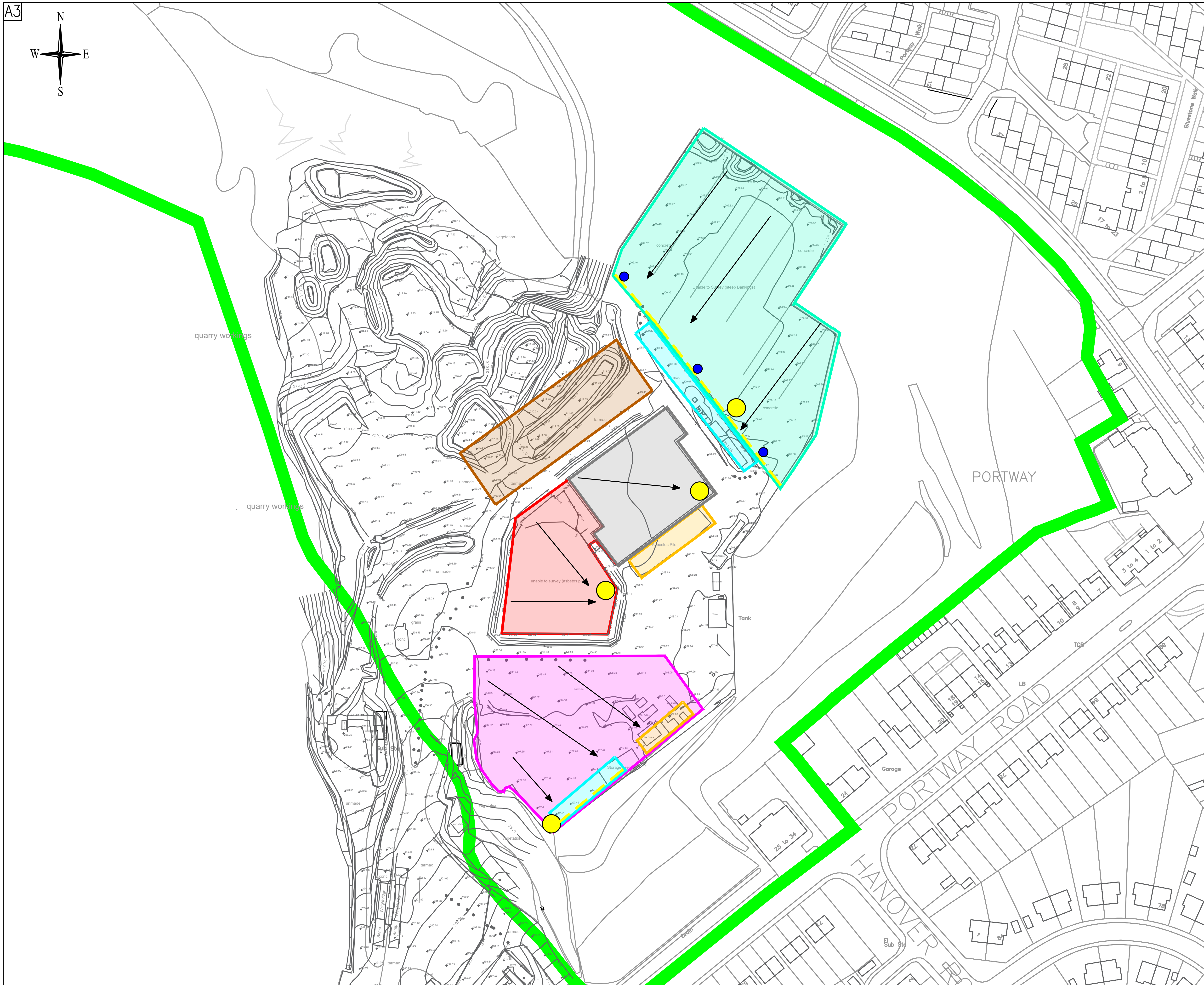
K0182	K0182.2.003	01



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- PUMPING CHAMBERS
- DRAINAGE GULLY
- DRAINAGE DIRECTION
- SURFACE WATER DRAINAGE PIPE

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PROJECT
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SOIL TREATMENT CENTRE

DRAWING TITLE
DRAINAGE PLAN

STATUS
FINAL

Date: 20.06.23	Scale: 1:1500	Drawn: JM	Chk: JW	App: JW

Project No:	Drg. No:	Rev:
K0182	K0182.2.004	01

Appendix B – Noise Impact Assessment

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Noise &
Vibration
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Noise Assessment
Compliance with Planning Condition 5a
For
Soil Treatment Facility (STF)

At
Edwin Richards Quarry
Portway Road
Rowley Regis

Prepared on behalf of
Provectus Remediation Ltd

Undertaken by:
Consultant: D.R. Kettlewell MSc MIOA MAE I.Eng

Report No.: R22.0905/DRK
Date: 29th September 2022

Noise & Vibration Consultants Ltd

Member of Institute of Acoustic
Member of Association of Noise Consultant
Member of Academy of Experts

Report prepared by:
D R Kettlewell MSc MIOA MAE I.Eng – Principal Consultant:

Date: 29th September 2022

CONTENTS

1.0 INTRODUCTION

1.1 At the request of Byrne Looby acting on behalf of Provectus Soil Treatment Ltd, Noise & Vibration Consultants Limited ("NVC") was commissioned to carry out a BS4142 noise assessment for the Soil Treatment Facility ("STF") Site at Edwin Richards Quarry. This is being provided to comply with planning condition 5a of the Planning Permission and for an environmental permit variation application for the new treatment pad. The assessment survey was undertaken with the STF Site operating under normal operating conditions, which is located at the Edwin Richards Quarry at Portway Road, Rowley Regis.

1.2 The site has planning consent and Environmental Permit ("EP") to operate the STF. The planning condition 5a (ref. Planning Permission DC/21/66058 dated 17th September 2021. The condition states:

"*5a) Before the development is brought into use a noise assessment shall be carried out in accordance with BS4141: 2014+A1:2019 to identify and quantify the noise impacts associated with the soil treatment plant. The assessment shall identify appropriate mitigation measures to limit noise to nearby residents and may include an acoustic barrier and enclosures for external plant and equipment. The assessment shall be submitted to and approved in writing by the local planning authority."*

1.3 Subsequent to the planning permission, the soil treatment facility has been constructed, commissioned and is now operational. The soil washing plant would be utilised on a temporary basis and treatment of stockpiled soils would occur typically for approximately 6-8 weeks for each batch of soil, which is likely to occur once a year. The washing plant would only be brought onto site when the temporary activity is required.

1.4 This survey provides information on typical site operational noise from the permanent STF activity at near field and far field positions relative to nearest sensitive receptors (NSRs) and compares the results with background sound measurements recorded during plant break periods. Where noise contribution levels at NSRs cannot be determined due to residual sound levels, the near field data will be used to produce a noise model of activity at Site and predict noise contribution levels at the NSRs in accordance with BS4142:2014+A1:2019 (section 7.3.5 to 7.3.6).

Sources of Information

1.5 Information used in this assessment has been obtained from the following sources:

- Ordnance Survey maps of the local area;
- information relating to the general layout of the site was provided by Provectus Remediaton Ltd;
- Environmental Statement, Chapter 11 `Noise and Vibration' May 2014;
- Planning Consent Conditions (Ref: Application (DC/14/57744, dated 3 August 2016;
- British Standard BS4142: 2014+A1:2019,`Method for rating and assessing industrial and commercial sound'';
- ISO 9613-2:1996 `Acoustics – Attenuation of sound during propagation outdoors - Part 2 General method of calculation; and

- Amee Foster Wheeler Environment & Infrastructure UK Ltd Noise Management Plan: October 2016 (report 33012rr726i1).

Assessment Aim

1.6 The aim of the survey and assessment was to provide information on site operational noise levels at the nearest receptors to the site during normal operating conditions to provide a comparison of site attributable noise against background sound levels in accordance with BS4142:2014+A1:2019.

1.7 Appendix 1 provides details of technical terms within the chapter, for ease of reference. There is also a chart showing typical everyday noise levels to assist in understanding the subjective level of noise in terms of decibels.

2.0 SITE DESCRIPTION

Site Location

2.1 Edwin Richards Quarry Soil Treatment Facility is located to the east / northeast of Edwin Richards Quarry Landfill Site.

2.2 The wider Edwin Richards Quarry Site is situated in a predominantly residential area of Rowley Regis to the northwest of the town centre. The site is bordered to the north by Portway Hill/Oakham Road and the local landmark of Turner's Hill, which at 271 m AOD, this being the highest peak in the West Midlands.

2.3 To the east and south is predominately residential properties and commercial premises on Portway Hill and Portway Road with the industrial premises of Droicon Trading Estate off Portway Hill to the southwest. Directly to the west is the Edwin Richards Quarry Landfill and a municipal golf course to the northwest.

Site Plant & Associated Buildings

2.4 The Plant and Buildings associated with the operation of STF facility relative to the EP site boundary include the following:

- Soil Treatment Building including the soil screening plant & excavator
- Biotreatment Area
- External Excavator at Biotreatment Area
- Dump Trucks (Volvo A30G) x 2
- HGVs
- Biofilter System
- Soil Washing Plant (occasional use on-site during soil batch processing)
- Storage Pad Pumping Chamber
- Storage Pad Treatment Plant

Noise Monitoring Locations

2.5 The noise monitoring positions are deemed to be representative of noise levels at the receptor locations (i.e. adjacent to receptors or at positions which were equidistant to nearest road traffic noise sources etc.). These positions were chosen as being suitable in the 2016 Noise Management Plan provided by Amee Foster Wheeler Environment & Infrastructure UK Ltd Noise Management Plan ("NMP") (report 33012rr726i1).

2.6 Baseline noise levels were monitored at the following fixed locations (shown on Figure 1):

M1. Southeast of the STF site on intervening land between the site and the nearest property off Portway Road (i.e. approximate proxy position as defined in the NMP).

M2. Northeast of the STF site on land opposite the nearest property off Portway Hill (i.e. approximate proxy position as defined in the NMP).

M3. West of the Landfill Site on land to the east of the nearest property off Hailstone Close (i.e. approximate proxy position as defined in the NMP).

Operating Hours

2.7 As per Condition 3 of the extant planning consent (DC/14/57744, dated 3 August 2016) there will be no deliveries to site outside the hours of 06:30 - 17:30 hrs, Monday–Friday.

2.8 As per Condition 5 of the extant planning consent (DC/14/57744, dated 3 August 2016) no operations associated with the soil treatment facility shall take place outside the hours of 06:00-20:00 hrs, Monday-Saturdays.

2.9 The STF plant is typically and currently operating between 0730 to 1630 hours and deliveries of soil between 0800 to 1600 hours.

3.0 NOISE SURVEY DETAILS

3.1 Noise Monitoring

3.1.1 Fixed noise monitoring at positions M1 to M3 was undertaken on Tuesday 2nd August 2022 between 0815 to 1600 hours.

3.1.2 Spot roaming position noise monitoring on site of soil treatment activities was undertaken on Tuesday 2nd August 2022 as detailed below in Table 3.1 and Appendix 2. The STF was operating normally and at normal capacity during the survey.

3.1.3 Refer to Figure 1 attached for the fixed noise monitoring locations.

3.2 Noise Monitoring Equipment and Survey Positions

3.2.1 Noise monitoring was undertaken based on the following methodology:

(i) Fixed noise monitoring at 3 positions (M1 to M3) at proxy positions at locations identified in the NMP for the purpose of establishing baseline sound levels during site operations and during `break-times' when all site plant was switched off. These positions are deemed to be representative of noise levels at the most sensitive receptors to the Site (i.e. Portway Road & Portway Hill).

(ii) Spot roaming noise measurements at near and far field locations relative to the site operational areas of the Site were carried out to enable typical noise `break-out' and operational noise levels to be determined. This included broadband and one-third octave band frequency spectra noise levels for analysis. Monitoring was undertaken at circa 1.5m and 5m above ground by a hand-held noise meter or meter mounted on a tripod.

(iii) Subjective observations of noise levels at the nearest sensitive receptors to determine the existence of any distinguishable noise character from site.

3.2.2 Noise measurements were undertaken with Type 1 integrating sound level meters and within acceptable calibration limits. According to BS4142: 2014+A1:2019 the calibration of instruments should be:

Section 5.2: "NOTE 1 It is recommended that sound calibrators are calibrated at intervals not exceeding 1 year, conformity of the measuring systems with BS EN 61672-1 is verified at intervals not exceeding 2 years, and the conformity of filters with BS EN 61260 is verified at intervals not exceeding 2 years."

3.2.3 An effective windshield was used to minimise turbulence at the microphone. Monitoring at fixed noise monitoring positions was undertaken at a height of 1.5m above ground level and at least 3.5 metres from the nearest reflecting surface.

3.2.4 An acoustic calibrator was applied to the microphone before and after measurements to check the sensitivity of the measuring equipment. Calibration certificates for the noise meters and calibrator are available on request.

3.2.5 Monitoring of site noise was recorded during the daytime operating periods in terms of LAeq, LA10, LA90 and LAmax measurement indices. The noise monitoring exercise was carried out during appropriate weather conditions as defined by BS4142: 2014+A1:2019 (sections 6.3 and 6.4 of the Standard). A Davis weather station was utilised to determine weather conditions on site.

3.2.6 The following set-up parameters were used on the sound level meters during noise measurement:

Time Weighting: Fast
Frequency Weighting: `A'
Measurement Period: Fixed monitoring 15 minutes and spot roaming measurements typically over 1-minute periods

3.3 Meteorological Conditions

3.3.1 Weather conditions were recorded during the period of the survey and are detailed below:

Tuesday 19th December 2018

3.3.2 During the daytime it remained dry, variable cloud cover with light north-north-east winds (2-3m/s) and temperature ranging between 20deg to 23deg C.

3.3.3 The above climatic conditions were suitable for monitoring environmental noise levels in accordance with advice provided in BS4142:2014+A1:2019.

3.3.4 Mr D. R. Kettlewell of Noise & Vibration Consultants Ltd set up the noise monitoring equipment and undertook measurements at near field and far field positions on site.

3.4 Site Operations

3.4.1 The site was generally operating normally during the daytime monitoring period and all plant was working generally under typical conditions.

3.4.2 Between the hours of 1000-1030 hours and 1300-1330 hours the site was on break-time and therefore all plant was shut-down and background sound levels recorded at M1 to M3.

3.5 Instrumentation

3.5.1 Noise meters used for the survey are detailed below.

Manufacturer	***Description***	***Type***	***Calibration Due Date***	***Serial No.***
Cirrus	Real Time Sound Analyser	1710	April 2023	G066350
Cirrus	Real Time Sound Analyser	171A	June 2023	G061253
Norsonic	Real Time Sound Analyser	140	February 2023	1405418
Cirrus	Real Time Sound Analyser	171B	April 2023	G056142
Cirrus	Electronic Calibrator	CR: 513A	April 2023	031523

4.0 NOISE ASSESSMENT METHODOLOGY & RESULTS

4.1 Noise Assessment Methodology

Baseline Sound Levels

4.1.1 The results of noise measurements recorded for the purpose of establishing typical ambient and background sound levels at nearest sensitive receptor positions have been determined from proxy positions during break periods when the STF plant was shut-down. Further detail of the baseline results and graphs are presented below and in Appendix 2.

Table 4.1: Baseline Results During Daytime Operation Break Periods

Position	Time	LAeq dB	LA90 dB	Observations
M1: Southeast	1000-1030 & 1300-1330	**51**	**48**	Road traffic noise
M2: Northeast	1000-1030 & 1300-1330	**59**	**48**	Road traffic noise
M3: West	1000-1030 & 1300-1330	**52**	**47**	Distant road traffic noise

4.1.2 The background sound levels for the assessment have been established as 48dB LA90 at the sensitive receptor locations (M1 and M2) for properties off Portway Hill and Portway Road. The reported background levels for the ES provided in 2014 at Portway Hill between 0700-1900 hours were 48dB LA90 and for Portway Hill (i.e. Table 11.2 of the ES) a level of 49dB LA90. This is comparable to those recently measured at similar locations.

4.1.3 Due to the influence of residual noise (i.e. non-site noise levels in terms of LAeq) the determination of site attributable noise would be difficult to determine by way of logarithmic subtraction from operational noise measurements at NSRs. We have therefore used the near field noise measurements to create a noise model that reflects the results of the survey to determine the likely noise contribution from site. Refer to Appendix 4 for details of the noise mapping results.

4.1.4 In terms of assessing the impact of the Site `rating level' in relation to BS4142: 2014+A1:2019 (which is the relevant standard) we have used frequency analysis and site subjective observations to determine whether any noise character is appropriate (i.e. any significant tonal or impulse noise or noise that would attract attention). According to the 2019 standard penalty to the site attributable noise level would be applied where the acoustic feature is deemed to be appropriate. Table 4.2 provides the corrections for perceptible noise character.

Table 4.2: BS4142:2014+A1:2019 Character Corrections

Level of Perceptibility	Correction for Tonal Character dB	Correction for Impulsivity dB	Correction for Intermittency dB	Correction for other character dB
Not Perceptible	0	0	0	0
Just perceptible	+2	+3	0	0
Clearly perceptible	+4	+6	+3*	+3*
Highly perceptible	+6	+9	+3*	+3*

*Standard defines this should be readily distinctive against the residual acoustic environment, it is interpreted therefore to be either clearly or highly perceptible as a character. If characteristics likely to affect perception and response are present in the specific sound, within the same reference period, then the applicable corrections ought normally to be added arithmetically. However, if any single feature is dominant to the exclusion of the others, then it might be appropriate to apply a reduced or even zero correction for the minor characteristics.

4.2 Results

Subjective Observations

**M1 Monitoring Position (south easterly direction - Refer to Figure 1)
Rear of Houses off Portway Road**

4.2.1 This receptor is the one of the closest to the STF site in a south easterly direction off Portway Road with a relatively high earth embankment between the receptors and the Site. General ambient noise was associated with local and distant road traffic and occasional noise from commercial premises.

4.2.2 Noise from the STF was not perceptible above the general ambient noise at the proxy monitoring position during the daytime apart from occasional low-level noise from mobile plant movement. Observations at slightly closer positions to the receptors further down the embankment indicated no perceptible noise character due to masking from local non-site noise sources (i.e. regular road traffic movements). The application of noise character from a subjective perspective was therefore not deemed to be appropriate based on normal and typical site operations.

**M2 Monitoring Position (north easterly direction – Refer to Figure 1)
15m south of Portway Hill (similar distance from main road as receptors)**

4.2.3 This receptor is also one of the closest to the STF site boundary with a large earth embankment leading up to the site boundary wall of the Biotreatment area.

4.2.4 General ambient noise at this monitoring position is associated with regular local noise from traffic movements along Portway Hill. Noise from the STF was not audible at this location due to masking from local traffic and the screening effect from the embankment.

4.2.5 There was no perceptible or distinctive noise character from Site in proximity to this receptor and therefore no noise character penalty required.

**M3 Monitoring Position (westerly direction – Refer to Figure 1)
40m East of Nearest Dwellings off Hailstone Close**

4.2.6 The nearest receptors west of the landfill site are located off Hailstone Close. Noise at this location was dominated by distant road traffic noise.

4.2.7 Due to the separation distance, topography and dominance of distant road traffic, noise from the STF facility was not audible and no perceptible noise character was observed.

Objective Results

Comparison of Noise Levels with and without the Site in Operation

4.2.8 In order to provide some comparison of noise levels at monitoring positions M1 to M3, we have provided Table 4.3 which shows the average LAeq, LA90 and LAmax levels during site operation and site `break' times when plant was not in operation.

Table 4.3: Noise Levels at Positions M1 to M3 with and without the STF Site

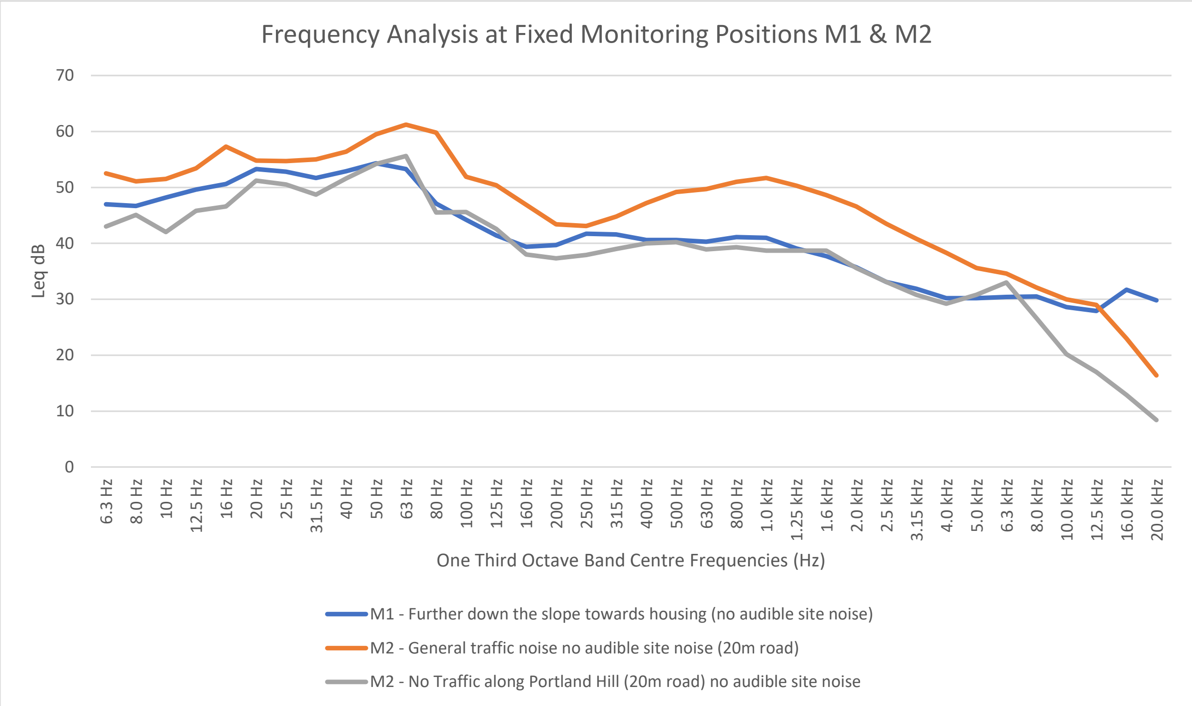
Location (Refer to Figure 1)	Grid Reference X Y	Time Period	LAeq dB	LA90 dB	LAmax dB	Level Difference LAeq dB
M1. Southeast	397149 288389	0815-1600	51.4	47.6	56-79	-
M1. Southeast	397149 288389	1000-1030 & 1300-1330	51.1	47.6	64-69	-0.3
M2. Northeast	397209 288578	0845-1600	59.7	48.0	68-84	-
M2. Northeast	397209 288578	1000-1030 & 1300-1330	59.3	48.0	68-74	-0.4
M3. West	396372 288346	0945-1600	52.2	46.6	54-70	-
M3. West	396372 288346	1000-1030 & 1300-1330	51.8	47.1	53-65	-0.4

4.2.9 The above table shows that noise levels have not increased as a result of the site STF operations. This supports the subjective observations of noise at these positions that site noise was not generally audible.

Frequency Analysis at Fixed Monitoring Positions

4.2.10 The results of one-third octave band centre frequency analysis of site noise at nearest sensitive receptors are presented below in Graph 4.1.

Graph 4.1: Frequency Analysis at Positions M1 & M2



4.2.11 The above graph shows no significant peak frequencies or tonal issues at the monitoring positions and the spectral shape is typical of road traffic noise due to vehicle engine noise at the 50Hz-63Hz third octave bands and at the mid frequency range between 800Hz to 1.25kHz due to vehicle tyre noise.

4.3 Near Field Monitoring Results

4.3.1 The results of on-site monitoring is provided below and in Appendix 2.

4.3.2 Monitoring was undertaken around the STF site in proximity to fixed and mobile plant, processing building, biofilter blower and the results are shown in Table 4.4.

Table 4.4: Monitoring in near field – STF Plant

Position & Activity	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)
10m Door Opening into Soil Treatment Building	67.8	69.6	66.1	74.3
HGV Pass-by at 10m	73.3	75.4	70.2	76.8
30m HGV Offload & HGV Movement	70.9	72.3	69.1	76.1
10m Door Opening into Soil Treatment Building	67.6	68.8	66.4	72.3
30m Excavator working on Soil Storage Mound	66.3	67.1	65.5	72.0
10m Dump Truck (Volvo A30G) movement	70.7	74.0	67.5	75.0
30m Dump Truck being loaded by Doosan DX225LG Excavator	67.2	70.6	64.3	79.1
30m Dump Truck being loaded by Doosan DX225LG Excavator	64.2	65.4	63.0	70.8
20m Dump Truck on haul road	64.2	66.2	60.7	67.0
10m Dump Truck (Volvo A30G) movement on haul road	69.0	70.8	65.2	73.9
Tipper HGV offloading at 30m	71.2	75.3	66.7	79.1
20m Excavator loading Dump Truck	68.7	69.6	67.0	82.7
1m Fan Blower mounted in acoustic enclosure	77.7	78.3	77.0	79.6
Doorway to Soil Treatment Building	81.4	82.3	80.3	88.3
Boundary Wall - 30m Doorway of STB , 50m Excavator loading DT	62.8	64.0	60.9	74.5
Boundary Wall - 50m Doorway of STB , opposite Excavator loading DT	61.3	64.1	56.7	74.9
Rear doorway to STB opening	68.1	68.7	67.3	69.3

4.3.3 Noise levels from the soil washing plant are as detailed below:

Table 4.5: Typical Noise Levels from Soil Washing Plant, Biofilter & Pumping Chamber

Plant	Measurement Position	Measured Noise Level LAeq dB
Soil Washing Plant	10m from side of plant	81
Soil Washing Plant	25m from end of plant	70
Biofilter in container	1m from container	70-77
Treatment Plant	1m from plant	64-65
Pumping Chamber	1m from chamber	70

4.4 Noise Prediction Model

4.4.1 For site operational noise we have used ISO9613-2 prediction modelling and CadnaA software for producing noise maps of the highest likely generated noise.

4.4.2 The noise model uses the empirical near field data and appropriate settings to give an accurate prediction of noise from site working under typical operational conditions. The Input settings for the noise model include:

Ground factor (G) = 0.5 (mixed ground absorption)
Temperature = 10degC
Relative humidity = 70%
Maximum order of reflection = 1
Receptor height = Assumed to be 1.5m above ground.

4.4.3 The results of the noise model output are provided in Appendix 4. The predicted noise contribution from Site is provided below in Table 4.6.

Table 4.6: Predicted noise contribution from STF Site including mobile plant and HGVs (excluding temporary Soil Washing)

Receptor Location	Background sound level LA90 dB [LAeq dB]	Predicted rating noise contribution $LAeq_{1hr}$ dB	Level Difference LAeq dB	Impact According to BS4142: 2014+A1:2019
R1: Southeast (Portway Road)	48 [51]	33-40	-15 to -8	**Low**
R2: Northeast (Portway Hill)	48 [59]	38-44	-10 to -4	**Low**
R3: West (Hailstone Close)	47 [52]	20-21	-27 to -26	**Low**

4.4.4 The above noise prediction results show that the rating noise levels at the nearest receptors are shown to be below background sound levels and therefore a **low impact** is predicted in accordance with BS4142:2014+A1:2019.

4.4.5 The Soil Washing Plant which would only operate for a few weeks per year when the soil storage mound has reached a sufficient level to be cleaned. We have assessed the noise from this temporary plant operation together with the Biofilter and Pumping Chamber and general STF plant to determine the cumulative effect with both processes in operation. Table 4.7 provides the results of the CadnaA noise modelling predictions (refer to Appendix 4 for noise mapping results).

Table 4.7: Predicted Noise from STF Plant & Soil Washing Plant Operations (with mitigation measures)

Receptor Position (Refer to Figure 1)	Background sound level LA90 dB [LAeq dB]	Predicted rating noise contribution $LAeq_{1hr}$ dB	Level Difference LAeq dB	Impact According to BS4142: 2014+A1:2019
R1: Southeast (Portway Road)	48 [51]	45-47	-3 to -1	**Low**
R2: Northeast (Portway Hill)	48 [59]	41-48	-7 to 0	**Low**
R3: West (Hailstone Close)	47 [52]	28-33	-19 to -14	**Low**

4.4.6 The above noise prediction results show that noise levels at the NSRs during the highest likely noise generation during the temporary use of the Soil Washing Plant show that the rating noise levels do not exceed the representative background sound levels and therefore a **low impact** is concluded in accordance with BS4142:2014+A1:2019.

4.4.7 Table 4.8 provides details of the BS4142 assessment based on the highest predicted impact at the NSRs.

Table 4.8: BS4142 Assessment of mitigated noise at Position M2 (all STF, Soil Washing plant & Mobile Plant running i.e. highest impact)

Results		**Relevant**	**Commentary**
Calculated Specific sound level	$L_{Aeq(1hour)}$ = 48dB	7.3.6	Specific sound source calculated using ISO9613-2
Background sound level	L_{A90} = 48dB	8.1.3 8.2	Measured over daytime periods when STF plant was switched off and therefore deemed to be representative of the background sound level.
Assessment during daytime, reference time interval is 60mins		7.2	
Acoustic feature correction	0dB	9.2	No acoustic feature expected due to site noise contribution and much higher residual sound levels.
Rating level	(48 + 0) dB = 48dB	9.2	No perceptible noise character predicted
Background sound level	L_{A90} = 48dB	8	Value determined using measured background level during operational periods when site not in operation providing a robust assessment of baseline.
Excess of rating over background sound level	(48 − 48) dB = 0dB	11	
Assessment indicates a Low Impact.			
Uncertainty	Not significant	10	The residual levels are much higher (i.e. 59dB LAeq) and the uncertainty of the measurement does not have any significance to the outcome of the assessment. Appropriate standards used for the calculation. All instruments used Type 1, calibrated and in calibration limits for baseline.

5.0 CONCLUSIONS

5.1 The results of the survey and analysis have shown the following:

(i) Subjective observations of the background noise climate during daytime operating periods at the NSRs show that non-site noise sources are generally formed by local and distant road traffic noise.

(ii) Background sound levels at the north-eastern to south-eastern NSRs are 48dB LA90 and at greater distance to the west 47dB LA90. Corresponding residual levels at NSRs vary between 51dB to 59dB LAeq.

(iii) Subjective observations at NSR monitoring positions when the STF plant was operating normally, showed no significant perceptible noise or no perceptible or distinctive noise character from Site and therefore no noise character penalty was deemed to be required.

(iv) Due to the ambient noise levels at NSRs being too high to be able to measure the noise contribution from the STF site, it has been necessary to undertake noise prediction modelling using computer-based modelling software with appropriate settings in accordance with ISO9613-2 and industry.

(v) On-site noise monitoring has been undertaken of fixed and mobile plant noise sources to inform the noise prediction modelling.

(vi) The results of noise predictions of the STF site determined by the construction of a noise model using the empirical noise measurements recorded on site has shown the following:

a) The predicted noise levels vary between 20dB to 44dB $LAeq_{1hr}$ at NSRs.

b) The noise prediction results show that the rating noise levels at the NSRs are shown to be between 4dB and 27dB below representative background sound levels and therefore a **low impact** would occur in accordance with BS4142:2014+A1:2019.

c) The predicted noise levels are between 11dB and 32dB below the residual LAeq levels at NSRs.

(vii) The soil washing plant would be utilised on a temporary basis and treatment of stockpiled soils would occur approximately 6-8 weeks for each batch of soil, which is likely to occur once a year. The washing plant would only be brought onto site when the temporary activity is required.

(viii) The cumulative effect of the temporary soil washing activity and the day-to-day operation of the STF plant has been assessed (with mitigation measures proposed) and a noise prediction model generated to calculate the noise impact and the results show the following:

a) The cumulative noise levels at the NSRs during the highest likely site noise generation during the temporary use of the Soil Washing Plant show rating noise levels are between 28dB and 48dB $LAeq_{1hr}$.

b) The rating levels do not exceed the representative background sound levels and therefore a **low impact** would occur in accordance with BS4142:2014+A1:2019.

c) The predicted noise levels are between 4dB and 24dB below the residual LAeq levels at NSRs.

5.2 The proposed noise mitigation strategy is provided in section 6.0.

6.0 NOISE MITIGATION MEASURES

6.1 Soil Treatment Facility

6.1.1 The STF plant noise control measures include:

(i) All mobile plant fitted with non-tonal reversing alarms when operating on site (i.e. broadband, SMART or `white noise' type reversing alarms).

(ii) The soil screening plant to be retained within the existing portal frame building during processing of soils, which is located towards the centre of the Site.

(iii) The site boundary retaining wall and embankment to be retained that exists around the Biotreatment area.

(iv) Wherever practicable maintain the one-way system for dump trucks to move around the Site and minimise reversing for HGVs offloading soils in the Biotreatment area.

6.2 Soil Washing Facility (occasional use)

6.2.1 To reduce noise levels from the Soil Washing plant and other plant relocated in this area (i.e. biofilter, pumping chamber and treatment plant) the southern boundary and the southeast and southwest boundary of the Treatment Pad would be fitted with an acoustic screen. The screen height would be 5m in height and the location shown in Figure 3. The screen can be formed from a solid material having a minimum mass of 15kg/m2 (e.g. concrete, brickwork, close-boarded fencing etc.).

6.2.2 The location area assumed for the Soil Washing plant is shown on Figure 3.

6.3 Noise Management Plan (NMP) Mitigation Measures

6.3.1 The existing noise control measures detailed in the existing NMP include the following:

"The main control measures that will be implemented as part of the scheme area summarised below:

Appointment of a site contact to whom complaints or queries about construction activities can be directed. Any complaints to be investigated and action taken where appropriate (see Section 3.7 of this NMP); and

All construction activities to be undertaken in accordance with good practice described in BS5228-1:2009+A1:2014.

The Waste Recycling and Soil Treatment Facilities will be located on the existing footprint of the ERQ Quarry Site;

The plant complement would consist of modern machinery fitted with efficient silencers/insulation designed to minimise noise levels that are generated during operations. Mobile plant would have noise emission levels that comply with the limit levels as defined by the EC Directive 86/662/EEC and subsequent amendments;

The plant would be properly serviced, maintained and operated in accordance with the manufacturers' instructions to ensure that the occurrence of malfunctions, which can give rise to elevated noise levels, is reduced and any malfunctions that do occur are swiftly repaired;

The effectiveness of acoustic insulation and silencers fitted to plant will be qualitatively assessed and recorded as part of the Facility Manager's Weekly Report. Any items of plant with defective insulation or silencers will be identified for immediate investigation and remediation;

All reasonable steps should be taken to limit the amount of HGVs queuing or waiting to enter/exit the site; this will be achieved through the provision of a new weighbridge at the site;

Internal haul roads shall, where possible, be routed to allow maximum acoustic screening and separation distances to noise sensitive receptors. Haul roads shall be kept clean and maintained in a good state of repair and subject to a 10mph speed limit so as to avoid unwanted rattle and "body slap" from vehicles;

The use of SMART, broadband or "white noise" reversing alarms to reduce the effect of reversing bleepers on site vehicles;

Local communities to be kept informed of general site activities, including working hours via the Edwin Richards Quarry liaison committee;

Any pumps used on site will be powered by electricity wherever practicable, and all pumps and generators will be placed at locations to minimise noise emissions to sensitive receptors;

With the exception of acoustically enclosed generators, pumps and electric plant, all static plant should be shut down when not in use;

Avoid unnecessary revving of engines and switch off mobile plant and equipment when not required;

Minimise drop height of materials;

Start-up plant and vehicles sequentially rather than simultaneously;

Appointment of a site contact to whom complaints or queries about operational activities can be directed. Any complaints to be investigated and action taken where appropriate (see Section 3.7 of this ***NMP);***

Where possible, use equipment with lowest sound power level and without any dominant tonal or impulsive characteristics available for the required purpose; and

If necessary and practicable, emissions from sources of significant noise can be controlled using acoustic enclosures."

6.3.2 The above NMP mitigation strategy would be updated to include any additional measures detailed in section 6.1 and 6.2.

References:

Environmental Statement, Chapter 11 `Noise and Vibration' May 2014

Planning Consent Conditions (Ref: Application (DC/14/57744, dated 3 August 2016

British Standard BS4142: 2014+A1:2019 `Method for rating and assessing industrial and commercial sound''

ISO 9613-2:1996 `Acoustics – Attenuation of sound during propagation outdoors - Part 2 General method of calculation; and

Amee Foster Wheeler Environment & Infrastructure UK Ltd Noise Management Plan: October 2016 (report 33012rr726i1).

BS7445: 2003 `Description and measurement of environmental noise'

FIGURES

Figure 1: Fixed Noise Monitoring Positions & Receptor Locations

Figure 2 : Site Layout

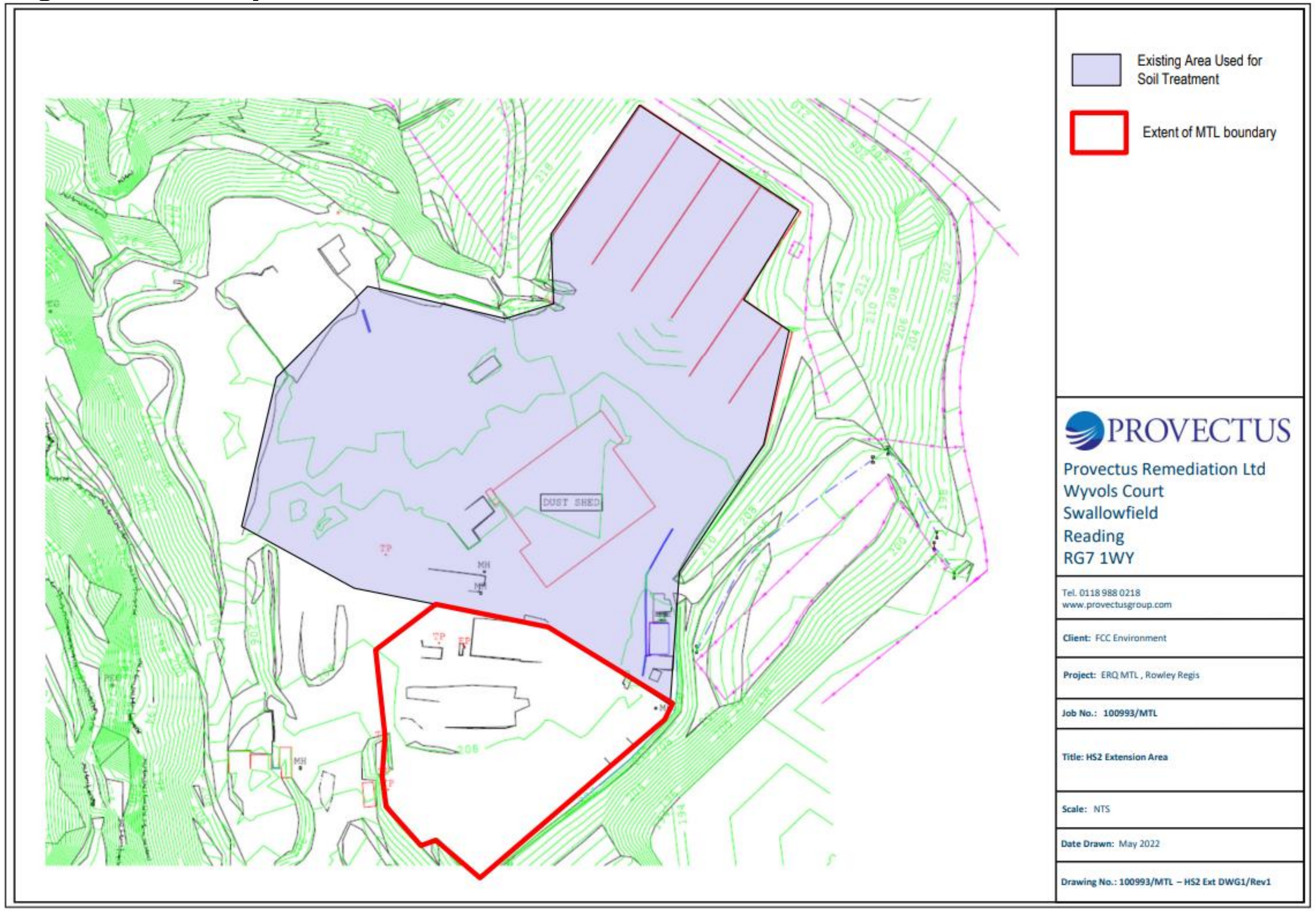
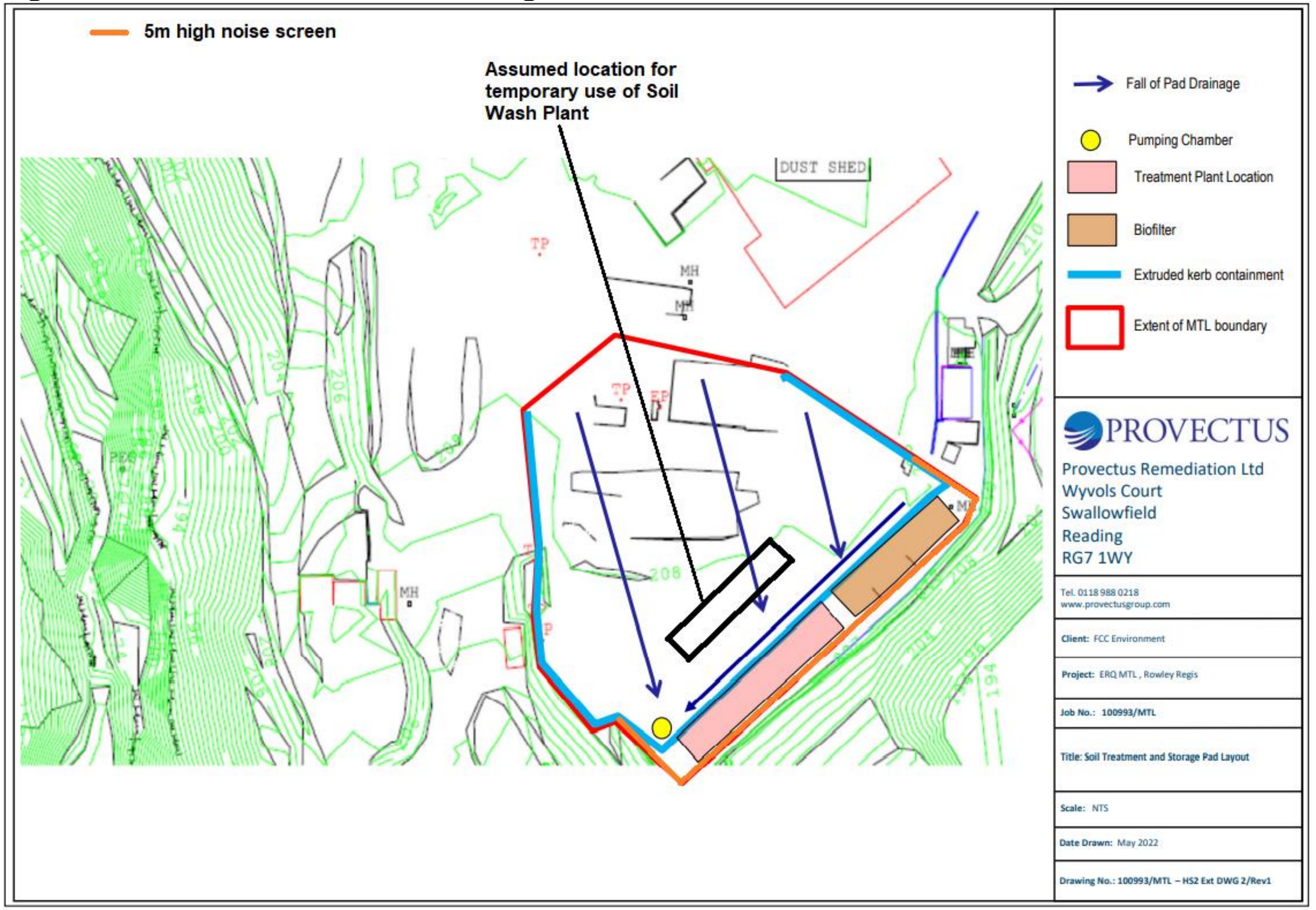


Figure 3 : Soil Wash Plant & Screening



APPENDIX 1

BASIC ACOUSTIC TERMINOLOGY

Sound is produced by mechanical vibration of a surface, which sets up rapid pressure fluctuations in the surrounding air.

Sound Pressure Level is a measurement of the size of these pressure fluctuations. It is expressed in decibels (dB) on a logarithmic scale. Each 3 dB increase in sound pressure level represents a doubling of the sound energy. The threshold of hearing is approximately 0 dB.

The rate at which the pressure fluctuations occur determines the pitch or frequency of the sound. The frequency is expressed in Hertz (Hz), that is, cycles per second. The human ear is sensitive to sounds from about 20 Hz to 20,000 Hz. Although sound can be of one discrete frequency - a 'pure tone' - most noises are made up of many different frequencies.

The human ear is more sensitive to some frequencies than others, and modern instruments can measure sound in the same 'subjective' way. This is the basis of the A-weighted sound level dB(A), normally used to assess the effect of noise on people. The dB(A) weighting emphasises or reduces the importance of certain frequencies within the audible range.

Noise Measurement

The measurement of sound pressure level is only really meaningful where the level of noise is constant. In the typical industrial environment noise levels can vary widely and sometimes short duration high levels of noise are interspersed with periods of relative quiet. The most widely used means of 'averaging' the noise over a period of time is the Equivalent Continuous Sound Level. Normally written as L_{Aeq} this value takes into account both the level of noise and the length of time over which it occurs. There are many meters available which are capable of measuring L_{Aeq} by electronic integration over the measurement period.

The L_{Aeq} or A-weighted equivalent continuous noise level is a measure of the total noise energy over a stated time period and includes all the varying noise levels and re-expresses as an 'average', allowing for the length of time for which each noise level was presented.

The L_{An} parameters are defined as the noise levels which are exceeded for n% of the monitoring period, thus, for example, the L_{A90} parameter is the noise level exceeded for 90% of the 15 minute period, ie. 13.5 minutes. The L_{A50} parameter is the noise level exceeded for 50% of the hourly period, i.e. 30 minutes, etc. The L_{max} parameter is the maximum RMS A-weighted noise level occurring during the measurement period.

The definition in layman's terms is given below for terminology used in the measurement and results obtained during the survey work.

A-weighting: Normal hearing covers the frequency (pitch) range from about 20Hz to 20,000 Hz but sensitivity of the ear is greatest between about 500Hz and 5000Hz. The "A-weighting" is an electrical circuit built into noise meters to mimic this characteristic of the human ear.

Ambient noise: The totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.

Attenuation: Noise reduction

Background noise: The general quiet periods of ambient noise when the noise source under investigation is not there.

Decibel (dB): The unit of measurement for sound based on a logarithmic scale. 0dB is the threshold of normal hearing; 140dB is the threshold of pain. A change of 1dB is only detectable under controlled laboratory conditions.

dB(A) [decibel A weighted]: Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) serves to distinguish sounds of different frequency (or pitch) in a similar way to how the human ear responds. Measurements in dB(A) broadly agrees with an individual's assessment of loudness. A change of 3dB(A) is the minimum perceptible under normal everyday conditions, and a change of 10dB(A) corresponds roughly to doubling or halving the loudness of sound.

dB(C): [decibel C weighted]: Frequency weighting which does not alter low frequency octave band levels by very much compared to `A' weighting. Similar to linear reading (i.e. linear does not alter frequency spectra at all)

Frequency (Hz): The number of sound waves to pass a point in one second.

L_{Aeq}: This is a noise index used to describe the "average" level of a noise that varies with time (T). It allows for the different sensitivities of the human ear to different frequencies (pitch), and averages fluctuating noise levels in a manner, which correlates well with human perceptions of loudness.

$L_{A10,T}$: This noise index gives an indication of the upper limit or peak levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 10 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the L_{A10} reading was say 60dB, then this means that for 1 hour out of 10 the level went above 60dB.

$L_{A90,T}$: This noise index gives an indication of the lower limit or levels of the fluctuating noise. It is the "A weighted" noise level exceeded for 90 per cent of the specified measurement period (T). e.g. If the measurement period was over 10 hours and the L_{A90} reading was say 50dB, then this means that for 9 hours out of 10 the level went above 50dB.

L_{Amax}: This is the highest A weighted noise level recorded during a noise measurement period.

Residual noise: The ambient noise remaining at a given position in a given situation when the noise source under investigation is not there.

Specific noise: The noise source under investigation for assessing the likelihood of complaints

Examples of typical noise levels

Source/Activity	**Indicative noise level [dB(A)]**
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind farm at 350m	35-45
Busy road at 5km	35-45
Car at 65km/h at 100m	55
Busy general office	60
Conversation	60
Truck at 50km/h at 100m	65
City Traffic at 5m	75-85
Pneumatic drill at 7m	95
Jet aircraft at 250m	105
Threshold of pain	140

APPENDIX 2

NOISE SURVEY RESULTS

FIXED POSITION NOISE MONITORING

Noise Survey Results

Date: Tuesday 2nd August 2022

Location: Edwin Richards Landfill, Portway Road, Rowley Regis **TABLE 1**

Client: Provectus Soil Management Ltd

Project: Soil Treatment Facility - Planning Condition 5a

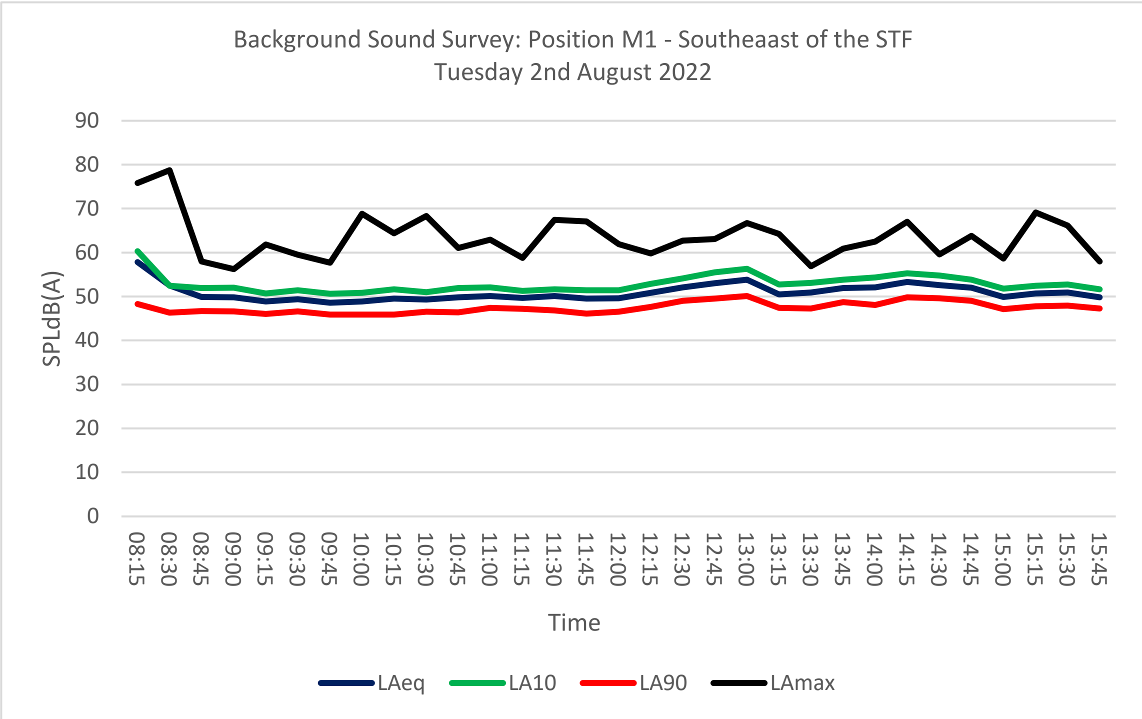
Data: **Baseline Sound Survey: Position M1 - Southeast of the STF**

Instrumentation: Cirrus 171A Real Time Analyser (G066350)

Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
08:15	15:00	57.8	60.3	48.3	75.8	Road traffic noise
08:30	15:00	52.5	52.4	46.3	78.7	Noise from Site not audible
08:45	15:00	49.9	51.9	46.7	58.0	
09:00	15:00	49.8	52.0	46.6	56.2	
09:15	15:00	48.9	50.7	46.0	61.8	
09:30	15:00	49.4	51.4	46.6	59.5	
09:45	15:00	48.6	50.6	45.9	57.7	
10:00	15:00	48.9	50.8	45.9	68.8	
10:15	15:00	49.5	51.6	45.9	64.4	
10:30	15:00	49.3	51.0	46.5	68.3	
10:45	15:00	49.8	51.9	46.4	61.0	
11:00	15:00	50.1	52.1	47.4	62.9	
11:15	15:00	49.7	51.3	47.2	58.8	
11:30	15:00	50.1	51.6	46.8	67.4	
11:45	15:00	49.5	51.4	46.1	67.1	
12:00	15:00	49.6	51.4	46.5	61.9	
12:15	15:00	50.8	52.9	47.6	59.8	
12:30	15:00	52.1	54.1	49.0	62.7	
12:45	15:00	53.0	55.5	49.5	63.1	
13:00	15:00	53.8	56.3	50.1	66.7	
13:15	15:00	50.5	52.7	47.4	64.2	
13:30	15:00	50.9	53.1	47.3	56.9	
13:45	15:00	51.9	53.8	48.7	60.9	
14:00	15:00	52.1	54.3	48.1	62.5	
14:15	15:00	53.3	55.3	49.8	67.0	
14:30	15:00	52.6	54.8	49.6	59.6	
14:45	15:00	52.0	53.8	49.0	63.8	
15:00	15:00	49.9	51.8	47.1	58.6	
15:15	15:00	50.7	52.4	47.8	69.1	
15:30	15:00	50.9	52.7	47.9	66.1	
15:45	15:00	49.8	51.6	47.3	58.0	
Average 0815-1600		51.4	53.4	47.6	56-79	

Average	51.1	53.4	47.6	64-69	


Background Sound Survey: Position M1 - Southeaast of the STF
Tuesday 2nd August 2022
SPLdB(A)
Time
LAeq
LA10
LA90
LAmax

Noise Survey Results

Date: Tuesday 2nd August 2022

Location: Edwin Richards Landfill, Portway Road, Rowley Regis **TABLE 2**

Client: Provectus Soil Management Ltd

Project: Soil Treatment Facility - Planning Condition 5a

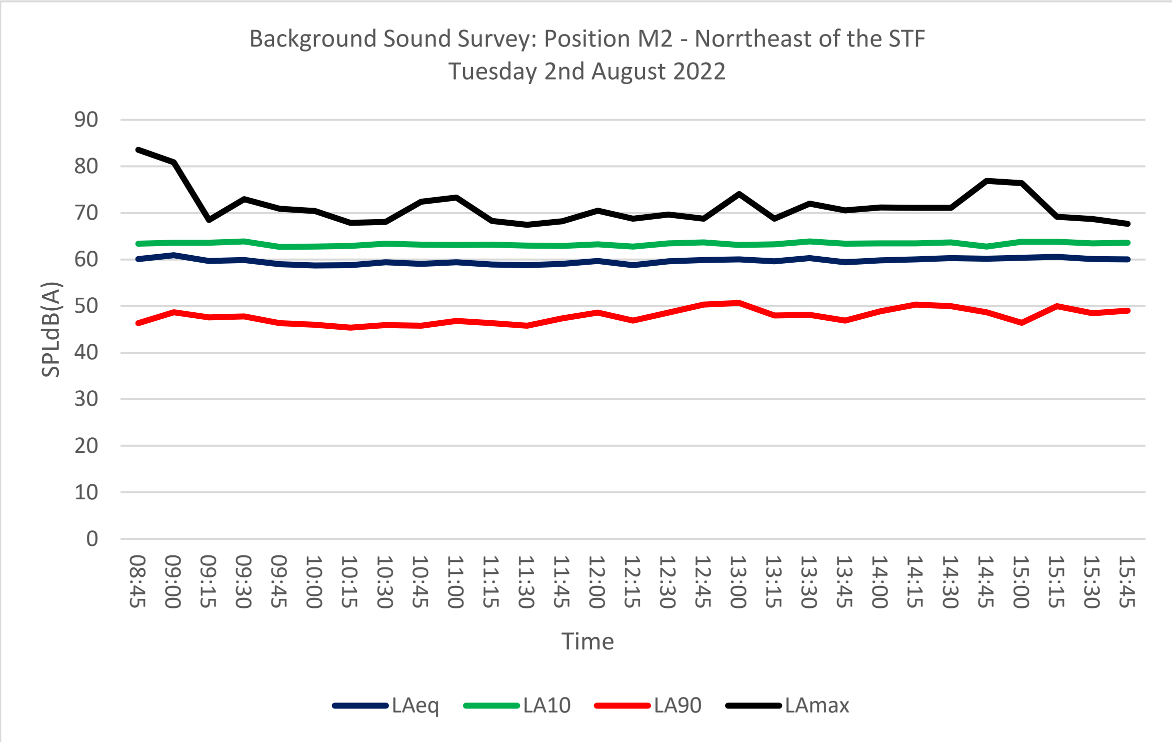
Data: **Baseline Sound Survey: Position M2 - North East of the STF**

Instrumentation: Cirrus 171A Real Time Analyser (G061253)

Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
08:45	15:00	60.1	63.4	46.3	83.6	Road traffic noise
09:00	15:00	60.9	63.6	48.7	80.9	Noise from Site not audible
09:15	15:00	59.7	63.6	47.6	68.5	
09:30	15:00	59.9	63.9	47.8	73.0	
09:45	15:00	59.0	62.7	46.3	70.9	
10:00	15:00	58.7	62.8	46.0	70.4	
10:15	15:00	58.8	62.9	45.4	67.9	
10:30	15:00	59.4	63.4	45.9	68.1	
10:45	15:00	59.1	63.2	45.8	72.4	
11:00	15:00	59.4	63.1	46.8	73.3	
11:15	15:00	58.9	63.2	46.3	68.3	
11:30	15:00	58.8	63.0	45.8	67.5	
11:45	15:00	59.1	62.9	47.4	68.2	
12:00	15:00	59.7	63.3	48.6	70.5	
12:15	15:00	58.8	62.8	46.9	68.8	
12:30	15:00	59.6	63.5	48.6	69.7	
12:45	15:00	59.9	63.7	50.3	68.8	
13:00	15:00	60.0	63.1	50.7	74.1	
13:15	15:00	59.6	63.3	48.0	68.8	
13:30	15:00	60.3	63.9	48.1	72.0	
13:45	15:00	59.4	63.4	46.9	70.6	
14:00	15:00	59.8	63.5	48.9	71.2	
14:15	15:00	60.0	63.5	50.3	71.1	
14:30	15:00	60.3	63.7	50.0	71.1	
14:45	15:00	60.2	62.8	48.7	76.9	
15:00	15:00	60.4	63.8	46.4	76.4	
15:15	15:00	60.6	63.8	50.0	69.2	
15:30	15:00	60.1	63.5	48.5	68.7	
15:45	15:00	60.0	63.6	49.0	67.7	
Average 0845-1600		59.7	63.4	48.0	68-84	

Average	59.3	63.0	48.0	68-74	

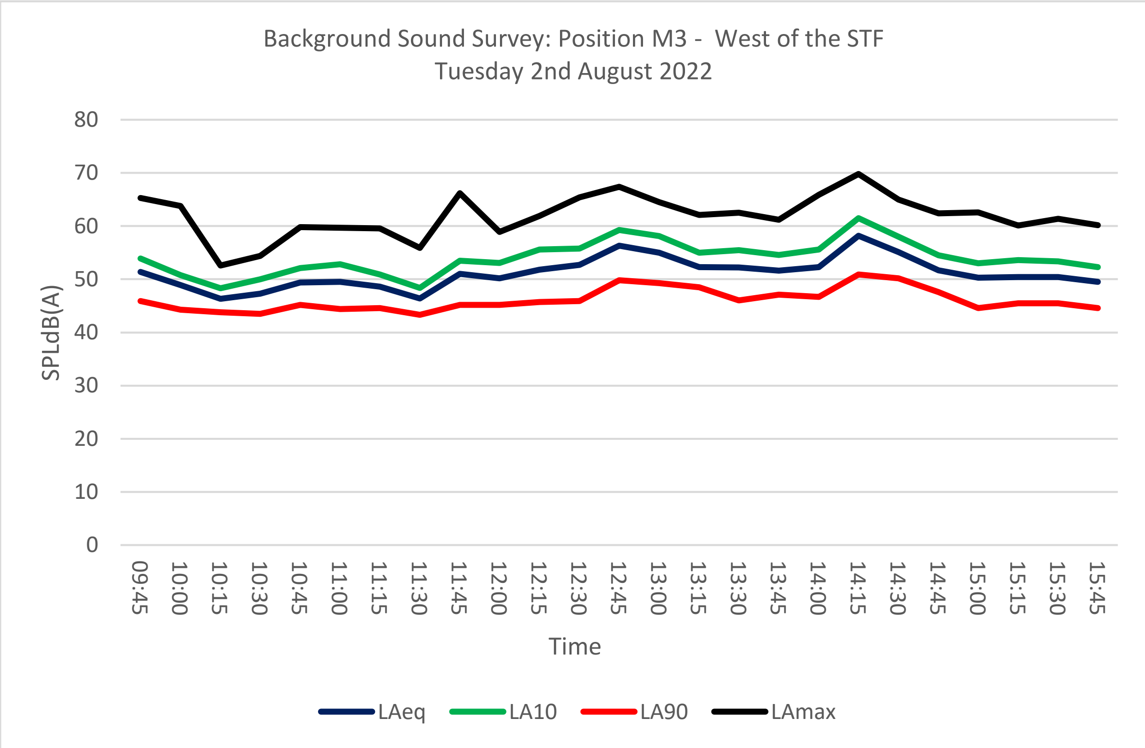

Background Sound Survey: Position M2 - Norrtheast of the STF
Tuesday 2nd August 2022
SPLdB(A)
90
80
70
60
50
40
30
20
10
0
08:45
09:00
09:15
09:30
09:45
10:00
10:15
10:30
10:45
11:00
11:15
11:30
11:45
12:00
12:15
12:30
12:45
13:00
13:15
13:30
13:45
14:00
14:15
14:30
14:45
15:00
15:15
15:30
15:45
Time
LAeq
LA10
LA90
LAmax

Noise Survey Results

Date: Tuesday 2nd August 2022
Location: Edwin Richards Landfill, Portway Road, Rowley Regis **TABLE 3**
Client: Provectus Soil Management Ltd
Project: Soil Treatment Facility - Planning Condition 5a
Data: **Baseline Sound Survey: Position M3 - West of the STF**
Instrumentation: Cirrus 171B Real Time Analyser (G056142)
Calibration: 94dB

Start Time	Run Time (mins.)	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Observations
09:45	15:00	51.4	53.9	45.9	65.3	Distant road traffic noise
10:00	15:00	48.9	50.8	44.3	63.8	
10:15	15:00	46.3	48.3	43.8	52.6	
10:30	15:00	47.3	50.0	43.5	54.4	
10:45	15:00	49.4	52.1	45.2	59.8	
11:00	15:00	49.5	52.8	44.4	59.7	
11:15	15:00	48.6	50.9	44.6	59.6	
11:30	15:00	46.4	48.4	43.3	55.9	
11:45	15:00	51.0	53.5	45.2	66.2	
12:00	15:00	50.2	53.1	45.2	58.9	
12:15	15:00	51.8	55.6	45.7	61.9	
12:30	15:00	52.7	55.8	45.9	65.4	
12:45	15:00	56.3	59.3	49.8	67.4	
13:00	15:00	55.0	58.1	49.3	64.5	
13:15	15:00	52.3	55.0	48.5	62.1	
13:30	15:00	52.2	55.5	46.0	62.5	
13:45	15:00	51.6	54.6	47.1	61.2	
14:00	15:00	52.3	55.6	46.7	65.9	
14:15	15:00	58.2	61.5	50.9	69.8	
14:30	15:00	55.1	58.0	50.2	65.0	
14:45	15:00	51.7	54.5	47.6	62.4	
15:00	15:00	50.3	53.0	44.6	62.6	
15:15	15:00	50.4	53.6	45.5	60.1	
15:30	15:00	50.4	53.4	45.5	61.4	
15:45	15:00	49.5	52.3	44.6	60.2	
Average 0945-1600		52.2	55.2	46.6	54-70	

Average	51.8	54.5	47.1	53-65	


Background Sound Survey: Position M3 - West of the STF
Tuesday 2nd August 2022
SPLdB(A)
80
70
60
50
40
30
20
10
0
09:45
10:00
10:15
10:30
10:45
11:00
11:15
11:30
11:45
12:00
12:15
12:30
12:45
13:00
13:15
13:30
13:45
14:00
14:15
14:30
14:45
15:00
15:15
15:30
15:45
Time
LAeq
LA10
LA90
LAmax

NEAR FIELD NOISE RESULTS

Noise Survey Results

Date: Tuesday 2nd August 2022
Location: Edwin Richards Landfill, Portway Road, Rowley Regis **TABLE 4**
Client: Provectus Soil Management Ltd
Project: Soil Treatment Facility - Planning Condition 5a
Data: **Baseline Sound Survey: Roaming measurements**
Instrumentation: Norsonic 140 Real Time Analyser (1405418)
Calibration: 94dB

Start Time	LAeq (dB)	LA10 (dB)	LA90 (dB)	LAmax (dB)	Position & Activity
10:52	67.8	69.6	66.1	74.3	10m Door Opening into Soil Treatment Building
10:52	73.3	75.4	70.2	76.8	HGV Pass-by at 10m
10:53	70.9	72.3	69.1	76.1	30m HGV Offload & HGV Movement
10:54	67.6	68.8	66.4	72.3	10m Door Opening into Soil Treatment Building
10:57	66.3	67.1	65.5	72.0	30m Excavator working on Soil Storage Mound
10:58	70.7	74.0	67.5	75.0	10m Dump Truck (Volvo A30G) movement
10:59	67.2	70.6	64.3	79.1	30m Dump Truck being loaded by Doosan DX225LG Excavator
11:00	64.2	65.4	63.0	70.8	30m Dump Truck being loaded by Doosan DX225LG Excavator
11:02	64.2	66.2	60.7	67.0	20m Dump Truck on haul road
11:03	69.0	70.8	65.2	73.9	10m Dump Truck (Volvo A30G) movement on haul road
11:04	71.2	75.3	66.7	79.1	Tipper HGV offloading at 30m
11:04	68.7	69.6	67.0	82.7	20m Excavator loading Dump Truck
11:06	77.7	78.3	77.0	79.6	1m Fan Blower mounted in acoustic enclosure
11:08	81.4	82.3	80.3	88.3	Doorway to Soil Treatment Building
11:11	62.8	64.0	60.9	74.5	Boundary Wall - 30m Doorway of STB , 50m Excavator loading DT
11:18	61.3	64.1	56.7	74.9	Boundary Wall - 50m Doorway of STB , opposite Excavator loading DT
11:56	68.1	68.7	67.3	69.3	Rear doorway to STB opening

Weather Station Davis Vantage Vue - Mounted on high ground

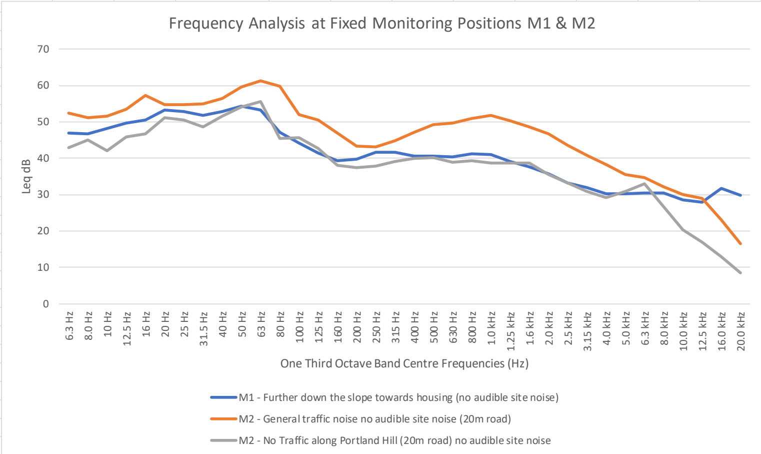
Time	Temp Out	Wind Speed	Wind Dir	Rain	Sample Wind Speed at M1 to M3 (hand-held anemometer)	Level Difference
07:30	19.5	3.7	ENE	0		
07:45	20.1	4.2	ENE	0		
08:00	20.4	4.2	ENE	0		
08:15	20.4	4.2	ENE	0	2.1m/s (M1)	-2.1
08:30	20.7	4.2	ENE	0		
08:45	20.9	4.2	ENE	0	1.8m/s (M2)	-2.4
09:00	21.2	4.2	ENE	0		
09:15	21.3	3.7	NE	0		
09:30	21.7	3.3	NE	0		
09:45	22.2	4.2	ENE	0		
10:00	21.9	4.6	NE	0		
10:15	21.8	4.6	NE	0		
10:30	21.6	4.6	NE	0		
10:45	22.2	4.2	ENE	0		
11:00	22.5	4.2	ENE	0		
11:15	23.1	4.6	NE	0		
11:30	23.4	4.4	NE	0		
11:45	23	4.1	ENE	0		
12:00	23	4.3	ENE	0		
12:15	23.9	4.5	ENE	0	1.9m/s (M2)	-2.6
12:30	24	4.5	ENE	0		
12:45	24	4.2	NE	0		
13:00	24.1	4.2	ENE	0		
13:15	24.8	4.4	ENE	0	2.2m/s (M1)	-2.2
13:30	24.1	4.4	ENE	0		
13:45	24	4.3	ENE	0		
14:00	23.6	4.6	NE	0		
14:15	23.5	4.2	ENE	0		
14:30	22.6	4.6	NE	0		
14:45	22.8	4.6	ENE	0		
15:00	22.9	4.1	ENE	0	2.1m/s (M3)	-2
15:15	23.2	4.1	ENE	0		
15:30	22.7	4	ENE	0		
15:45	22.4	4.1	ENE	0		
16:00	22.6	4.6	NE	0		

APPENDIX 3

FREQUENCY ANALYSIS RESULTS

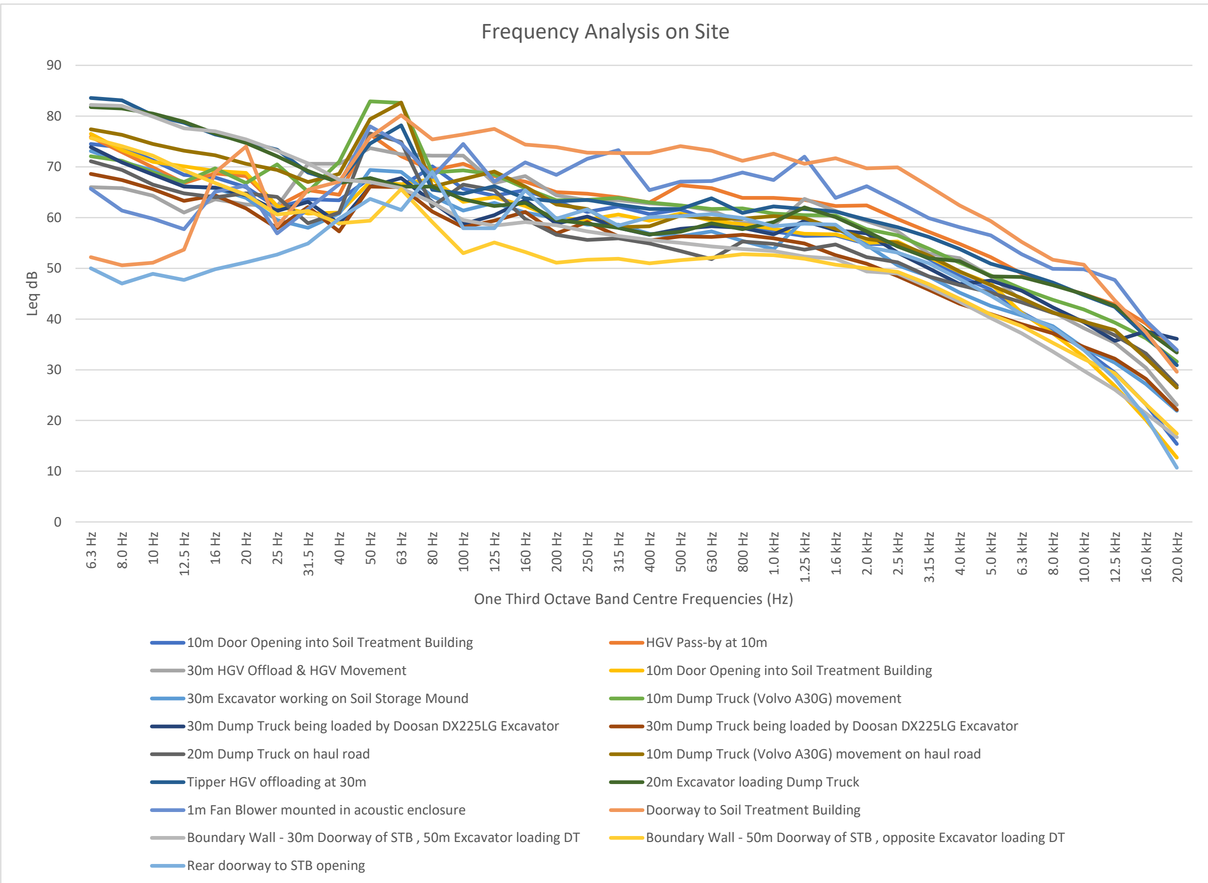
Frequency Analysis at Far Field Noise Monitoring Positions

LAeq	49	58.7	48.1
LA10	50.5	62.5	49.5
LA90	45	46.4	46.6
LAmax	69.3	67.1	50.4
Freq (Hz)			
6.3 Hz	47	52.5	43
8.0 Hz	46.7	51.1	45.1
10 Hz	48.2	51.5	42
12.5 Hz	49.6	53.4	45.8
16 Hz	50.6	57.3	46.6
20 Hz	53.3	54.8	51.2
25 Hz	52.8	54.7	50.5
31.5 Hz	51.7	55	48.7
40 Hz	52.9	56.4	51.6
50 Hz	54.3	59.5	54.2
63 Hz	53.3	61.2	55.6
80 Hz	47.1	59.8	45.5
100 Hz	44.2	51.9	45.6
125 Hz	41.4	50.4	42.6
160 Hz	39.4	46.9	38
200 Hz	39.7	43.4	37.3
250 Hz	41.7	43.1	37.9
315 Hz	41.6	44.8	39
400 Hz	40.6	47.2	40
500 Hz	40.6	49.2	40.2
630 Hz	40.3	49.7	38.9
800 Hz	41.1	51	39.3
1.0 kHz	41	51.7	38.7
1.25 kHz	39.1	50.3	38.7
1.6 kHz	37.7	48.6	38.7
2.0 kHz	35.7	46.6	35.6
2.5 kHz	33.1	43.5	33.1
3.15 kHz	31.9	40.8	30.8
4.0 kHz	30.2	38.3	29.2
5.0 kHz	30.2	35.6	30.8
6.3 kHz	30.4	34.6	33
8.0 kHz	30.5	32.1	26.6
10.0 kHz	28.6	30	20.2
12.5 kHz	27.9	29	17
16.0 kHz	31.7	23	12.9
20.0 kHz	29.8	16.4	8.4



Near Field Frequency Spectra

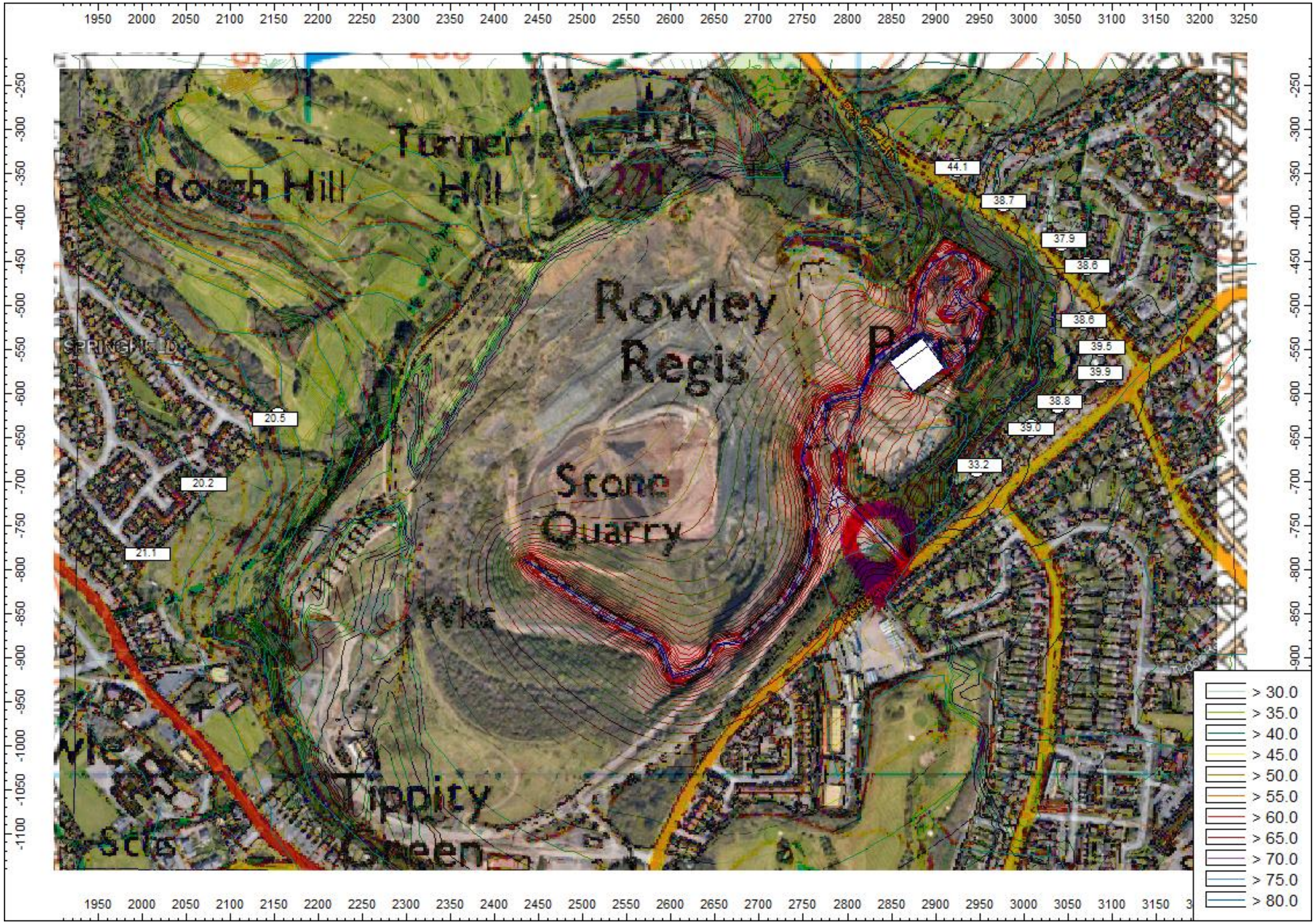
LAeq	67.8	73.3	70.9	67.6	66.3	70.7	67.2	64.2	64.2	69	71.2	68.7	77.7	81.4	62.8	61.3	68.1
LA10	69.6	75.4	72.3	68.8	67.1	74	70.6	65.4	66.2	70.8	75.3	69.6	78.3	82.3	64	64.1	68.7
LA90	66.1	70.2	69.1	66.4	65.5	67.5	64.3	63	60.7	65.2	66.7	67	77	80.3	60.9	56.7	67.3
LAmax	74.3	76.8	76.1	72.3	72	75	79.1	70.8	67	73.9	79.1	82.7	79.6	88.3	74.5	74.9	69.3
Position																	
6.3 Hz	74.5	75.9	66	76.5	73.1	72.1	73.9	68.6	71.1	77.4	83.6	81.8	65.7	52.2	82.2	75.7	50
8.0 Hz	73.8	72.9	65.8	73.3	71	71.2	70.9	67.4	69.4	76.3	83.1	81.5	61.4	50.6	82	74.1	47
10 Hz	71.3	69.9	64.3	71	69.3	68.9	68.5	65.6	66.5	74.5	80.2	80.5	59.8	51.1	79.9	72.2	48.9
12.5 Hz	68.4	66.8	61	70.1	66.2	67	66.1	63.3	64.8	73.2	78.7	78.9	57.7	53.7	77.6	69.3	47.7
16 Hz	67.9	68.7	63.6	69.2	65.8	69.7	65.9	64.4	64	72.3	76.4	76.6	65.1	68.9	77	66.8	49.8
20 Hz	66	68.2	62.6	68.8	63.9	66.8	64.4	61.8	64.8	70.6	75	74.7	66.3	74	75.4	64.5	51.2
25 Hz	62	62.2	62.2	62.3	59.5	70.5	61.3	57.9	64.1	69.4	73.4	72.1	56.9	58.3	73.2	60.6	52.7
31.5 Hz	63.6	65.4	70.6	60.8	58	65.1	63.1	62.1	58.9	67	68.9	69.2	61.7	65.5	70.7	61.3	54.9
40 Hz	63.4	64.5	70.6	61	60.8	71	58.8	57.3	61	68.6	67	66.8	66.6	67.1	67.5	58.9	59.8
50 Hz	67.8	76.4	73.7	67	69.4	82.9	66.1	66.1	76.6	79.4	74.6	67.8	78	75.9	67	59.4	63.7
63 Hz	66.1	72.1	72.5	66.6	69	82.6	67.8	66	74.9	82.7	78.2	66.1	74.6	80.2	65.8	65.6	61.5
80 Hz	70.1	69.3	72.2	67.6	64.2	68.9	63.1	61.2	62.2	66.1	65.5	66.1	68	75.4	63	59.1	69
100 Hz	65.7	70.6	72.2	63.1	61.4	69.3	58.7	58.1	66.5	67.6	64.7	63.6	74.5	76.4	59.5	53	57.9
125 Hz	64.3	68.2	66.8	64	62.9	68.5	60.5	59.4	65.4	69.1	66.2	62.3	67.1	77.5	58.4	55.1	57.9
160 Hz	65.4	67.1	68.2	62.3	61	65.8	63.4	61.1	59.7	66.1	63.8	62.9	70.9	74.4	59.1	53.2	65.4
200 Hz	63.2	65	64.4	59.9	59.9	63.4	58.8	56.9	56.6	62.6	63.2	59.5	68.4	73.9	58.5	51.1	59.8
250 Hz	61.1	64.7	63.4	59.6	58.6	63.5	60.2	59.1	55.6	61.7	63.5	58.8	71.6	72.8	57.3	51.7	61.6
315 Hz	62.2	64	63.4	60.6	58.6	63.9	58	56.3	55.9	58.1	62.5	58	73.3	72.7	56.4	51.9	58.4
400 Hz	60.7	63	62.8	59.4	56.8	63	56.6	55.5	54.9	58.3	61.7	56.7	65.4	72.7	55.6	51	60.1
500 Hz	61.6	66.4	62.4	60.8	56.3	62.4	57.8	56.3	53.4	60.4	61.7	57.2	67.1	74.1	55	51.6	60.3
630 Hz	59.4	65.8	61.4	59.4	57.3	61.7	58.3	56.2	51.8	59.8	63.8	58.9	67.2	73.2	54.3	52.1	60.7
800 Hz	58	63.9	59	58.7	55.4	61.8	58	56.6	55.3	59.8	60.9	57.7	68.9	71.2	53.8	52.8	59.9
1.0 kHz	57.3	63.9	58.4	57.8	53.8	60.8	56.7	55.9	54.8	60.3	62.2	59.1	67.4	72.6	53.4	52.6	58.3
1.25 kHz	56.4	63.5	63.7	56.8	59.6	60.5	59.3	54.9	53.7	59.9	61.7	62	72	70.6	52.3	51.9	58.8
1.6 kHz	56.5	62.3	61.3	56.7	58	60.4	57.5	52.6	54.7	57.8	61.2	60.1	63.9	71.7	51.9	50.7	58.6
2.0 kHz	54.8	62.4	59.3	55	54.6	57.7	56.9	50.9	52.2	55.8	59.6	57.3	66.2	69.7	49.4	50	54.2
2.5 kHz	54.7	59.7	57.3	55.3	50.6	56.5	53.1	48.5	51.2	55	58.1	54.3	63.1	69.9	49	49.3	53.1
3.15 kHz	51.9	57.2	52.9	52.2	48.4	53.9	50	45.8	48.4	52.5	56.2	52	59.9	66.2	46.3	46.9	51
4.0 kHz	48.5	54.8	52	49.3	45.2	51.1	46.9	43	46.7	49.4	53.8	51.4	58.1	62.4	43.4	44	47.9
5.0 kHz	45.8	52.2	48.5	47	42.6	48.6	47.6	41	45.2	46.7	50.9	48.4	56.5	59.3	40.2	40.9	44.6
6.3 kHz	41.3	49	43.7	41.2	40.7	46	45.6	39	43.3	44.1	49.2	48.3	52.8	55.2	37.2	38.6	41
8.0 kHz	38	46.8	41.4	37.2	38.6	43.8	42.3	37.2	41.2	41.3	47.2	46.7	49.9	51.7	33.6	35.3	38.3
10.0 kHz	34	44.9	38.2	32.6	34.3	41.9	39.4	34.5	39.6	39.5	44.7	44.9	49.8	50.7	29.8	32.1	33.9
12.5 kHz	29.4	42.9	35.3	26.8	31.4	39.3	35.7	32.2	36.8	37.8	42.4	42.6	47.7	43.7	26.1	29.3	28.3
16.0 kHz	23.2	39.1	30.4	20.1	27.2	36.2	37.6	28.2	33.2	32.3	36.6	37.8	39.7	37.4	21.4	23.2	20.7
20.0 kHz	15.4	33.6	23.1	12.7	21.9	31.6	36.1	22.1	26.9	26.5	30.9	33.4	33.9	29.6	16.7	17.4	10.7



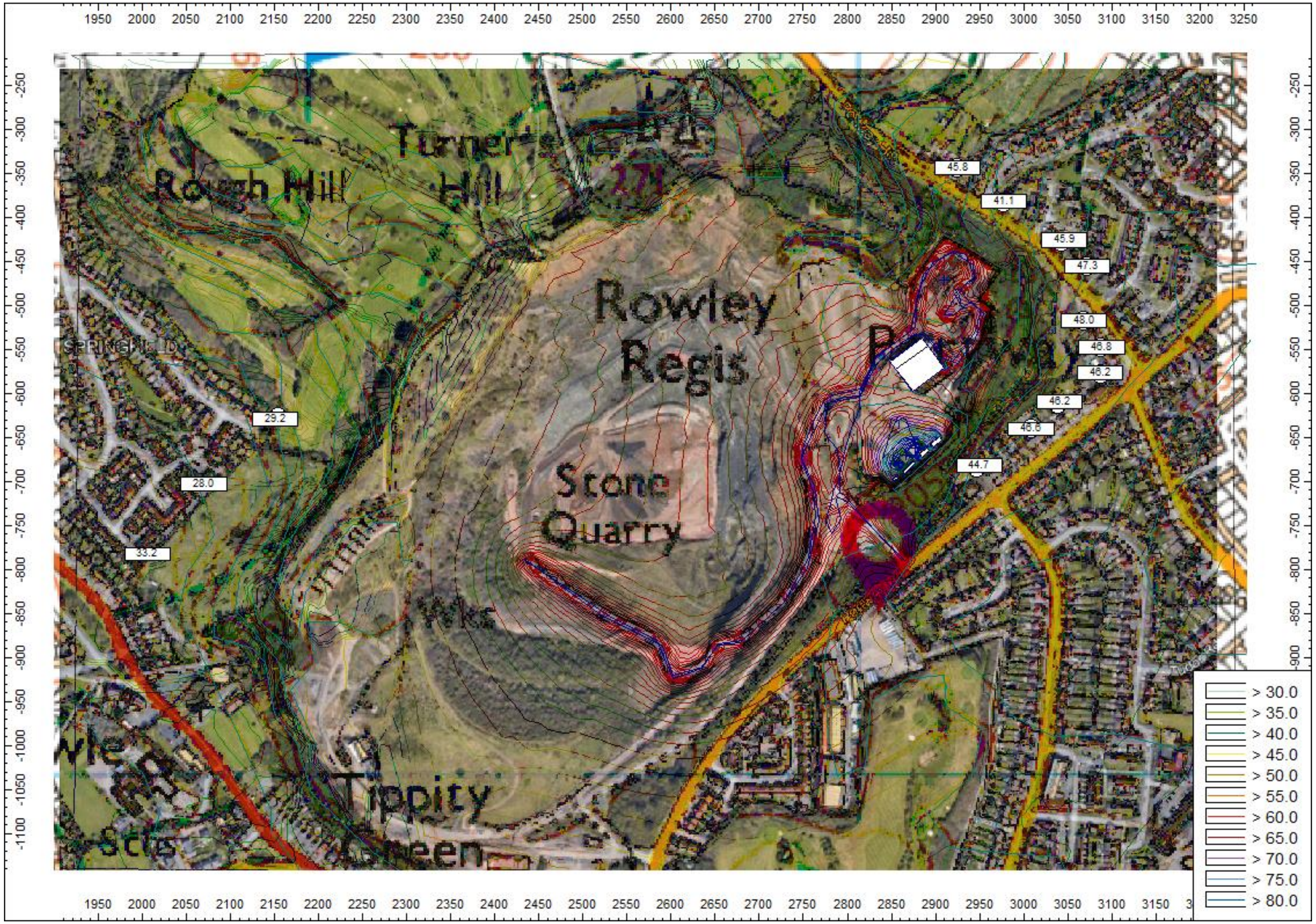
APPENDIX 4

NOISE PREDICTION MAPPING RESULTS

NOISE MAP 1: SOIL TREATMENT FACILITY NOISE CONTOURS



NOISE MAP 2: SOIL TREATMENT WITH SOIL WASHING FACILITY NOIISE CONTOURS



APPENDIX 5

CONSULTANT'S EXPERIENCE & QUALIFICATIONS

Consultant: Dean Robert Kettlewell - MSc MIOA MAE I.Eng
(Director - Principal Acoustic Consultant)

Précis

As Director and Principal Acoustic Consultant with Noise & Vibration Consultants Ltd, Dean has over 35 years background experience in a wide range of issues relating to environmental, industrial and commercial noise and vibration assessment. He currently manages corporate and unit specific contracts for:

- Assessment of Environmental & Industrial Noise
- Environmental Noise Impact Assessments
- Specialist knowledge in the Design of Noise Control Systems
- Expert Witness representation for Planning Appeals
- Integrated Pollution Prevention and Control (IPPC) Applications
- Industrial Noise Assessment and Control
- Planning Issues for Residential and Commercial Development
- Noise at Work Regulations Assessments
- Building Acoustics and Sound Insulation Tests
- Wind Farm Noise Impact Assessments
- Entertainment Noise Assessment and Control
- Ground borne vibration measurement and assessment
- Project Management of Noise Control Systems

Relevant Work Experience

Director & Principal Consultant - Noise & Vibration Consultants Ltd	2001- to date
Senior Acoustic Consultant - Vibrock Limited	1998 - 2001
Associate & Principal Acoustic Consultant - John Savidge & Associates	1994 - 1998
Technical Manager – LBJ Limited (Noise Control Division)	1990 - 1994
Technical Engineer/Technical Manager (1988) - Vibac (Noise Control) Ltd	1982 - 1990

Qualifications and Education

M.Sc. Applied Acoustics (Derby University – Distinction)
HNC Electrical & Electronic Engineering
IOA Diploma in Acoustics & Noise Control
IOA Certificate in Law and Administration
Certificate of Competence in Workplace Noise Assessment
Certificate of Competence in Ground Vibration Monitoring

Affiliations: Member of Institute of Acoustics (MIOA)
Member of Academy of Experts (MAE)
Member of Association of Noise Consultants (ANC)
Incorporated Engineer (I.Eng)

NVC

Noise &
Vibration
Consultants Ltd

Appendix C – Emissions Management and Monitoring Plan

Emissions Management and Monitoring Plan

This document has been prepared in response to the Schedule 5 notice dated 28/09/20 for the variation to permit reference EPR/HP3632RP/V003.

The document details the existing monitoring undertaken at site both for reporting against the permit conditions and the other monitoring undertaken as routine by the applicant to support effective emissions management at the site. This report includes some minor changes to sampling locations due to the change in layout of the site under the proposed permit variation. In preparing this document the following EA guidance documents has been reviewed:

- Technical Guidance Note (Monitoring) M8 – Ambient Air. Environment Agency, Version 2 (May 2011)
- Technical Guidance Note (Monitoring) M17 - Monitoring Particulate Matter in Ambient Air around Waste Facilities. Environment Agency, Version 2 (July 2013)

Potential Emissions at Edwin Richards Quarry Soil Treatment Facility

The following provides a list of potential emissions at the soil treatment facility

1. Dust
2. Volatile Organic Compounds
3. Odours
4. Surface Run Off
5. Noise and vibration
6. Drag out of mud/debris

Items 2-6 were addressed by the original H1 ERA prepared by Amex Foster Wheeler Environment & Infrastructure UK Limited (Amec) that was submitted and approved as part of the original permit application for the facility. The Amec H1 ERA considered which aspects of the operation were likely to cause a potentially harmful emission in terms of odour, noise and vibration, fugitive emissions (including dust and pests) and accidents. This also referenced the Best Available Techniques and Operating Techniques including details on the types and quantities of waste accepted, operating controls and pollution mitigation controls. An ERA prepared by TerraConsult (Report Ref: 3483/R/002/02) was submitted in November 2017 in support of an application to vary permit EPR/HP3632RP to allow the acceptance of soils containing asbestos and untreated woodchip. The ERA was updated with the permit variation application issued to the EA on 20 June 2019.

The Schedule 5 received on 28/09/20 requires a revised Emissions Management and Monitoring Plan for the whole site. It requests that we will need to include the following aspects:

1. You must use appropriate measures to prevent emissions of dust, PM10 and asbestos fibres.

2. You must design, operate and maintain all internal and external storage areas and treatment processes, including all associated equipment and infrastructure, in a way that prevents fugitive emissions to air, including dust, PM10 and asbestos fibres. Where that is not possible, you must minimise these emissions.

3. All internal and external storage areas and treatment processes must collect, extract and direct all process emissions to an appropriate abatement system for treatment before release. Where that is not possible, you must minimise these emissions.

4. To reduce point source emissions to air (dust, PM10 and asbestos fibres) from the internal and external storage areas, treatment processes and handling of waste, you must use an appropriate combination of abatement techniques, including one or more of the following systems: adsorption (for example, activated carbon), biofiltration, wet scrubbing, fabric filters, high efficiency particulate (HEPA) filtration, condensation and cryogenic condensation, cyclonic separation, electrostatic precipitation and thermal oxidation.

5. You must identify the main chemical constituents of the site’s point source emissions as part of the site’s inventory of emissions to air.

6. You must make an assessment of the impact of the substances emitted to air, following the Environment Agency’s guidance; Control and monitor emissions for your environmental permit https://www.gov.uk/guidance/control-and-monitor-emissions-for-your-environmental-permit#dust-mud-and-litter

7. You must design, operate and maintain an appropriate monitoring system on site to ensure dust, PM10 and asbestos fibres releases are prevented, if not minimised, from leaving the site boundary.

The above seven points are now addressed.

You must use appropriate measures to prevent emissions of dust, PM10 and asbestos fibres:

Table 1. Sources of Emissions and Mitigation

Parameter	Source	Mitigation
Dust	Soil Inputs	Reception of soils with moisture content >15%. Generally soil moisture content is ~20% on received soils
	Dragout of mud onto road	Frequent road sweeping/damping down, daily visual inspections, speed limits on roads and designated traffic routes on hardstanding
	Soil Stockpiles/Biopiles	Limiting stockpile height within approved areas, sealing stockpile surfaces or covering, elevated soil moisture content >15% with reintroduction of treated water if required
PM10	Heavy duty vehicles	Traffic limits and routes, addition of soil screening to permit to enable tenfold increase in soil processing rates and reduction in plant time
	Soils	Unlikely with moisture content >15% and elevated clay content
Asbestos Fibres	Asbestos contaminated soils	Conservative waste acceptance criteria to prevent the acceptance of soils that can generate airborne asbestos fibres above the detection limit
		Moisture content in soils >15%. Dust suppression system on site
	Asbestos removed from soil	Double bagged and stored in locked skip

You must design, operate and maintain all internal and external storage areas and treatment processes, including all associated equipment and infrastructure, in a way that prevents fugitive emissions to air, including dust, PM10 and asbestos fibres. Where that is not possible, you must minimise these emissions.

Internal and external storage areas and treatment equipment are constructed on impermeable hardstanding with sealed perimeter kerbs and underground drainage and pumping chambers. Water treatment equipment is located within bunded areas with a minimum of 110% storage capacity. This ensures that there is no cross contamination to land or surface water from mobile contaminants or impacted surface water.

<u>Biotreatment Area</u>
The biopiles are operated using vacuum technology that means that >99% of volatile contaminants within soil pore spaces are collected and treated at the adjacent biofilter. The conversion of hydrocarbons to carbon dioxide and water vapour means that the soil moisture concentration in soils is elevated during treatment and is rarely, if ever below 15-20%. Soil in treatment does not give rise to visible dust or elevated dust concentrations during treatment.

<u>Access Roads (biotreatment and asbestos treatment area)</u>
Access roads and exposed areas of the treatment pads are potential sources of dust due to drag out of soil from vehicle movements which can dry out to a level which could post a dust nuisance. All traffic routes are regularly swept and damped down to prevent mud accumulation on internal roads or the public highway or be a source of dust during dry conditions.

<u>Asbestos Treatment Area</u>
The control of asbestos emissions is predominantly based upon only receiving soils that are proven to pose no potential for airborne emissions of asbestos fibres above the detection limit. The approach to achieving this has been stated in the previous permit variation approved in February 2018.

Soils with asbestos will be quarantined prior to formal acceptance even where in the majority of cases, soils have already been visually inspected and sampled prior to a formal offer for accepting the soils has been issued to the waste producer. The reception testing also includes for moisture content which will provide information on the dust potential in addition to the asbestos fibre quantification.

Reception testing will be undertaken at the receipt of soils and any soils that contain >0.1% chrysotile fibres, >0.01% other forms of asbestos fibres, or any form of unbound asbestos will be rejected from site. As an extra level of mitigation all externally stored asbestos contaminated soils will be covered prior to transfer to the internal building for screening and hand picking.

Within the asbestos soils storage and treatment areas, a dust suppression system is available to reduce dust and any particulate emissions. However, even without this operating and treatment activities operational there has never been an incidence of airborne asbestos being measured above the detection limit using Phase Contrast Microscopy (PCM) or if required to achieve a lower detection limit: Scanning Electron Microscopy (SEM) or Transmission Electron Microscopy (TEM).

<u>PM10 emissions from vehicles</u>
The main sources of PM10 emissions on site are from:

- Excavators

- Dump trucks
- Tipper/articulated lorries
- Hopper and Picking station

At present the use of the hand picking inside the building allows for the processing of approximately 50t/day. The picking station is regularly damaged as no removal of oversize inclusions is permitted and so there is significant amount of down time for asbestos processing plant. Also, the presence of soil fines in the matrix has the potential to conceal smaller asbestos debris meaning that the soils are generally handpicked twice to ensure compliance with the requirements to achieve a non-hazardous soil status. The existing approved method requires a significant amount of plant time for each tonne of asbestos contaminated soil and therefore is a source of elevated PM10.

On projects with a mobile plant license deployment a soil screener is added to the above list of equipment. This increases the throughput to approximately 500t/day, results in less downtime and due to the separation of the different soil fractions makes the hand picking significantly more effective with little or no double handling.

Therefore by adding the soil screening option, the efficiency is increased tenfold, so whilst there is a slight increase in PM10 levels as there is more plant present, it is for 10% of the existing timescales.

We have recently hired an electric hopper and picking station to review suitability which will offset PM10 emissions from the previous set of equipment. It is proposed to make this a permanent acquisition if the pre-screening is approved as it is only suitable for soils without large inclusions.

There will be no increase in asbestos fibres due to the strict waste acceptance criteria and we would anticipate a decrease in dust as the soil screener will be fitted with a spray rail for dust suppression. There would be a tenfold decrease in PM10 emissions from the soil processing due to the reduced plant timescales.

The additional storage areas will allow a one way traffic system to be employed and avoid the vehicle restrictions and delays during delivery into the asbestos building. This will significantly decrease the time the lorry is present on site and result in a reduction in PM10 emissions.

All internal and external storage areas and treatment processes must collect, extract and direct all process emissions to an appropriate abatement system for treatment before release. Where that is not possible, you must minimise these emissions.

The emissions from the biotreatment pad are collected by the undersoil pipework with liquids treated in the water treatment system and air treated by the biofilter. This approach is well established.

Asbestos fibres are not generated on site above the detection limit so no abatement system is required.

Dust generation is largely on haul roads and road sweeping/dust suppression is undertaken at source to prevent or minimise dust emissions occurring.

PM10 emissions are largely from heavy plant and vehicle traffic. Emissions from vehicles delivering soils to site are to be reduced by having external reception areas rather than the existing system of delivering inside a building which often leads to queuing vehicles.

The use of a soil screener in the asbestos processing will result in a tenfold reduction in PM10 emissions compared to the existing emissions.

To reduce point source emissions to air (dust, PM10 and asbestos fibres) from the internal and external storage areas, treatment processes and handling of waste, you must use an appropriate combination of abatement techniques, including one or more of the following systems: adsorption (for example, activated carbon), biofiltration, wet scrubbing, fabric filters, high efficiency particulate (HEPA) filtration, condensation and cryogenic condensation, cyclonic separation, electrostatic precipitation and thermal oxidation.

The majority of emissions described previously are prevented from occurring and do not require further mitigation after the initial suppression. Monitoring will provide verification to the effectiveness of the suppression works.

A water treatment plant is present on site to continuously treat water as it is collected from treatment areas.

A biofilter is used to treat continuous emissions from the biotreatment area and is deemed a point source emission and is currently monitored as per Table S3.1 of the permit.

Only the presence of PM10 that could accumulate inside the asbestos building is deemed to potentially require mitigation as a point source. This is released by the treatment plant from inside the asbestos building as a result of soil screener and 360 excavator. In the event that monitoring data shows that the emissions are within 25% of the thresholds in Table 3 then the building will have HEPA filters installed to mitigate point source emissions.

Mitigation of PM10 in a situation where concentrations are at 250µg/m3 or above, would comprise of using HEPA filters located near to the exhaust of the soil screener and on the ground close to the 360 excavator loading the screener. The type of HEPA filter utilised would allow 5,000m3/hr per unit and 2 units would be employed to allow for 10,000m3/hr flow rate. A typical HEPA filter employed on construction sites is shown below on the attached link.

https://www.dustarrest.com/product/dustblocker-5000-air-filtration-cleaner

You must identify the main chemical constituents of the site's point source emissions as part of the site's inventory of emissions to air.

Table 2. Chemical Constituents of Emissions

Source	Chemical Constituents
Biotreatment area	TPH, PAHs, BTEX, total VOCs
Asbestos building	PM10 from indoor soil screener and excavator unless electric or hybrid plant is used

All other sources are suppressed and therefore prevented from occurring. PM10 emissions from vehicles/plant outside of the asbestos building are not deemed to be point source emissions.

You must make an assessment of the impact of the substances emitted to air, following the Environment Agency's guidance; Control and monitor emissions for your environmental permit https://www.gov.uk/guidance/control-and-monitor-emissions-for-your-environmental-permit#dust-mud-and-litter

A historical assessment of the impact of substances to air was completed in 2016 by Amec in the Air Quality Assessment document for the treatment of 150,000t of soils at the treatment facility. This assessment has not changed despite the inclusion of asbestos contaminated soils to the permit. There are no additional emissions from this activity above those permitted in 2016 as the restrictions placed on waste acceptance prevents airborne asbestos emissions from occurring. The same standards will be maintained if the permit variation is approved with an improvement in air quality as a result of reduced plant use. There is a change however in areas of the site being used for soil treatment with the extension in use of the building and adjacent soil storage area. However, the measures detailed in Table 1 of this response are utilised to mitigate any emissions to the limits provided in Table 3.

You must design, operate and maintain an appropriate monitoring system on site to ensure dust, PM10 and asbestos fibres releases are prevented, if not minimised, from leaving the site boundary.

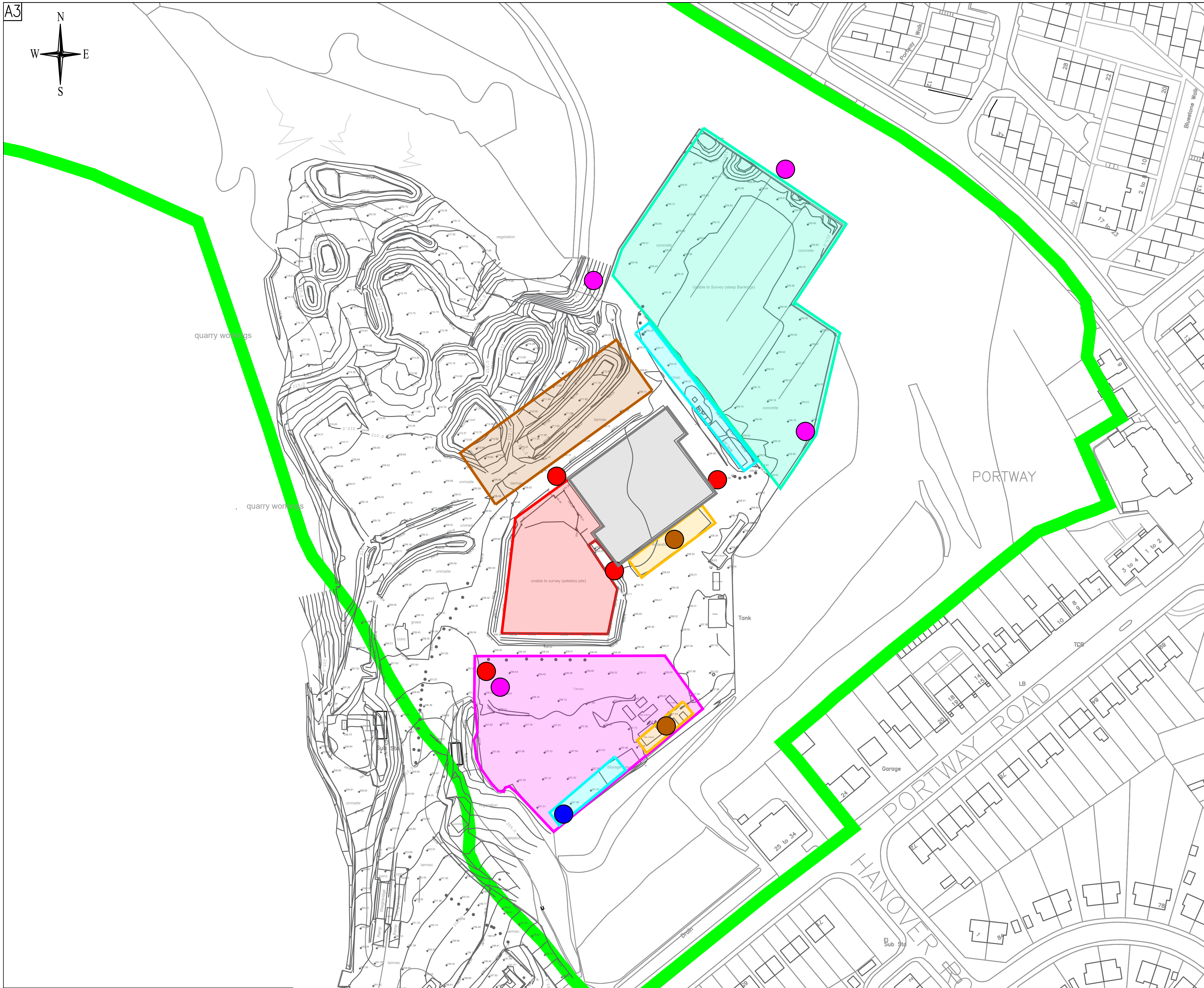
Table 3 provides detail of the existing monitoring undertaken on site for reporting as a permit condition, additional monitoring undertaken for internal management and control of emissions (but not required to be reported as a permit condition) with an update on locations in Appendix A to reflect the change in layout proposed for the site.

All equipment is calibrated at a frequency dictated by the manufacturer rather than a 4 monthly interval.

Table 3. Emissions Monitoring

Parameter	Frequency	Thresholds	Comments
Asbestos (TCM)	Daily during initial soil screening	<0.01f/ml	Proposed for permit variation to replace monitoring during hand picking. Method as described in M17 guidance and Table S3.3. This frequency is far in excess of other similarly permitted facilities.
Asbestos (SEM)	Quarterly		Added reassurance to ensure baseline of asbestos emissions is not changing. Method is as described in M17 guidance. Detection limit anticipated to be <0.0005f/ml. This monitoring is far in excess of other similarly permitted facilities.
Dust	Monthly	200mg/m2/day	Frisbee dust gauge method as described in M17 guidance.
Soil moisture content	Reception testing of soils as per	15% moisture content	To ensure soils received have low potential for dust release
Asbestos content in soils	Reception testing of soils	<0.1% chrysotile, <0.01% other types of asbestos fibres. No visible unbound asbestos or insulation	To ensure soils received cannot generate airborne emissions of asbestos above the method detection limit
PM_{10}	Weekly or as required if dust is suspected	250µg/m3/15 minute TWA*	Use of hand held nephelometer – not used for compliance against EU Directive Limit for PM_{10} as stated in EA Guidance M8, but provides real time results for implementing immediate mitigation if results are within 25% of threshold. A hand held mobile device for discrete monitoring around working areas. This method is preferred to support operational control of emissions rather than a fixed monitoring system for general air quality analysis at fixed locations (e.g. Filter Dynamics Measurement System/Beta Attenuation Monitor)
TPH/BTEX/PAHs	Monthly	None stated in permit	Biofilter Monitoring as described in Table S3.1
VOCs	Weekly or as required	1mg/m3 benzene	Use of calibrated PID around working areas on biotreatment pad. For ensuring RPE requirements are respected and biofilter is not overloaded with VOCs from incoming soils.
Odour	Daily	Absent	To ensure site activities do not cause nuisance
Noise	Monthly	85dBA	Occupational exposure monitoring in close proximity to working plant.
Treated water	Monthly	As required by trade effluent consent	Reported to Severn Trent to ensure compliance with trade effluent consent

*Mitigation implemented if within 25% of threshold due to accuracy of nephelometer method
Grey shading means the analysis results are already reported as required by the permit



GENERAL NOTES

1. SURVEY INFORMATION SUPPLIED BY THE WASTE RECYCLING GROUP .
2. DO NOT SCALE
3. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM
4. ANY ANOMALIES ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF BYRNE LOOBY

KEY

- PERMIT BOUNDARY
- NON–HAZARDOUS SOIL STORAGE AND SCREENING AREA
- BIOLOGICAL TREATMENT AREA
- BIOFILTERS
- HAZARDOUS SOILS STORAGE AREA
- BIOLOGICAL TREATMENT AREA/SOIL WASHING AREA
- WATER TREATMENT PLANTS
- SOIL TREATMENT BUILDING
- AIR SAMPLING: ASBESTOS/PM10
- AIR SAMPLING: TPH/BTEX/PAH'S
- AIR SAMPLING: DUST/NOISE/ODOUR
- WATER SAMPLING: SEVERN TRENT

Rev	Date	Description	By	Chk	App

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CLIENT

waste recycling GROUP

PROJECT

EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

DRAWING TITLE

EMMISIONS MONITORING PLAN

STATUS

FINAL

Date: 20.06.23	Scale: 1:1500	Drawn: JM	Chk: JW	App: JW

Project No:	Drg. No:	Rev:
K0182	K0182.2.003	01

STC – WI 014 – EMISSIONS CONTROL AND MONITORING

Author:	Jon Owens - STCM	**Approved By:**	Steve Langford - MD
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	Summary of Changes	Date
1	N/A	05/03/18
2	Addition of SEM testing detection limit	30/09/20
3	Inclusion of new treatment areas	06/06/22

Introduction

This Work Instruction (WI) sets out the measures taken to manage and control emissions of dust, PM10, asbestos fibres and VOCs/odours as part of permit requirements for Edwin Richards Soil Treatment Centre – EPR/HP3632RP/V003. This procedure is in addition to existing monitoring and measures undertaken by Provectus and FCC on site.

Principle of Operations

The main objective of the operation is to monitor, manage and minimise dust, PM10 and asbestos fibres from potentially being released at the soil treatment facility.
WI 007 – Environmental Monitoring outlines the sites current monitoring regime which includes dust and PM10 monitoring around the site. While *WI 011 – Processing of Asbestos Contaminated Soils* describes the measures in place with regards to ambient asbestos fibre monitoring in the air.

Procedure

All soils entering the Soil Treatment Centre (STC) undergo pre-assessment where the suitability is checked to ensure it meets the acceptance criteria such as asbestos type and fibre content.

Once on site soils are sampled for compliance and moisture content. Where soils are found to be too dry, they can be acted upon by damping down. For soils stored externally it is highly unlikely that they become dry enough to generate dust due to the UK climate.

Any soils that fail the compliance criteria shall be segregated and rejected from site and sent to an appropriately licensed facility.

Soils containing asbestos for picking are to either be placed directly in the asbestos shed or in the external storage areas shown on the attached drawing. Current monitoring undertaken within the asbestos shed has shown that fibres are not detected >0.01f/ml or >0.0005f/ml at any point (depending on what method is used for monitoring). When in use, the asbestos shed access road is to be routinely sprayed down with a propriety surfactant mixture. Dust levels on the roads in and around site are controlled through regular damping down and sweeping.

Externally, asbestos containing soils are to be covered with a tarpaulin or equivalent once formed into a static batch. If the soils are being moved to the asbestos shed, or being added to, then the tarpaulin can be temporarily removed.

Soil moisture content for exposed soils within the shed and also in the external storage area is to be checked to ensure moisture levels are above 15%. Soils with moisture content below 15% shall be dampened down using the irrigation system on site

Monitoring

Monitoring locations will be placed around the perimeter of site. These locations are to be monitored on a weekly basis for PM10 using a *Dustmate* – which will be calibrated as per the manufacturer's guidance. Action will be taken if dust results record levels greater than 250µg/m^3 over a 15 minute TWA, such as additional dust suppression on the roads via a water bowser, road sweeper or damping down soils with a pressure washer.

Additionally, frisbee dust gauges shall also be placed at these monitoring locations. This shall be sent to an accredited laboratory monthly for testing of deposited dust. Should levels of deposited dust exceed 200mg/m^2/day then actions as previously described, shall be taken.

Ambient asbestos fibre monitoring shall continue in the shed whilst activities are occurring to ensure compliance with the permit level of <0.01f/ml or the WHO levels of <0.0005f/ml. Additional monitoring shall take place externally around the storage area to confirm that fibres are not being released though site activities. This will be done via an accredited asbestos monitoring contractor. All of this monitoring is to confirm that no emissions are being generated on site.

Noise

The noise thresholds are contained within the noise assessment and are monitored on a weekly basis. It is not anticipated that the addition of the biotreatment pad will increase the noise levels at the site due to the acoustic insulation used on all equipment and previous monitoring that has shown that noise levels are not exceeding 5dB above background at the site boundary.

Odour

There is a low potential for odour at the site. Odour monitoring is undertaken on a daily basis with the target of no odour detected at the site boundary.

Biofilter Emissions

The point emissions from the STC biotreatment process to air are controlled through the site biofilter that is present on two separate biotreatment areas. On a monthly basis, sampling of the gases directly exhausted from the biofilter will be undertaken by 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. The biofilter is periodically changed or refreshed to ensure that it remains effective.

All results of monitoring shall be stored on the company server and/or site files.

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Appendix C – Fugitive Emissions Management Plan

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Edwin Richards Quarry – Soil Treatment Centre

Fugitive Emissions Management Plan for Dust

Waste Recycling Group (Central) Limited

Report No. K0182-BLA-R-ENV-00005
September 2023
Revision 2

Document Control

Project: Edwin Richards Quarry – Soil Treatment Centre

Document: Fugitive Emissions Management Plan for Dust

Client: Waste Recycling Group (Central) Limited

Report Number: K0182-BLA-R-ENV-00005

Document Checking:

Revision	Revision/ Review Date	Details of Issue	Authorised		
			Prepared By	Checked By	Approved By
01	23 December 2022	Final issued	E Greenhalgh	C Finney	C Finney
02	September 2023	Final reissued	E Greenhalgh	C Finney	C Finney
Disclaimer: Please note that this report is based on specific information, instructions, and information from our Client and should not be relied upon by third parties.					

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Contents

1 Introduction

1.1 Report Objectives

This Fugitive Emissions Management Plan for Dust (FEMP) supports an application by Waste Recycling Group (Central) Limited (WRG) to vary the current permit referenced EPR/HP3632RP to:

- Allow additional 30,000 tonnes per annum to be accepted at the facility and increase overall throughput to 180,000 tonnes per annum inclusive of either hazardous and/or non-hazardous waste.
- Remove the split of hazardous / non-hazardous waste treated at the facility from 89,998 tpa for hazardous waste and 60,002 tpa for non-hazardous waste to 180,000 tonnes per annum inclusive of either hazardous and/or non- hazardous waste. The amended ratio relates to the list of wastes in Table S2.2 and S2.3 of the permit (physical treatment of wastes and wastes for treatment in the bioremediation process respectively). This will impact the following listed activities:
    - AR1 S5.3A(1)(a)(ii) Physical treatment of hazardous waste
    - AR2 S5.3A(1)(a)(ii) Asbestos removal from soils
    - AR3 S5.4A(1)(a)(ii) Physical treatment of non-hazardous waste
    - AR4 S5.3 A(1)(a)(i) Bioremediation of hazardous waste for disposal
    - AR5 S5.3 A(1)(a)(i) Bioremediation of hazardous waste for recovery
    - AR6 S5.4A(1)(a)(i) Bioremediation of non-hazardous waste for disposal
    - AR7 S5.4A(1)(b)(i) Bioremediation of non-hazardous waste for recovery
- Addition of new soil treatment pad for biological treatment and soil washing.
- Addition of a point source emission to air to Table S3.1 to account for the biofilter from the new soil treatment area.
- Addition of soil washing activity for the soil washing of soils contaminated with heavy metals comprising the following listed activities and waste operations to be subject to the 180,000 tonnes per annum inclusive of either hazardous and/or non-hazardous waste.
    - S5.3 A(1)(a)(ii) – recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment via soil washing
    - S5.3 A(1)(a)(ii) – disposal of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment via soil washing

  Associated waste operations will be:
    - Treatment of non-hazardous waste soils by soil washing for recovery.
- Amendment to Table S1.1 Activity AR8 regarding the temporary external storage of up to 20,000 tonnes to include soils contaminated with heavy metals (10,000 tonnes) and activities associated soil washing activity references in the limits of specified activity and waste types.
- Allow the use of a mechanical screener for the pre-screening of soils containing asbestos.

- Remove pre-operational condition 1 as listed in Table S1.3 of the Permit.
- Undertake mechanical screening of non-hazardous soils in the area currently used for storage of non-hazardous soils. It is proposed to use this area for storage and screening of non-hazardous soils. Screening is already regulated under activity reference AR3 physical treatment of non-hazardous waste.
- Amend drawing reference in Table S3.3 of the Permit to remove reference to plan 100993 – Asbestos DWG1 dated January 2018 and replace with reference to an Emissions Monitoring Plan.

The proposed changes to the Permit at the Soil Treatment Centre (STC) better reflect current market conditions and reflect the activities permitted by the extant planning permission.

It will also discharge Condition 3.a) of Planning Permission DC/21/66058 which approves the new soil treatment area. Condition 3.a) is reproduced below for reference.

> *Soil treatment works should not begin on this part of the site until information is submitted to and approved in writing by the local planning authority confirming the mitigation measures that will be employed to contain fugitive emissions of dust and odour from this activity. This information could be either a specific dust management plan or details of the conditions in the Environmental Permit issued by the Environment Agency which adequately demonstrates the measures in place to ensure that there will be no adverse impact on local amenity from dust.*

An Air Quality Management Plan relating to both odour and dust (Report Ref: 33012rr722i2, November 2016) was submitted with the previous planning application and a Dust and Particulate Management Plan (Report Ref: 4236/R/005/3) was submitted with the previous permit application. A Planning Statement (Report Ref: 2596-01, August 2021) was submitted with the planning application for the new soil treatment area and includes measures for air quality. These Reports have been utilised to develop this FEMP. Reference has also been made to Environment Agency Guidance[1].

The purpose of this FEMP is to address the current and proposed activities at the Soil Treatment Centre (STC) likely to cause a potential emission of uncontrolled dust and particulates and how these emissions will be minimised. A copy will be included in the Site Management System (or Working Plan) held at the Site Office and all members of staff will have access to this document.

[1] Air emissions risk assessment for your environmental permit - GOV.UK (www.gov.uk)

2 Site Operations

2.1 Current Site Activities

The STC is currently permitted to accept a mixture of hazardous and non-hazardous waste for treatment for recovery, pending disposal off-site at the directly adjacent Edwin Richards Landfill Site also operated by WRG or reused on site as restoration soils. The treatment technologies employed include pre-screening of soils, bioremediation of hazardous soils in biopiles and handpicking discrete fragments of asbestos material from soils (not contaminated with asbestos fibres).

The entirety of the area inside the current permit boundary, including inside the building comprises approximately 8.6 ha comprising a large hard surfaced level platform, which was used as part of the quarrying activities and now the STC. The STC is currently accessed via the entrance on Portway Road.

2.2 Proposed Activities

The proposed changes to the Permit at the Soil Treatment Centre (STC) better reflect current market conditions and reflect the activities permitted by the extant planning permission.

The Operator proposes to add a soil washing activity to the permit to allow soil washing of soils containing heavy metals. As a result of the addition of a soil washing activity on the proposed new area, a change to hazardous soils storage area is required to allow storage of 10,000 tonnes soils contaminated with heavy metals. 10,000 tonnes will remain as the storage limit on the adjacent area for soils containing asbestos.

The new soil treatment pad area will be able to treat 30,000 tonnes via either bioremediation or soil washing dependent on the contract. Soil will be treated on an impermeable surface with sealed drainage. It is occupied by an area of hard standing within the current permit boundary and will use the existing access road from Portway Road. The location of the new soil treatment area is shown on the Site Layout Plan. The Site Permit Boundary is shown on drawing reference K0182.1.002 and remains unchanged as part of this application.

A point source emission to air will be added to Table S3.1 of the permit to account for the biofilter from the new soil treatment area.

The Operator proposes to pre-screen the soils contaminated with asbestos fragments prior to handpicking to remove oversize aggregate materials which would otherwise damage the handpicking station and prolong hand picking works whilst oversized fragments are manually removed by site personnel. The limits applied to the asbestos content in the soil matrix will not change. Pre-screening will be undertaken in the Soil Treatment Building.

The Operator proposes to remove the tonnage split between non-hazardous waste and hazardous waste and increase the annual throughput by 30,000 tonnes per annum. The total annual throughput will be 180,000 tonnes inclusive of either hazardous and / or non-hazardous waste. Although, the annual throughput will be increasing the quantity of waste onsite will continue to be limited by the treatment and storage capacities onsite.

Screening of non hazardous soils is already regulated under activity reference AR3 Physical treatment consisting of sorting, separation, screening and crushing of non-hazardous waste in the extant Environmental Permit. The screening of non-hazardous wastes is undertaken in the area utilised for storage. The location of the non hazardous soils storage and treatment area is centrally located to the Site away from sensitive receptors.

2.2.1 Acceptance

Strict waste acceptance procedures are in place to ensure that no non-conforming materials are accepted. If the soils are permitted and likely to be capable of treatment the customer will be issued with the terms and conditions for acceptance of the soils.

The materials will predominantly arrive at the Site in articulated vehicles. All vehicles would arrive sheeted and would only remove their sheets once at the point of material inspection / deposition.

All vehicles would pass over the existing weighbridge before travelling along the internal access road and entering the STC. Soils delivered to the STC would be visually inspected. If the soils are provisionally accepted based upon the initial visual assessment, chemical sampling would be undertaken by an accredited laboratory as deemed necessary by WRG. If the soils are rejected for treatment at the STC they would be required to be taken away by the customer for disposal at a suitable location. All activities would take place on the soil treatment pad, with the exception of the samples which are sent for chemical testing.

2.2.2 Bioremediation Process

The biological treatment process typically is between 8 to 16 weeks dependent on the contaminants present in the soil.

Bioremediation of soils is undertaken on a kerbed treatment pad comprising concrete and tarmac hardstanding. The treatment pad has an appropriate fall to allow all process water to be collected in a precast concrete covered gully which ultimately drains to the southern corner of the pad to be pumped out and either recirculated back into the biopile or discharged to the on-site foul water drainage system. A system of perforated aeration pipes run horizontally along the base of the biopile treatment pad.

Soils accepted at the STC and post-treated asbestos soils which require further treatment are transferred to the biopile treatment area via dump truck and/or excavator. The soils are arranged into biopiles and are managed using a system of lots which allows the waste to be trackable from the point of origin to its location on the treatment pad.

Bioremediation of soils refers to the biological treatment of contaminated soils by creating optimal conditions for biodegradation of contaminants. To enable biodegradation to occur the following parameters are monitored and manipulated:

- pH;
- temperature;
- moisture content;
- oxygen level; and,
- nutrient concentrations.

Decomposition of the organic contaminants is carried out by microorganisms in the soil. This can be enhanced by addition of inorganic nutrients such as ammoniacal nitrate and organic material such as woodchip. Moisture is also essential for microbial activity; low moisture content will inhibit microbial growth but excessive moisture restricts airflow. The perforated aeration pipes located beneath the waste extract air from the biopile. This allows effective control of the waste oxygen levels and moisture content in the waste to maintain aerobic conditions.

Biodegradation is optimised by maintaining a temperature in the biopiles 30 and 40°C to ensure the mesophilic microflora are predominately stimulated.

The stages of the bioremediation process are detailed below:

i. **Initial Placement**: The soil is placed on the treatment pad by a dump truck where an excavator will form the biopile.

ii. **Addition of Nutrients**: Based on the contaminants present within the soil, nutrients are added to facilitate the biological degradation of the hydrocarbon compounds.

iii. **Chemical Analysis**: Approximately every 4 weeks the soil is tested to analyse the contaminant concentrations to determine whether the biological treatment of the soil is adequately reducing the hazardous contaminants to non-hazardous concentrations. Additional nutrients and/or organic inputs may be added to expedite the process

iv. **Nutrients testing:** Every 2-4 weeks the soil is tested to analyse the levels of nutrients within the soil to ensure that there is sufficient inorganic and organic material to facilitate the biodegradation process. This is supported by the chemical analysis of the soil for contaminant concentrations. Soils are tested in accordance with Provectus procedure STC-F006-Soil Analysis.

v. **De-compaction of the soil**: Every 4-8 weeks the biopile will be turned to facilitate aeration of the soil.

vi. **Validation testing:** Once the soil meets the re-use criteria, the soil is removed from the treatment pad and transferred to the non-hazardous soils storage area or directly to the non-hazardous landfill void on site.

On receipt of validation testing that confirms the soil meets re-use criteria, it is transferred to the non-hazardous soils storage area, disposed in the adjacent Edwin Richards Landfill Site or reused on site as restoration soils. The treated soils are stored externally pending disposal or removal off-site.

The STC lies within the larger Edwin Richard Quarry/landfill site. The whole site is fully contained and bounded by a palisade security fence. The access has steel framed lockable double gates which will be kept locked at all times outside operational hours.

2.2.3 Asbestos Pre-Screening

The Operator proposes to pre-screen the soils containing asbestos fibres prior to handpicking. All soils containing asbestos accepted on site will be pre-screened within the building to allow the removal of oversized fractions which have the potential to damage the picking station and fines that can conceal smaller bound asbestos debris.

The pre-screening will increase the efficiency of the soil processing and will not result in airborne asbestos fibres above existing levels. It will also significantly decrease the timescales for picking thereby significantly reducing exhaust emissions from mobile plant. Waste Soil containing >0.1% w/w asbestos is classified as hazardous waste. The Operator restricts asbestos in soil to less than 0.1% w/w for chrysotile fibrous asbestos and 0.01% w/w for other forms of fibrous asbestos below the hazardous limit. This is to limit the potential for airborne respirable asbestos fibres which is limited to 0.01 fibres/ml. This concentration was determined as the concentration at where the generation of elevated levels of asbestos fibres was highly unlikely in laboratory conditions. Air monitoring will be undertaken to monitor any asbestos fibre emissions and dust suppression measures are available to ensure fibre generation is never above the air quality target of 0.01f/ml. Monitoring to date has demonstrated that the waste acceptance provisions have been entirely effective in preventing airborne asbestos fibres being elevated above the permit limits.

Monitoring of the soil treatment activity since the commencement of handpicking of soils containing asbestos in 2018 has demonstrated that the waste acceptance procedures have been effective in preventing airborne asbestos fibres exceeding the permit limits and airborne asbestos emissions have never exceeded the WHO air quality guidance level of <0.0005f/ml which is several orders of magnitude below the permit limit.

2.2.4 Asbestos in Soil Treatment

The STC is permitted to accept waste soils containing mixed forms of asbestos with soil fibre concentrations <0.01% w/w and chrysotile asbestos with soil fibre concentrations <0.1% w/w. The application of these soil asbestos fibre limits is to remove the potential for airborne emissions of asbestos fibres.

Once reception analysis is received to confirm that soils have no potential to generate airborne asbestos fibres they will be moved to the asbestos shed and screened. Any soils received that have the potential to generate airborne asbestos fibres above the detection limit of 0.01f/ml will be rejected from site. Hand-picking of small asbestos fragments is undertaken by suitably trained operatives. The asbestos fragments are placed in individual polythene bags directly adjacent to each operative. When full the picking line conveyor is stopped, and the sealed bag placed into a second bag. The double bagged asbestos is placed in a designated container which will not exceed 10 tonnes at any one time.

On completion of hand-picking, the waste soils are deposited into a stockpile in designated bays within the building. Care is taken not to drop the material from excessive height to reduce potential for dust emissions. Each of the bays provides storage of material post hand picking awaiting compliance testing prior to further onward treatment or disposal. The bays have a storage capacity of 3,750 m^3/6,000t. Validation testing will be carried out prior to disposal or further treatment. If the soil meets the re-use criteria, then it will be retained on site for deposition in the Edwin Richards Landfill Site or sent off-site.

The Operator has advised that it is unlikely that soil accepted for treatment to remove asbestos fragments will also be contaminated with hazardous concentrations of hydrocarbons, as these waste streams are largely from different types of source sites. Processing material heavily contaminated with hydrocarbons through the screen / handpicking line is not envisaged as it presents significant operational difficulties such as contamination and protection of personnel and plant. Soil which has been subjected to screening and picking is unlikely to be contaminated with solvents or organic residues limiting the potential for VOC release if disturbed.

A conveyor belt is used on the picking station which will be set at the lowest height level.

The typical drop height is approximately 2.5m as the picking stations allow for deposit into large skips/or containers. The drop heights are generally determined by the picking station cabin height. An operative will inspect the stockpile soils and take samples for testing prior to a 360 excavator placing the handpicked soils into the final bay stockpile which will await the testing results prior to being removed from the final bay to a non-hazardous stockpile / adjacent void.

The deposit point from the picking station is used as one of the monitoring points to ensure the method does not result in asbestos fibres emissions.

2.2.5 Soil washing activity

The soil washing activity will comprise the treatment of up to 30,000 tonnes per annum. Soils contaminated with heavy metals will be bought in for treatment in the soil wash plant. The soil wash plant is to be located on an area of hardstanding as shown on the Site Layout Plan.

The conveyor belt which will load the soil into the soil washing process is fully enclosed. The site will ensure that regular housekeeping is undertaken to ensure that dust does not build up on the outsides of or underneath the conveyor.

Due to the activities undertaken as part of the soil washing process there is considered to be limited potential for agitation of soils resulting in fugitive emissions of dust.

Untreated soils awaiting soil washing) will be covered where appropriate with tarpaulins to prevent dust generation. The stockpiles can be treated with a dust cannon as an additional dust suppressant.

2.2.6 Screening of non-hazardous soils

The screening of non-hazardous wastes in the area utilised for storage is not considered to pose an additional risk of fugitive emissions to air. Dust controls are in place comprising the dust cannons which will be utilised during any screening activities as required. Regular housekeeping will be undertaken to minimise the spread of dust and ensure effective containment and all site staff, including contractors, will receive appropriate training in order to ensure that employees are conversant with the dust control and management procedures onsite. Screening of non hazardous soils is already regulated under activity reference AR3 Physical treatment consisting of sorting, separation, screening and crushing of non-hazardous waste in the extant Environmental Permit. The location of the non hazardous soils storage and treatment area is centrally located to the Site away from sensitive receptors.

2.2.7 Soil storage

The soil storage area for hazardous soils is to increase by 10,000 tonnes per annum to 20,000 tonnes in total to account for the soils containing heavy metals that are to be accepted for soil washing. The hazardous soil storage pad comprises a kerbed impermeable surface with sealed drainage. This storage area provides temporary storage for soils awaiting treatment. The soils awaiting treatment will be stored separately dependent on contaminants. Dust controls will be applied to the soil storage area as currently undertaken on Site.

3 Potential Dust Emission Sources

3.1 On-Site Sources

Fugitive dust and particulate emissions can potentially arise from the following Site activities:

- Delivery of waste to site and initial pre-acceptance assessment;
- Transfer of soils to appropriate storage area (biopiles, external and internal asbestos soils storage);
- Storage of soils pre and post treatment;
- Bioremediation of hydrocarbon contaminated soils including initial placement, aeration and turning;
- Soil washing of soils containing heavy metals;
- Screening of soils containing asbestos fragments;
- Screening of non-hazardous soils;
- Storage and transfer of residual material removed from screen; and
- Handpicking of asbestos fragments and subsequent storage prior to further treatment.

Fugitive dust may present a dust nuisance to surrounding human receptors or cause an adverse environmental impact if excessive deposits settle on sensitive habitats. Particulates pose a nuisance to human receptors, particularly as an added health risk by inhalation and could have adverse effects on sensitive habitats by smothering vegetation.

3.2 Off-Site Sources

Edwin Richards Landfill Site is located to the southwest and commercial premises are located to the south on Portway Road. There are several roads surround the Site including the B4171 (Dudley Road) 650 m to the southwest. The industrial / commercial facilities and the roads surrounding the Site have the potential for generating dust and particulates.

4 Control Measures for Fugitive Emissions of Dust

4.1 Overview

The bioremediation and physical treatment of soils has been undertaken at the Site since 2016. The Site is located at an elevated level behind a belt of mature trees. Existing Planning Permissions and Environmental Permits are in place onsite. A number of dust controls are already in place onsite and are outlined below.

4.2 Controls

4.2.1 Waste Acceptance Procedure

The Technical Standards Report (Document referenced: K0182-BLP-R-ENV-00004) details the waste acceptance procedure for the STC. Weighbridge will conduct assessment of waste inputs and impose controls and restriction on potentially dusty waste (e.g. bagging, rapid cover following placement, refusal to tip). All soils received at the STC are appropriately sheeted pending pre-acceptance checks. Once formally accepted, dependent on the contaminants present, the soils will be transferred to the appropriate treatment area.

4.2.2 Pre-screening and hand-picking of asbestos soils

Handpicking of soils containing asbestos is carried out within the Soil Treatment Building. Pre-screening of asbestos oils is proposed to be carried out within the Soil Treatment Building.

A permanently installed dust suppression system is present in the Soil Treatment Building and can be operated when required. Surfactant is added to the suppression system as a precautionary measure in the unlikely event of amphibole asbestos fibres being present (Amphibole fibres are hydrophobic (unlike chrysotile fibres) and this makes the fibres more difficult to remove from airborne suspension or likewise immobilise them on soil surfaces with water alone). In addition to the installed dust suppression system there are mobile atomisers and dust cannons. Dust suppression of stockpiles is proposed prior to screening.

The Operator has restrictions placed on soils contaminated with asbestos as stated in Table S2.4 of the permit. This is to limit the potential for airborne respirable asbestos fibres. Once reception analysis is received to confirm that soils have no potential to generate airborne asbestos fibres, they will be moved to the asbestos shed. Any soils received that have the potential to generate airborne asbestos fibres above the permit limits will be rejected from site. Soils containing asbestos accepted on site will then be pre-screened within the building to allow the removal of oversized and fine fractions which have the potential to damage the picking station along with the fines that can conceal smaller bound asbestos debris.

Only soils with a moisture content >15% are to be pre-screened. Generally, soil moisture content is ~20% or above on received soils. Soils are dampened down when required prior to pre-screening. This further limits any potential for liberation of fibres through handling / treatment.

The conveyor belt on the screener will be set at the lowest height level to limit the drop height of material after screening. The deposit point from the picking station is used as one of the monitoring points to ensure the method does not result in asbestos fibres emissions.

The pre-screening will increase the efficiency of the soil processing and will not result in airborne asbestos fibres above permitted limits. It will also significantly decrease the timescales for picking thereby significantly reducing exhaust emissions from mobile plant. Waste Soil containing >0.1% w/w asbestos is classified as hazardous waste. The Operator restricts asbestos in soil to less than 0.1% w/w for chrysotile fibrous asbestos and 0.01% w/w for other forms of fibrous asbestos below the hazardous limit. This is to limit the potential for airborne respirable asbestos fibres which is limited to 0.01 fibres/ml. This concentration was determined as the concentration at where the generation of elevated levels of asbestos fibres was highly unlikely in laboratory conditions. Air monitoring will be undertaken to monitor any asbestos fibre emissions and dust suppression measures are available to ensure fibre generation is never above the air quality target of 0.01f/ml. This process is monitored in accordance with the procedures and monitoring regime detailed in the Emissions Management and Monitoring Plan attached as Appendix B. Monitoring within the Soil Treatment Building has confirmed that the airborne asbestos emissions have never exceeded the WHO air quality guidance levels of <0.0005f/ml which is several orders of magnitude below the permit threshold.

The Soil Treatment Building in which the screen will operate is maintained with daily housekeeping. Areas are emptied of treated soil as soon as validation results are obtained to allow reuse elsewhere on site.

The screener, conveyor belt and associated plant are cleaned as required when accumulations of cohesive soils are observed on the screener decks during the working day.

4.2.3 Waste Storage and Non-Hazardous Screening

All surfaces used to treat or store waste comprise impermeable concrete hardstanding. There are no direct releases off-site other than via the engineered surface water management system. Waste is stored in designated bays or areas either outside or within the building. All bays are clearly marked and signed detailing the quantity and hazardous characteristics of the wastes stored therein. The screening of non-hazardous wastes in the area utilised for storage will only be undertaken where necessary with existing dust controls utilised to minimise the risk of fugitive emissions to air.

During particularly dry weather the storage areas will be dampened down with dust cannons as necessary using the dust suppression measures detailed below. Tarpaulins are used to cover external stockpiles if considered necessary however soils stored pending treatment are stored for short duration and subject to dust suppression. Current additional dust management and suppression measures comprise a permanent water spray system within the building.

4.2.4 Bioremediation Process

The moisture content of the biopiles is maintained at a constant level (~30%) to allow the bioremediation and subsequently minimise the dust potential. Operational controls during the bioremediation process are in place to ensure no turning of the biopiles is undertaken during high winds. Untreated soils not undergoing bioremediation are subject to dust suppression. The planning consent also imposes a 5m height limits.

4.3 Dust Suppression

Dust management and suppression measures comprise a permanent dust suppression system within the Soil Treatment building. Surfactant is added as a precautionary measure in the unlikely event of amphibole asbestos fibres being present (Amphibole fibres are hydrophobic (unlike chrysotile fibres) and this makes the fibres more difficult to remove from airborne suspension or likewise immobilise them on soil surfaces with water alone). Low levels of surfactant are added to water (1 part surfactant to 15 parts water) which is applied to the soil surface only. This mitigation measure is present for use but has not been shown to have been required within the asbestos shed due to the strict acceptance criteria and efficiency of pre-acceptance procedures employed at site. Dust cannons are available to be mobilised across the Site as and where required.

4.4 Housekeeping Practices

Regular housekeeping will be undertaken to minimise the spread of dust and ensure effective containment and all site staff, including contractors, will receive appropriate training in order to ensure that employees are conversant with the dust control and management procedures onsite.

4.5 Site Vehicles

On site vehicle speed limits are enforced to ensure that vehicle movements do not generate excessive dust. All vehicles would arrive sheeted and would only remove their sheets once at the point of material inspection / deposition to prevent dust nuisance along the access route and beyond.

All vehicles will use wheel wash to prevent mud / dust being trailed onto adjacent roads and creating a hazard / nuisance.

Drop heights will be minimised as far as practicable during the loading and unloading of materials to reduce the likelihood of dispersion and minimise the potential for dust release as a consequence of agitation.

All Site roads and surfaces will be inspected on a daily basis. A street sweeper will regularly clean site roads of any mud trailed on from site vehicles. Dampening of site roads / surfaces as necessary using a tanker during dry periods will minimise dust / odour.

5 Potential Pathways

5.1 Airborne Pathways

The potential pathways for dust and particulates to reach sensitive receptors are through the air. This will be determined by:

- The quantity of waste at source;
- Wind direction and speed;
- Intervening obstacles; and,
- Exposure of receptor to waste.

A wind rose generated at from Rowley Regis[2] has been used. The windrose indicates a wind direction from the prevailing south-south-east. Locations to the north-north-west of the STC are therefore most likely to receive potential emissions should they arise. The frequency the wind blows toward potentially sensitive receptors is detailed in Table 1. Met office data for Hayley Green[3] indicate the days where >1mm of rainfall occurring is 132.2 days out of 365 days (36% of the year).

The primary barrier to particulate emissions will be the mature line of trees abutting the northern, western and southern boundary of the STC. These may serve to disperse the wind flow potentially reducing the distance dust emissions could travel downwind causing this material to accumulate in the vegetation. The STC building may also act as a barrier trapping dust, however strong winds may still lift dust over the building.

[2] Rowley Regis Wind Forecast, West Midlands B65 9 - WillyWeather
[3] Hayley Green (West Midlands Conurbation) UK climate averages - Met Office

6 Potential Sensitive Receptors

6.1 Receptor Locations

When choosing the receptors, the closest or the most sensitive (if different from the closest) have been considered in each direction from the hazard. The Sensitive receptors are summarised in Table 1.

The most sensitive receptors are within 500 m radius of the STC making the assessment conservative for other potential receptors located further away. Account has been taken of the mechanism of transport to the sensitive receptor e.g. wind direction or a physical connection to the Site. Receptors are considered sensitive where people and habitats have the potential to be adversely affected by the dust emissions.

The probability of exposure is determined by the distance of the receptor to the Site and the likelihood of the hazard reaching the receptor (e.g. frequency of prevailing wind in that direction). This stage of the assessment assumes that exposure has resulted from an uncontrolled emission i.e. without mitigation.

The distance of these receptors to the Site boundary, their direction relative to the Site and the frequency of the wind blows in the direction of the receptor is detailed below. The sensitivity to dust of the individual receptor types identified in the third column of Table 1 is further detailed in Table 2.

Table 1 – Potential Sensitive Receptors

No.	Receptor Description	Receptor Type	Direction from Site	Distance to Building	Frequency downwind of site
1	Tower Road off Portway Hill	Residential properties	NNE	360 m	6.3 %
2	Dudley Golf Club House	Recreational facility	NNW	125 m	22.1 %
3	Portway Hill	Residential and Commercial Properties	NE	10 m	7.4 %
4	Old Portway House and Barn	Listed building	NE	10 m	7.4 %
5	Portway Road	Residential and Commercial Properties	E to S	10 m	5.5 % to 2.1 %
6	Warren Hall Country Park	Local Nature Reserve	W	610 m	0.7 %
7	Bumble Hole	Local Nature Reserve	W	990m	0.7 %
8	Rowley Hills	Local Wildlife Site	NE	225 m	7.4 %
9	Dudley Golf Course	Recreational	W to NW	40 m	0.7 % to 8.6 %
10	Rowley Regis Golf Course	Recreational	SE to S	120 m	3.6 % to 2.1 %

No.	Receptor Description	Receptor Type	Direction from Site	Distance to Building	Frequency downwind of site
11	Rowley Hall Primary School	School	SE	360 m	3.6 %
12	Grace Mary Primary School	School	NNE	420 m	6.3 %
13	Dudley Road	Residential and Commercial Properties	SW	440 m	4.2 %
14	Deciduous woodland, woodland & good quality semi-improved grassland (nonpriority)	Priority Habitats	NE, S & W	0-500m	4.2 % to 0.7 %

Table 2 – Types of Receptors Sensitive to Dust

Receptor Type	Sensitivity to Dust
Residential	High
Recreational	High
Commercial	High
Highway	Low
Habitat	High
School	High

6.2 Receptor Types

6.2.1 Residential, recreational, industrial, commercial and educational premises

The potential emissions from the STC are likely to have a similar impact on persons occupying residential, recreational, industrial, commercial or educational premises. Exposure of emission to persons at industrial or commercial premises may be lower as they are more likely to be inside during the working day or they may be transient visitors to the premises.

Fine dust particles may be able to travel further than larger particles that may settle on surfaces nearby. Finer particulates may elicit an unpleasant or harmful respiratory effect from sensitive individuals whilst settlement of dust may be unsightly or damaging by smothering sensitive flora.

The closest residential areas to the Site are Portway Hill, Portway Road and Dudley Road. Two primary schools are also within the 500 m radius of the Site. For conservatism this management plan assumes the residents and schools are occupied during the operational hours of the Site by members of the public most sensitive to emissions from the Site. It is considered that the operational controls, physical barriers (building, treeline and fences), and distance to the receptor prevent any emissions from reaching receptors.

6.2.2 Highways and footpaths

The transitory nature of highways means receptors using those locations will be exposed to potential emissions from the STC for shorter (albeit variable) periods of time than residences or businesses. Pedestrians will have longer and more direct exposure to emissions compared to vehicle users.

Highways and a number of footpaths are close to the STC. The highways and footpaths to the north east are upwind of the Site for the majority of the time, but are protected by the boundary fence and dense vegetation.

6.2.3 Habitats, watercourse and waterbodies

The deciduous woodland located from the northeast of the STC is classified as a protected habitat. The Environment Agency describes these types of habitats as contained nutrient sensitive vegetation which if depleted, may affect sensitive species dependent on that type of flora.

Uncontrolled fugitive dust and particulates are likely to affect adjacent habitats. The dense vegetation itself is expected to limit the transit of any such emissions far from the STC. In the unlikely event it was to occur, only the accumulation of significant quantities of dust in the vegetation may inhibit normal plant growth or animal behaviour.

There are no watercourses within the 500 m radius of the STC.

7 Dust Risk Assessment

7.1 Risk Assessment

The risk potential to each receptor as identified in Section 6 from dust and particulates generated at the Site is presented in Table 3 below. This table evaluates the unmitigated risk to sensitive receptors from uncontrolled dust emissions and the control measures to be implemented at the Site in order to minimise this risk, producing a revised risk to receptors.

Table 3 – Fugitive Emission (dust and particulates) Risk Assessment and Management Plan

Hazard / Pathway	Receptor				Probability of exposure	Unmitigated Consequence	Initial Risk / Reason	Risk Management	Mitigated Risk
	No.	Dist.	Direc.	Freq.					
Dust through air from: Vehicle movements. Waste storage. Pre-screening activity. Bioremediation process.	1	360 m	NNE	6.3 %	Medium – proximity to site, occasionally downwind	High - dust nuisance to residents	Medium –dust nuisance, proximity to site	On site vehicle speed limit enforced to ensure that vehicle movements do not generate excessive dust. Dust suppression system that directs a fine mist within the asbestos building and mobile units for general dust suppression for waste storage and treatment activities where required. Bioremediation management controls are in place including an air extraction system, biopiles only being turned during appropriate meteorological conditions. Weighbridge will conduct assessment of waste inputs and impose controls and restriction on potentially dusty waste (e.g. bagging, rapid cover following placement, refusal to tip). Daily visual inspection by appropriate site staff at suitable locations taking account of the prevailing wind direction. All vehicles will use wheel wash to prevent mud / dust being trailed onto adjacent roads and creating a hazard / nuisance. A street sweeper will regularly clean site roads of any mud trailed on from site vehicles. Dampening of site roads/surfaces as necessary using a tanker during dry periods.	Low
	2	125 m	NNW	22.1 %	High - close to site, frequently downwind	High - dust nuisance to users of golf course	High – dust nuisance		
	3	10 m	NE	7.4 %	High – close to site, infrequently downwind	High - dust nuisance to residents	High – dust nuisance		
	4	10 m	NE	7.4 %	High – close to site, infrequently downwind	High - dust nuisance to residents	High – dust nuisance		
	5	10 m	E to S	5.5 % to 2.1 %	High close to site, occasionally downwind	High - dust nuisance to residents	High – dust nuisance		
	6	610 m	W	0.7 %	Low - distant from site, occasionally downwind	High – dust nuisance and potential to smother vegetation	Low – significant distance, occasionally downwind		
	7	990m	W	0.7 %	Low - distant from site, occasionally downwind	High – dust nuisance and potential to smother vegetation	Low – significant distance, occasionally downwind		
	8	225 m	NE	7.4 %	Medium - proximity to site, infrequently downwind	High – dust nuisance and potential to smother vegetation	Medium – dust nuisance, proximity to site		
	9	40 m	W to NW	0.7 % to 8.6 %	High - close to site, infrequently to occasionally downwind	High - dust nuisance to users of open space	High – dust nuisance		
	10	120 m	SE to S	3.6 % to 2.1 %	High - close to site, occasionally downwind	High - dust nuisance to users of golf course	High – dust nuisance		
	11	360 m	SE	3.6 %	Low – distant from site, occasionally downwind	High - dust nuisance to students	Medium – dust nuisance, distant from site		
	12	420 m	NNE	6.3 %	Low – distant from site, occasionally downwind	High - dust nuisance to students	Medium – dust nuisance, distant from site		
	13	440 m	SW	4.2 %	Low – distant from site, occasionally downwind	High - dust nuisance to residents	Medium – dust nuisance, distant from site		
	14	0-500m	NE, S & W	4.2 % to 0.7 %	High – close to site and occasionally downwind	High – dust nuisance and potential to smother vegetation	High – dust nuisance		

8 Community Engagement, Reporting & Contingencies

8.1 Overview

Prevention will be viewed as the most effective means of controlling dust before an adverse impact occurs from uncontrolled emissions. The Source → Pathway → Receptor model determined above allows for the identification of the critical control points where dust can arise, how it can travel to a receptor and the likely impact.

The performance of a dust and particulate management system will ultimately be judged from the STC on the receptors. Should complaints be received, a procedure will be in place to effectively deal with the issue in a sensitive, efficient and auditable manner.

The controls for each source term are detailed in previous sections of this report. The management of those controls will be based on the on-going monitoring regime on Site. The monitoring regime can work as an early warning system against potential problems (e.g. meteorological monitoring) or a diagnostic tool to establish the cause of a dust event (e.g. perimeter monitoring).

8.2 Monitoring

The Site has an Emissions Management and Monitoring Plan in place for the prevention and control of dust, PM10 and asbestos fibres, attached as Appendix B. This includes monitoring procedures and management controls to limit the potential for dust, PM10 and asbestos fibres to be released. Monitoring requirements are set out in Schedule 3 of the permit and in the Emissions Management and Monitoring Plan. Table 4 summarises those relating to dust, PM10 and asbestos. The monitoring locations are shown on K1082.2.003.

Table 4 – Monitoring

Parameter	Frequency	Thresholds	Comments
Asbestos Transmission Electron Microscopy (TEM)	During the asbestos hand-picking works	<0.01f/ml	Method as described in M17 guidance and Table S3.3 of Permit
Asbestos Scanning Electron Microscopy (SEM)	Quarterly		Added reassurance to ensure baseline of asbestos emissions is not changing. Method is as described in M17 guidance
Dust	Monthly	200mg/m2/day	Frisbee dust gauge method as described in M17 guidance
Soil moisture content	Reception testing of soils as required	15% moisture content	To ensure soils received have low potential for dust release
Asbestos content in soils	Reception testing of soils	<0.1% chrysotile, <0.01% other types of asbestos fibres. No visible unbound asbestos or insulation	To ensure soils received cannot generate airborne emissions of asbestos above the method detection limit

Parameter	Frequency	Thresholds	Comments
PM_{10}	Weekly or as required if dust is suspected	250µg/m3/15 minute TWA*	Use of handheld nephelometer – not used for compliance against EU Directive Limit for PM10 as stated in EA Guidance M8 but provides real time results for implementing immediate mitigation if results are within 25% of threshold. A handheld mobile device for discrete monitoring around working areas. This method is preferred to support operational control of emissions rather than a fixed monitoring system for general air quality analysis at fixed locations (e.g. Filter Dynamics Measurement System/Beta Attenuation Monitor)

**Mitigation implemented if within 25% of threshold due to accuracy of nephelometer method Grey shading means the analysis results are already reported as required by the permit*

8.2.1 Offsite Monitoring

Regular visual inspections of the STC and perimeter will be undertaken by the Site Manager to identify any sources of dust and particulates and to establish whether any dust has left the STC. This will include dust arising from vehicles arriving at the STC.

All Site Personnel will be responsible for reporting dust and particulate problems as soon as practicable to the Site Manager or the next level of management if the Site Manager is not available.

The following locations will be targeted for dust monitoring by the nominated Site staff:

- Weighbridge or waste reception area (continuous monitoring of vehicles);
- Point of waste deposition;
- Bioremediation area, particularly during initial placement, aeration and turning; and
- Subject to prevailing wind direction (i.e. up and down wind), appropriate areas of the site perimeter.

The following information will be recorded during each round of monitoring:

- Name of assessor and position at facility e.g. weighbridge clerk etc;
- Nature of any problem identified including location, source, date, time, duration, prevailing weather conditions and likely cause;
- On-site activities and operational condition at the time of the monitoring visit (this should include any of the abnormal events detailed in Section 8.7 below);
- Records of the likely source of any dust, even if it is not from the STC; and,

- Details on the corrective action taken, realistic timeframes for remedial works and any subsequent changes to monitoring and operational procedures.

The Site Manager will be informed immediately of any findings of dust and particulates attributed to the site and will authorise remedial measures to be taken.

Dust will be monitored via frisbee gauges on a monthly basis. A limit of 200mg/m2/day should be applied.

8.2.2 PM10 Monitoring

Consideration has been given to carrying out total deposited dust and / or PM10 monitoring at the site. The main source of PM10 is considered to be releases from the treatment plant inside the asbestos building as a result of soil screener and 360 excavator.

PM10 is proposed to be monitored on a weekly basis as stated in Table 4 or as required if significant dust release is expected. This will be undertaken by handheld nephelometer such as a Dustmate or similar to provide real time results for implementing immediate mitigation if results are within 25% of threshold. This method is preferred to support operational control of emissions rather than a fixed monitoring system for general air quality analysis at fixed locations (e.g. Filter Dynamics Measurement System/Beta Attenuation Monitor).

8.3 Complaint Process

Any complaints received at the STC or via the Regulatory bodies including the Environment Agency and Local Authority, will be recorded using the Compliant Report Form contained in the Site Management System. On receipt of a compliant the Site Manager will be informed which will instigate further visual dust monitoring at the location of the complaint and on-site to determine the extent and location of the dust generating materials and/or process will be identified. Where possible, as much information and detail about the complaint will be recorded, whether this is from the relevant authority or complaint direct to site. This information will assist in the investigation and determining the source of the dust e.g. differentiating between potential dust from the Site or other off-site activities.

All complaints and queries will be logged in accordance with the management system as soon as is practicably possible. All complaints logged will be subject to investigation and complainants responded to within 48 hours of receipt, where possible.

In the event that a substantiated dust complaint is received arising from the site, additional monitoring will be undertaken at the nearest sensitive receptors to determine any off-site dust emissions.

Complaints regarding dust from the Site will be investigated in accordance with the protocol, and appropriate records maintained which may include:

- Complaints received including name and contact details of complainant (if known), and complainants description of the dust;
- Nature of problem including date, time, duration, prevailing weather conditions and cause of the problem;
- Onsite activities and operational condition at the time of the complaint;
- Records of the likely source of the dust even if it is clearly not from the Site; and,
- Details on the corrective action taken, and any subsequent changes to monitoring and operational procedures.

The Environment Agency will be informed by WRG of the complaint and WRG will confirm to the best of its knowledge the information described above.

WRG will ensure that the complainant has all the relevant contact details of the site (i.e. the Site Manager) and the officer responsible at the Environment Agency. WRG will be in regular contact with the complainant and the Environment Agency whilst the cause of the dust is being investigated and remediated.

An evaluation of the effectiveness of the techniques used will be carried out on completion of any remedial measures or if the complaints persist. Records of the above will be retained by site for future reference.

8.4 Means of Contact

The Site will be readily contactable to outside organisations and to members of the public. The Site signage board (placed in a readily visible location) will contain the necessary contact details for both the Site operations and Environment Agency. The company website also contains the necessary contact details for each individual Site.

Any complaints received directly to Site will be notified to the Environment Agency. Should an off-site issue arise, therefore, the complainant has a readily available means of getting in touch with WRG.

8.5 Complaint Screening

As part of each dust complaint received, these will be objectively assessed against the wider environment to ensure that the source of the emission is traced back to the correct source. It is essential that the source is correctly identified in order that mitigating measures can be applied effectively and correctly. The complaint will also be assessed against previous records to place the nature of the complaint into context.

If patterns in complaints emerge, community groups or individuals (subject to their agreement) will be called upon to act as an additional dust monitoring resource.

8.6 Complaints Investigation

In the event that dust is found to be causing a problem from the STC, as determined and confirmed by investigation into off-site complaints, or during routine monitoring; the following measures will be undertaken:

- Additional dust monitoring as detailed above to identify the extent of the dust emission and potential cause for the dust i.e. waste material and/or activity;
- Examination of the operational activities at the time of the dust complaint;
- Examination of the meteorological conditions at the time of the complaint;
- Carry out a review of the operational procedure and controls and instigate any control measures immediately following identification of the problem; and,
- Further monitoring will be carried out to ensure the issue has been addressed and to monitor the effectiveness of any control measures undertaken.

8.7 Abnormal Events

The FEMP assumes that the STC will be running under expected operational conditions. There are however circumstances that could result in a dust emission from the Site if not appropriately considered in advance.

8.7.1 Strong Winds

Daily visual inspection of the site infrastructure will be undertaken and recorded. Additional inspection for damage resulting from high wind events will also be undertaken and contingency actions identified below considered should high wind conditions result in escape of significant dust emissions.

8.7.2 Hot/Dry Conditions

The warmer the weather the greater the potential for wastes to become dry and dusty, particularly when stored outside and when agitated. Daily inspections will be undertaken to ensure soils delivered to the site are appropriately wetted down if required to reduce dust emissions. During prolonged periods of hot weather inspection frequency will be increased, and dust mitigation measures will be more readily utilised. Additionally, dust suppression may be employed if deemed necessary. Contingency actions plans are included in the Site Management System and are identified in Table 5. Those specific to the asbestos treatment building are summarised below.

Table 5 – Monitoring, Audits and Emergency Procedures

Activity	Measures Employed
Monitoring	If the dust suppression mist system is not operational then works will cease. In the unlikely event that airborne asbestos is >0.01 fibres/ml then airborne

Activity	Measures Employed
	monitoring will be repeated immediately and works stopped after samples are obtained until the second round of results are available. For external quarterly monitoring, the criteria are included in Table 2 of Appendix A for the lower detection limit implemented on a quarterly basis. Conduct monitoring and review of wind direction for potential off-site contributory factors with weather station data. Conduct review of waste input materials and resample potential source stockpiles for laboratory analysis. Conduct further operational checks on fugitive dust controls. Enter report in Site Log
Audits	The site is subject to regular audits by FCC quality staff to ensure that the works are implemented in accordance with accredited quality systems on site, the environmental permit and site-specific risk assessments and method statements. A quarterly review of all data is reviewed by the compliance section of FCC as part of their permit reporting requirements.
Emergency Procedures	All operations Stop – conduct urgent review of Asbestos Risk Assessment and Asbestos Plan of Work. Conduct review of wind direction for potential off-site contributory factors. Conduct comprehensive review of all input materials. Conduct comprehensive operational checks on fugitive dust controls. Submit retained sample filter(s) for urgent SEM-EDXA analysis. No commencement of operations until a safe system of work is established Implement any regulatory reporting required by the environmental permit

8.7.3 Implementation of the Contingency Plan and/or Emergency Plan

Unscheduled unavailability should only take place due to unscheduled maintenance, emergency situations and for Health and Safety reasons such as a fire at the site. In such cases the plant staff will initially inform the plant manager who will in turn inform service managers, the Authority and the Environment Agency. Site staff will implement measures to store or divert wastes as required.

8.7.4 Operator’s Experience with contingency/emergency situations

WRG has Emergency / Incident Preparedness procedures which are implemented and continually reviewed to help improve procedures across the site’s operations.

8.7.5 Review and Update of Contingency and Emergency Plans

The Emergency / Incident Preparedness procedures will be reviewed following any incident where they have had to be followed. They will be updated as necessary with any lessons learned.

8.8 Records and Reviews

A daily record relating to the management and monitoring of dust will be maintained. It will include the following details:

i. The results of inspections and visual monitoring carried out by installation personnel;

ii. Weather conditions including atmospheric pressure, wind speed and wind direction;

iii. Problems including date, time, duration, prevailing weather conditions and cause of the problem;

iv. Complaints received including address of complainant; and

v. Details of the corrective action taken, and any subsequent changes to operational procedures.

The FEMP will be reviewed on an annual basis with the scheduled review of the site management system or with every major increase, or alteration to the dust generated at site (i.e. a change to dust source term, pathways or receptors).

8.9 Communication tools

Stakeholders will typically include the Local Authority, the Environment Agency, Parish Councils and members of the local community. Other stakeholders may include local businesses should the facility be deemed to impact upon them. Local communities to be kept informed of general site activities, including working hours via the Edwin Richards Quarry Liaison Committee

In addition, and as covered within the complaints section, contact details will be made available so that any complaints can be directed to site and an investigation undertaken immediately.

Appendix A – Drawings

GENERAL NOTES

1. SURVEY INFORMATION SUPPLIED BY THE WASTE RECYCLING GROUP .
2. DO NOT SCALE
3. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM
4. ANY ANOMALIES ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF BYRNE LOOBY

KEY

PERMIT BOUNDARY

NEW BIOREMEDIATION AREA

85.0
86.0
EXISTING GROUND CONTOURS

BUFFER ZONE

9 RECEPTOR MARKER

Rev	Date	Description	By	Chk	App
01	23/12	BOUNDARIES ADDED	GH	EG	CF

BYRNELOOBY
WWW.BYRNELOOBY.COM
IRELAND | UK | UAE | BAHRAIN | KSA

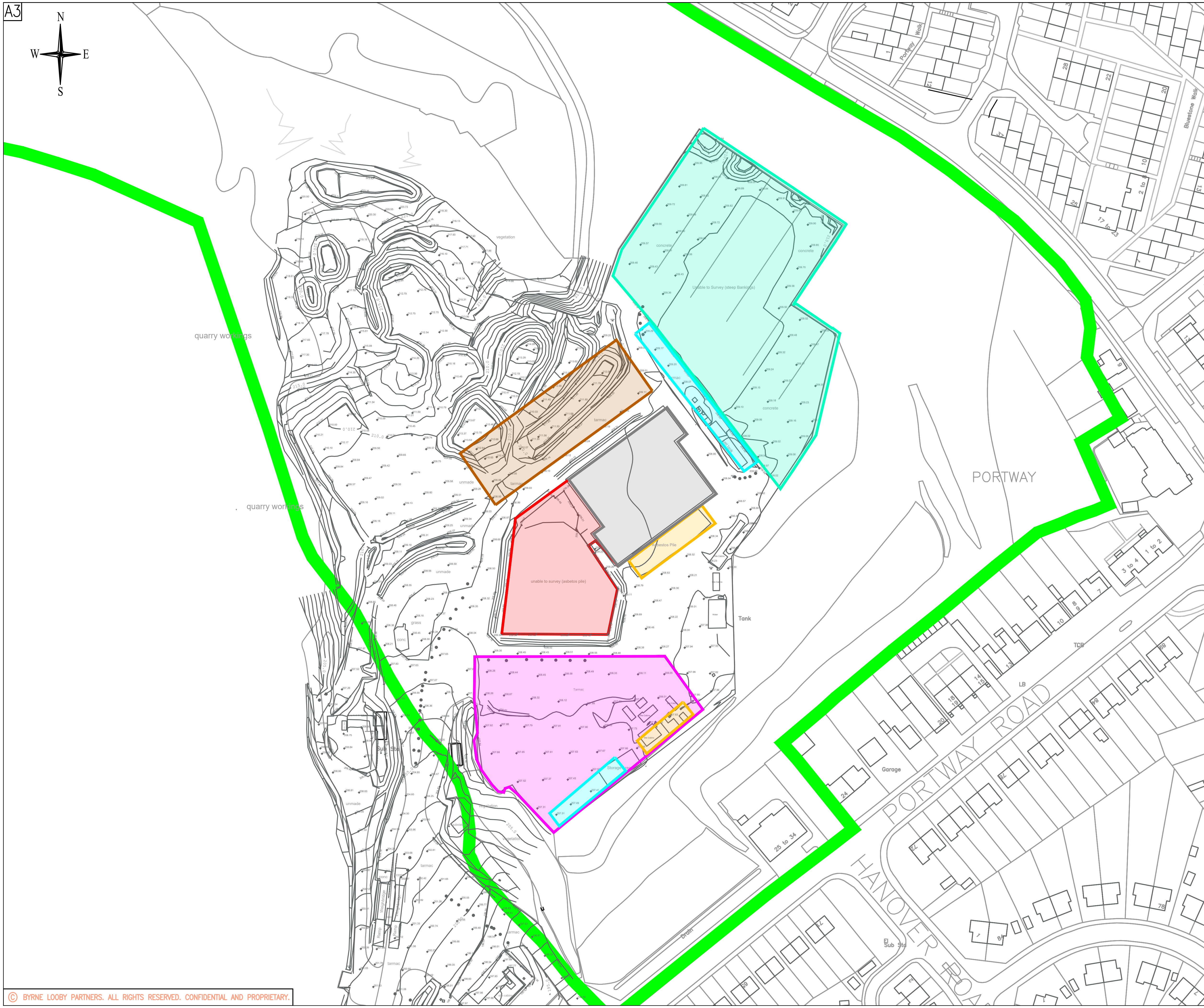
CLIENT
waste recycling GROUP

PROJECT
EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

DRAWING TITLE
SENSITIVE RECEPTOR PLAN

STATUS
FINAL

Date: 21.12.22	Scale: N/A	Drawn: JM	Chk: JW	App: JW
Project No: K0182	Drg. No: K0182.1.001			Rev: 01



GENERAL NOTES

1. SURVEY INFORMATION SUPPLIED BY THE WASTE RECYCLING GROUP .
2. DO NOT SCALE
3. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM
4. ANY ANOMALIES ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF BYRNE LOOBY

KEY

- PERMIT BOUNDARY
- NON–HAZARDOUS SOIL STORAGE AND SCREENING AREA
- BIOLOGICAL TREATMENT AREA
- BIOFILTERS
- HAZARDOUS SOILS STORAGE AREA
- BIOLOGICAL TREATMENT AREA/SOIL WASHING AREA
- WATER TREATMENT PLANTS
- SOIL TREATMENT BUILDING

Rev	Date	Description	By	Chk	App

BYRNELOOBY

WWW.BYRNELOOBY.COM

IRELAND | UK | UAE | BAHRAIN | KSA

CLIENT

waste recycling group

PROJECT

EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

DRAWING TITLE

SITE LAYOUT PLAN

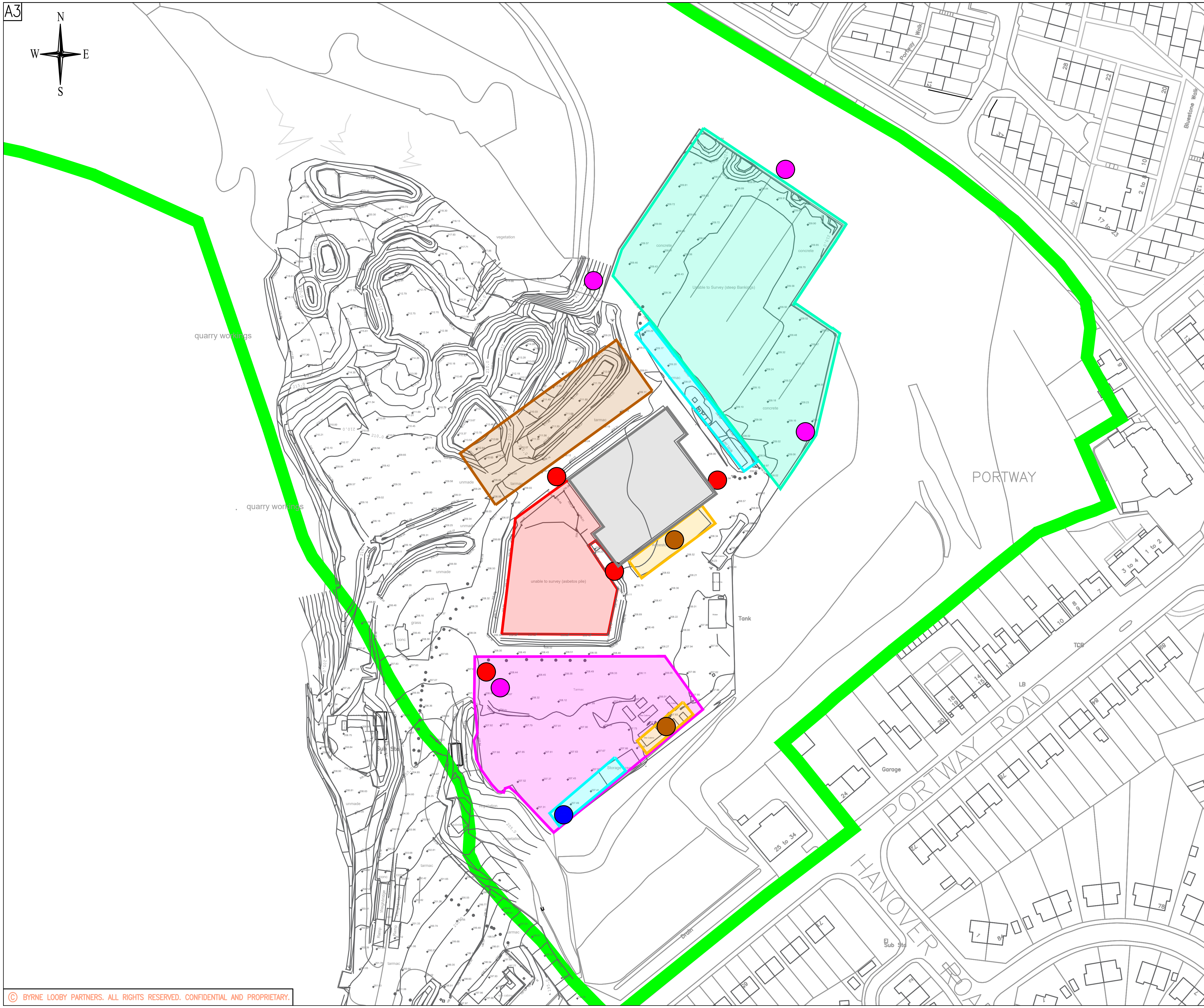
STATUS

FINAL

Date: 20.06.23	Scale: 1:1500	Drawn: JM	Chk: JW	App: JW

Project No:	Drg. No:	Rev:
K0182	K0182.2.002	01

A3



GENERAL NOTES

1. SURVEY INFORMATION SUPPLIED BY THE WASTE RECYCLING GROUP .
2. DO NOT SCALE
3. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM
4. ANY ANOMALIES ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF BYRNE LOOBY

KEY

- PERMIT BOUNDARY
- NON-HAZARDOUS SOIL STORAGE AND SCREENING AREA
- BIOLOGICAL TREATMENT AREA
- BIOFILTERS
- HAZARDOUS SOILS STORAGE AREA
- BIOLOGICAL TREATMENT AREA/SOIL WASHING AREA
- WATER TREATMENT PLANTS
- SOIL TREATMENT BUILDING
- AIR SAMPLING: ASBESTOS/PM10
- AIR SAMPLING: TPH/BTEX/PAH'S
- AIR SAMPLING: DUST/NOISE/ODOUR
- WATER SAMPLING: SEVERN TRENT

Rev	Date	Description	By	Chk	App

BYRNELOOBY

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PROJECT

EDWIN RICHARDS QUARRY SOIL TREATMENT CENTRE

DRAWING TITLE

EMMISIONS MONITORING PLAN

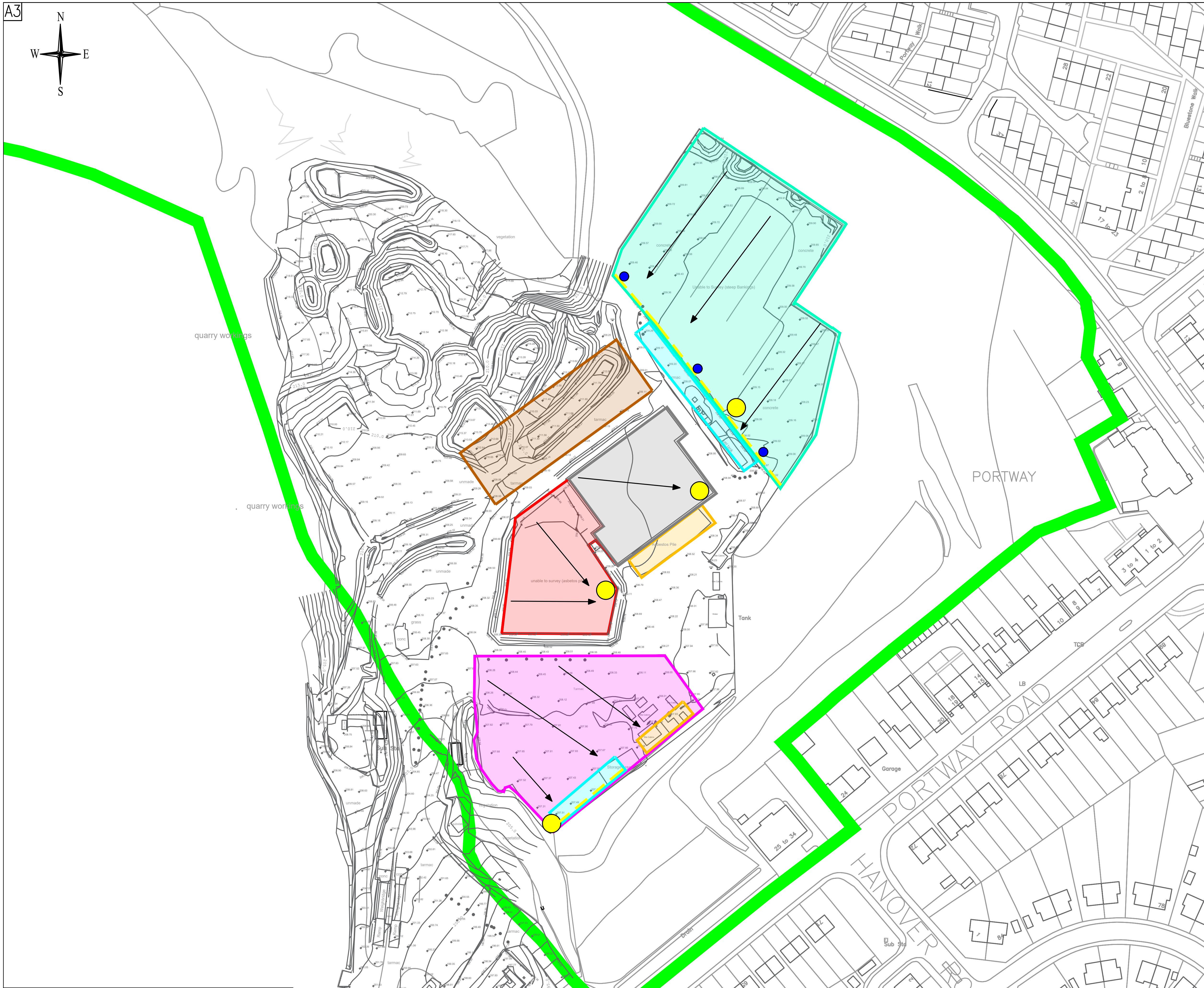
STATUS

FINAL

Date: 20.06.23	Scale: 1:1500	Drawn: JM	Chk: JW	App: JW

Project No:	Drg. No:	Rev:
K0182	K0182.2.003	01

A3



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KEY

- PERMIT BOUNDARY
- NON-HAZARDOUS SOIL STORAGE AND SCREENING AREA
- BIOLOGICAL TREATMENT AREA
- BIOFILTERS
- HAZARDOUS SOILS STORAGE AREA
- BIOLOGICAL TREATMENT AREA/SOIL WASHING AREA
- WATER TREATMENT PLANTS
- SOIL TREATMENT BUILDING
- PUMPING CHAMBERS
- DRAINAGE GULLY
- DRAINAGE DIRECTION
- SURFACE WATER DRAINAGE PIPE

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DRAINAGE PLAN

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Appendix B – Emissions Management and Monitoring Plan

Emissions Management and Monitoring Plan

This document has been prepared in response to the Schedule 5 notice dated 28/09/20 for the variation to permit reference EPR/HP3632RP/V003.

The document details the existing monitoring undertaken at site both for reporting against the permit conditions and the other monitoring undertaken as routine by the applicant to support effective emissions management at the site. This report includes some minor changes to sampling locations due to the change in layout of the site under the proposed permit variation. In preparing this document the following EA guidance documents has been reviewed:

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Potential Emissions at Edwin Richards Quarry Soil Treatment Facility

The following provides a list of potential emissions at the soil treatment facility

1. Dust
2. Volatile Organic Compounds
3. Odours
4. Surface Run Off
5. Noise and vibration
6. Drag out of mud/debris

Items 2-6 were addressed by the original H1 ERA prepared by Amex Foster Wheeler Environment & Infrastructure UK Limited (Amec) that was submitted and approved as part of the original permit application for the facility. The Amec H1 ERA considered which aspects of the operation were likely to cause a potentially harmful emission in terms of odour, noise and vibration, fugitive emissions (including dust and pests) and accidents. This also referenced the Best Available Techniques and Operating Techniques including details on the types and quantities of waste accepted, operating controls and pollution mitigation controls. An ERA prepared by TerraConsult (Report Ref: 3483/R/002/02) was submitted in November 2017 in support of an application to vary permit EPR/HP3632RP to allow the acceptance of soils containing asbestos and untreated woodchip. The ERA was updated with the permit variation application issued to the EA on 20 June 2019.

The Schedule 5 received on 28/09/20 requires a revised Emissions Management and Monitoring Plan for the whole site. It requests that we will need to include the following aspects:

1. You must use appropriate measures to prevent emissions of dust, PM10 and asbestos fibres.

2. You must design, operate and maintain all internal and external storage areas and treatment processes, including all associated equipment and infrastructure, in a way that prevents fugitive emissions to air, including dust, PM10 and asbestos fibres. Where that is not possible, you must minimise these emissions.

3. All internal and external storage areas and treatment processes must collect, extract and direct all process emissions to an appropriate abatement system for treatment before release. Where that is not possible, you must minimise these emissions.

4. To reduce point source emissions to air (dust, PM10 and asbestos fibres) from the internal and external storage areas, treatment processes and handling of waste, you must use an appropriate combination of abatement techniques, including one or more of the following systems: adsorption (for example, activated carbon), biofiltration, wet scrubbing, fabric filters, high efficiency particulate (HEPA) filtration, condensation and cryogenic condensation, cyclonic separation, electrostatic precipitation and thermal oxidation.

5. You must identify the main chemical constituents of the site's point source emissions as part of the site's inventory of emissions to air.

6. You must make an assessment of the impact of the substances emitted to air, following the Environment Agency's guidance; Control and monitor emissions for your environmental permit https://www.gov.uk/guidance/control-and-monitor-emissions-for-your-environmental-permit#dust-mud-and-litter

7. You must design, operate and maintain an appropriate monitoring system on site to ensure dust, PM10 and asbestos fibres releases are prevented, if not minimised, from leaving the site boundary.

The above seven points are now addressed.

You must use appropriate measures to prevent emissions of dust, PM10 and asbestos fibres:

Table 1. Sources of Emissions and Mitigation

Parameter	Source	Mitigation
Dust	Soil Inputs	Reception of soils with moisture content >15%. Generally soil moisture content is ~20% on received soils
	Dragout of mud onto road	Frequent road sweeping/damping down, daily visual inspections, speed limits on roads and designated traffic routes on hardstanding
	Soil Stockpiles/Biopiles	Limiting stockpile height within approved areas, sealing stockpile surfaces or covering, elevated soil moisture content >15% with reintroduction of treated water if required
PM10	Heavy duty vehicles	Traffic limits and routes, addition of soil screening to permit to enable tenfold increase in soil processing rates and reduction in plant time
	Soils	Unlikely with moisture content >15% and elevated clay content
Asbestos Fibres	Asbestos contaminated soils	Conservative waste acceptance criteria to prevent the acceptance of soils that can generate airborne asbestos fibres above the detection limit
		Moisture content in soils >15%. Dust suppression system on site
	Asbestos removed from soil	Double bagged and stored in locked skip

You must design, operate and maintain all internal and external storage areas and treatment processes, including all associated equipment and infrastructure, in a way that prevents fugitive emissions to air, including dust, PM10 and asbestos fibres. Where that is not possible, you must minimise these emissions.

Internal and external storage areas and treatment equipment are constructed on impermeable hardstanding with sealed perimeter kerbs and underground drainage and pumping chambers. Water treatment equipment is located within bunded areas with a minimum of 110% storage capacity. This ensures that there is no cross contamination to land or surface water from mobile contaminants or impacted surface water.

<u>Biotreatment Area</u>
The biopiles are operated using vacuum technology that means that >99% of volatile contaminants within soil pore spaces are collected and treated at the adjacent biofilter. The conversion of hydrocarbons to carbon dioxide and water vapour means that the soil moisture concentration in soils is elevated during treatment and is rarely, if ever below 15-20%. Soil in treatment does not give rise to visible dust or elevated dust concentrations during treatment.

<u>Access Roads (biotreatment and asbestos treatment area)</u>
Access roads and exposed areas of the treatment pads are potential sources of dust due to drag out of soil from vehicle movements which can dry out to a level which could post a dust nuisance. All traffic routes are regularly swept and damped down to prevent mud accumulation on internal roads or the public highway or be a source of dust during dry conditions.

<u>Asbestos Treatment Area</u>
The control of asbestos emissions is predominantly based upon only receiving soils that are proven to pose no potential for airborne emissions of asbestos fibres above the detection limit. The approach to achieving this has been stated in the previous permit variation approved in February 2018.

Soils with asbestos will be quarantined prior to formal acceptance even where in the majority of cases, soils have already been visually inspected and sampled prior to a formal offer for accepting the soils has been issued to the waste producer. The reception testing also includes for moisture content which will provide information on the dust potential in addition to the asbestos fibre quantification.

Reception testing will be undertaken at the receipt of soils and any soils that contain >0.1% chrysotile fibres, >0.01% other forms of asbestos fibres, or any form of unbound asbestos will be rejected from site. As an extra level of mitigation all externally stored asbestos contaminated soils will be covered prior to transfer to the internal building for screening and hand picking.

Within the asbestos soils storage and treatment areas, a dust suppression system is available to reduce dust and any particulate emissions. However, even without this operating and treatment activities operational there has never been an incidence of airborne asbestos being measured above the detection limit using Phase Contrast Microscopy (PCM) or if required to achieve a lower detection limit: Scanning Electron Microscopy (SEM) or Transmission Electron Microscopy (TEM).

<u>PM10 emissions from vehicles</u>
The main sources of PM10 emissions on site are from:

- Excavators

- Dump trucks
- Tipper/articulated lorries
- Hopper and Picking station

At present the use of the hand picking inside the building allows for the processing of approximately 50t/day. The picking station is regularly damaged as no removal of oversize inclusions is permitted and so there is significant amount of down time for asbestos processing plant. Also, the presence of soil fines in the matrix has the potential to conceal smaller asbestos debris meaning that the soils are generally handpicked twice to ensure compliance with the requirements to achieve a non-hazardous soil status. The existing approved method requires a significant amount of plant time for each tonne of asbestos contaminated soil and therefore is a source of elevated PM10.

On projects with a mobile plant license deployment a soil screener is added to the above list of equipment. This increases the throughput to approximately 500t/day, results in less downtime and due to the separation of the different soil fractions makes the hand picking significantly more effective with little or no double handling.

Therefore by adding the soil screening option, the efficiency is increased tenfold, so whilst there is a slight increase in PM10 levels as there is more plant present, it is for 10% of the existing timescales.

We have recently hired an electric hopper and picking station to review suitability which will offset PM10 emissions from the previous set of equipment. It is proposed to make this a permanent acquisition if the pre-screening is approved as it is only suitable for soils without large inclusions.

There will be no increase in asbestos fibres due to the strict waste acceptance criteria and we would anticipate a decrease in dust as the soil screener will be fitted with a spray rail for dust suppression. There would be a tenfold decrease in PM10 emissions from the soil processing due to the reduced plant timescales.

The additional storage areas will allow a one way traffic system to be employed and avoid the vehicle restrictions and delays during delivery into the asbestos building. This will significantly decrease the time the lorry is present on site and result in a reduction in PM10 emissions.

All internal and external storage areas and treatment processes must collect, extract and direct all process emissions to an appropriate abatement system for treatment before release. Where that is not possible, you must minimise these emissions.

The emissions from the biotreatment pad are collected by the undersoil pipework with liquids treated in the water treatment system and air treated by the biofilter. This approach is well established.

Asbestos fibres are not generated on site above the detection limit so no abatement system is required.

Dust generation is largely on haul roads and road sweeping/dust suppression is undertaken at source to prevent or minimise dust emissions occurring.

PM10 emissions are largely from heavy plant and vehicle traffic. Emissions from vehicles delivering soils to site are to be reduced by having external reception areas rather than the existing system of delivering inside a building which often leads to queuing vehicles.

The use of a soil screener in the asbestos processing will result in a tenfold reduction in PM10 emissions compared to the existing emissions.

To reduce point source emissions to air (dust, PM10 and asbestos fibres) from the internal and external storage areas, treatment processes and handling of waste, you must use an appropriate combination of abatement techniques, including one or more of the following systems: adsorption (for example, activated carbon), biofiltration, wet scrubbing, fabric filters, high efficiency particulate (HEPA) filtration, condensation and cryogenic condensation, cyclonic separation, electrostatic precipitation and thermal oxidation.

The majority of emissions described previously are prevented from occurring and do not require further mitigation after the initial suppression. Monitoring will provide verification to the effectiveness of the suppression works.

A water treatment plant is present on site to continuously treat water as it is collected from treatment areas.

A biofilter is used to treat continuous emissions from the biotreatment area and is deemed a point source emission and is currently monitored as per Table S3.1 of the permit.

Only the presence of PM10 that could accumulate inside the asbestos building is deemed to potentially require mitigation as a point source. This is released by the treatment plant from inside the asbestos building as a result of soil screener and 360 excavator. In the event that monitoring data shows that the emissions are within 25% of the thresholds in Table 3 then the building will have HEPA filters installed to mitigate point source emissions.

Mitigation of PM10 in a situation where concentrations are at 250µg/m3 or above, would comprise of using HEPA filters located near to the exhaust of the soil screener and on the ground close to the 360 excavator loading the screener. The type of HEPA filter utilised would allow 5,000m3/hr per unit and 2 units would be employed to allow for 10,000m3/hr flow rate. A typical HEPA filter employed on construction sites is shown below on the attached link.

https://www.dustarrest.com/product/dustblocker-5000-air-filtration-cleaner

You must identify the main chemical constituents of the site's point source emissions as part of the site's inventory of emissions to air.

Table 2. Chemical Constituents of Emissions

Source	Chemical Constituents
Biotreatment area	TPH, PAHs, BTEX, total VOCs
Asbestos building	PM10 from indoor soil screener and excavator unless electric or hybrid plant is used

All other sources are suppressed and therefore prevented from occurring. PM10 emissions from vehicles/plant outside of the asbestos building are not deemed to be point source emissions.

You must make an assessment of the impact of the substances emitted to air, following the Environment Agency's guidance; Control and monitor emissions for your environmental permit https://www.gov.uk/guidance/control-and-monitor-emissions-for-your-environmental-permit#dust-mud-and-litter

A historical assessment of the impact of substances to air was completed in 2016 by Amec in the Air Quality Assessment document for the treatment of 150,000t of soils at the treatment facility. This assessment has not changed despite the inclusion of asbestos contaminated soils to the permit. There are no additional emissions from this activity above those permitted in 2016 as the restrictions placed on waste acceptance prevents airborne asbestos emissions from occurring. The same standards will be maintained if the permit variation is approved with an improvement in air quality as a result of reduced plant use. There is a change however in areas of the site being used for soil treatment with the extension in use of the building and adjacent soil storage area. However, the measures detailed in Table 1 of this response are utilised to mitigate any emissions to the limits provided in Table 3.

You must design, operate and maintain an appropriate monitoring system on site to ensure dust, PM10 and asbestos fibres releases are prevented, if not minimised, from leaving the site boundary.

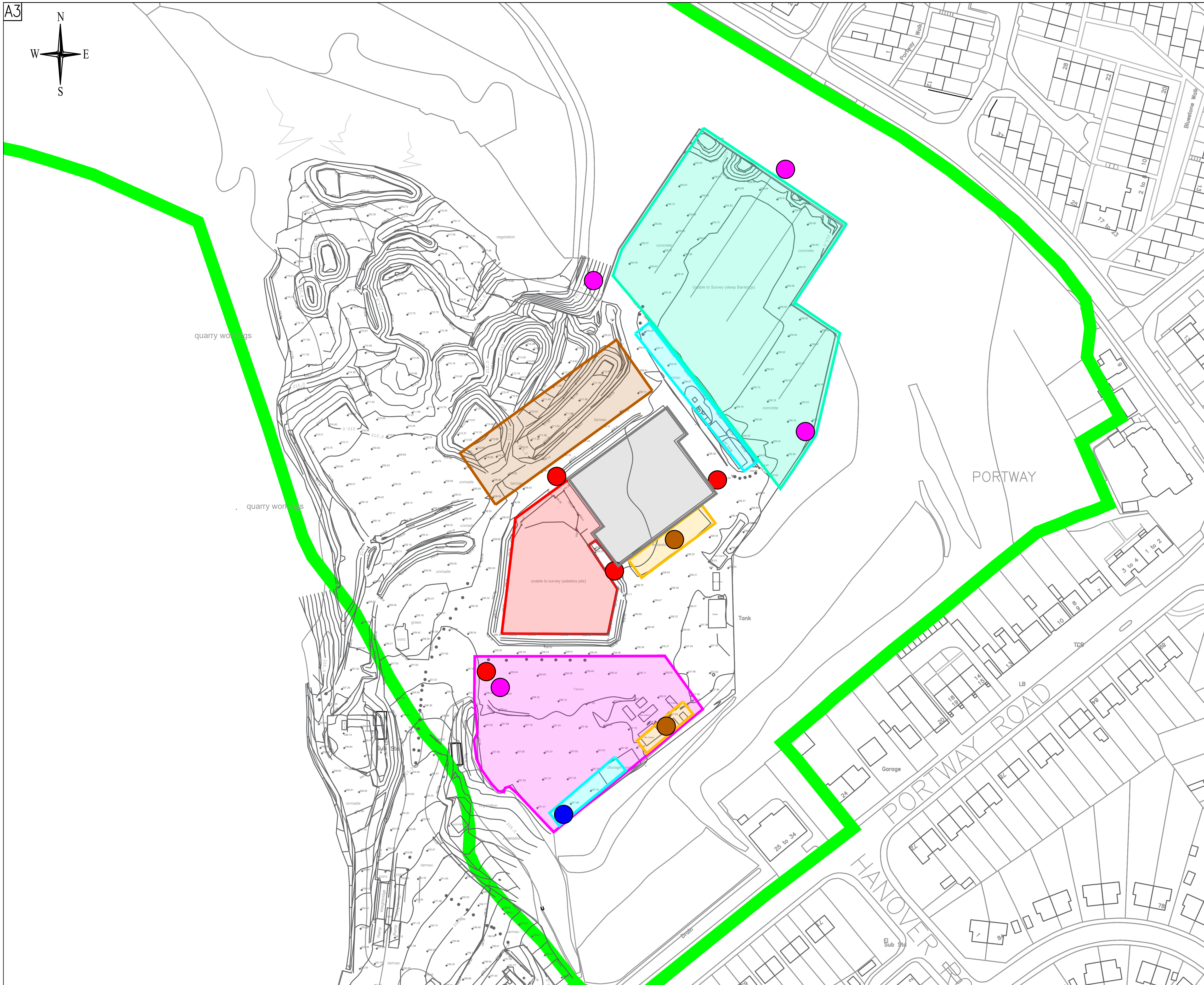
Table 3 provides detail of the existing monitoring undertaken on site for reporting as a permit condition, additional monitoring undertaken for internal management and control of emissions (but not required to be reported as a permit condition) with an update on locations in Appendix A to reflect the change in layout proposed for the site.

All equipment is calibrated at a frequency dictated by the manufacturer rather than a 4 monthly interval.

Table 3. Emissions Monitoring

Parameter	Frequency	Thresholds	Comments
Asbestos (TCM)	Daily during initial soil screening	<0.01f/ml	Proposed for permit variation to replace monitoring during hand picking. Method as described in M17 guidance and Table S3.3. This frequency is far in excess of other similarly permitted facilities.
Asbestos (SEM)	Quarterly		Added reassurance to ensure baseline of asbestos emissions is not changing. Method is as described in M17 guidance. Detection limit anticipated to be <0.0005f/ml. This monitoring is far in excess of other similarly permitted facilities.
Dust	Monthly	200mg/m2/day	Frisbee dust gauge method as described in M17 guidance.
Soil moisture content	Reception testing of soils as per	15% moisture content	To ensure soils received have low potential for dust release
Asbestos content in soils	Reception testing of soils	<0.1% chrysotile, <0.01% other types of asbestos fibres. No visible unbound asbestos or insulation	To ensure soils received cannot generate airborne emissions of asbestos above the method detection limit
PM_{10}	Weekly or as required if dust is suspected	250µg/m3/15 minute TWA*	Use of hand held nephelometer – not used for compliance against EU Directive Limit for PM_{10} as stated in EA Guidance M8, but provides real time results for implementing immediate mitigation if results are within 25% of threshold. A hand held mobile device for discrete monitoring around working areas. This method is preferred to support operational control of emissions rather than a fixed monitoring system for general air quality analysis at fixed locations (e.g. Filter Dynamics Measurement System/Beta Attenuation Monitor)
TPH/BTEX/PAHs	Monthly	None stated in permit	Biofilter Monitoring as described in Table S3.1
VOCs	Weekly or as required	1mg/m3 benzene	Use of calibrated PID around working areas on biotreatment pad. For ensuring RPE requirements are respected and biofilter is not overloaded with VOCs from incoming soils.
Odour	Daily	Absent	To ensure site activities do not cause nuisance
Noise	Monthly	85dBA	Occupational exposure monitoring in close proximity to working plant.
Treated water	Monthly	As required by trade effluent consent	Reported to Severn Trent to ensure compliance with trade effluent consent

*Mitigation implemented if within 25% of threshold due to accuracy of nephelometer method
Grey shading means the analysis results are already reported as required by the permit



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- WATER TREATMENT PLANTS
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- AIR SAMPLING: ASBESTOS/PM10
- AIR SAMPLING: TPH/BTEX/PAH'S
- AIR SAMPLING: DUST/NOISE/ODOUR
- WATER SAMPLING: SEVERN TRENT

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PROVECTUS

STC – WI 014 – EMISSIONS CONTROL AND MONITORING

Author:	Jon Owens - STCM	**Approved By:**	Steve Langford - MD
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	Summary of Changes	Date
1	N/A	05/03/18
2	Addition of SEM testing detection limit	30/09/20
3	Inclusion of new treatment areas	06/06/22

Introduction

This Work Instruction (WI) sets out the measures taken to manage and control emissions of dust, PM10, asbestos fibres and VOCs/odours as part of permit requirements for Edwin Richards Soil Treatment Centre – EPR/HP3632RP/V003. This procedure is in addition to existing monitoring and measures undertaken by Provectus and FCC on site.

Principle of Operations

The main objective of the operation is to monitor, manage and minimise dust, PM10 and asbestos fibres from potentially being released at the soil treatment facility.
WI 007 – Environmental Monitoring outlines the sites current monitoring regime which includes dust and PM10 monitoring around the site. While *WI 011 – Processing of Asbestos Contaminated Soils* describes the measures in place with regards to ambient asbestos fibre monitoring in the air.

Procedure

All soils entering the Soil Treatment Centre (STC) undergo pre-assessment where the suitability is checked to ensure it meets the acceptance criteria such as asbestos type and fibre content.

Once on site soils are sampled for compliance and moisture content. Where soils are found to be too dry, they can be acted upon by damping down. For soils stored externally it is highly unlikely that they become dry enough to generate dust due to the UK climate.

Any soils that fail the compliance criteria shall be segregated and rejected from site and sent to an appropriately licensed facility.

Soils containing asbestos for picking are to either be placed directly in the asbestos shed or in the external storage areas shown on the attached drawing. Current monitoring undertaken within the asbestos shed has shown that fibres are not detected >0.01f/ml or >0.0005f/ml at any point (depending on what method is used for monitoring). When in use, the asbestos shed access road is to be routinely sprayed down with a propriety surfactant mixture. Dust levels on the roads in and around site are controlled through regular damping down and sweeping.

Externally, asbestos containing soils are to be covered with a tarpaulin or equivalent once formed into a static batch. If the soils are being moved to the asbestos shed, or being added to, then the tarpaulin can be temporarily removed.

Soil moisture content for exposed soils within the shed and also in the external storage area is to be checked to ensure moisture levels are above 15%. Soils with moisture content below 15% shall be dampened down using the irrigation system on site

Monitoring

Monitoring locations will be placed around the perimeter of site. These locations are to be monitored on a weekly basis for PM10 using a *Dustmate* – which will be calibrated as per the manufacturer's guidance. Action will be taken if dust results record levels greater than 250µg/m^3 over a 15 minute TWA, such as additional dust suppression on the roads via a water bowser, road sweeper or damping down soils with a pressure washer.

Additionally, frisbee dust gauges shall also be placed at these monitoring locations. This shall be sent to an accredited laboratory monthly for testing of deposited dust. Should levels of deposited dust exceed 200mg/m^2/day then actions as previously described, shall be taken.

Ambient asbestos fibre monitoring shall continue in the shed whilst activities are occurring to ensure compliance with the permit level of <0.01f/ml or the WHO levels of <0.0005f/ml. Additional monitoring shall take place externally around the storage area to confirm that fibres are not being released though site activities. This will be done via an accredited asbestos monitoring contractor. All of this monitoring is to confirm that no emissions are being generated on site.

Noise

The noise thresholds are contained within the noise assessment and are monitored on a weekly basis. It is not anticipated that the addition of the biotreatment pad will increase the noise levels at the site due to the acoustic insulation used on all equipment and previous monitoring that has shown that noise levels are not exceeding 5dB above background at the site boundary.

Odour

There is a low potential for odour at the site. Odour monitoring is undertaken on a daily basis with the target of no odour detected at the site boundary.

Biofilter Emissions

The point emissions from the STC biotreatment process to air are controlled through the site biofilter that is present on two separate biotreatment areas. On a monthly basis, sampling of the gases directly exhausted from the biofilter will be undertaken by 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. The biofilter is periodically changed or refreshed to ensure that it remains effective.

All results of monitoring shall be stored on the company server and/or site files.

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- Dump trucks
- Tipper/articulated lorries
- Hopper and Picking station

At present the use of the hand picking inside the building allows for the processing of approximately 50t/day. The picking station is regularly damaged as no removal of oversize inclusions is permitted and so there is significant amount of down time for asbestos processing plant. Also, the presence of soil fines in the matrix has the potential to conceal smaller asbestos debris meaning that the soils are generally handpicked twice to ensure compliance with the requirements to achieve a non-hazardous soil status. The existing approved method requires a significant amount of plant time for each tonne of asbestos contaminated soil and therefore is a source of elevated PM10.

On projects with a mobile plant license deployment a soil screener is added to the above list of equipment. This increases the throughput to approximately 500t/day, results in less downtime and due to the separation of the different soil fractions makes the hand picking significantly more effective with little or no double handling.

Therefore by adding the soil screening option, the efficiency is increased tenfold, so whilst there is a slight increase in PM10 levels as there is more plant present, it is for 10% of the existing timescales.

We have recently hired an electric hopper and picking station to review suitability which will offset PM10 emissions from the previous set of equipment. It is proposed to make this a permanent acquisition if the pre-screening is approved as it is only suitable for soils without large inclusions.

There will be no increase in asbestos fibres due to the strict waste acceptance criteria and we would anticipate a decrease in dust as the soil screener will be fitted with a spray rail for dust suppression. There would be a tenfold decrease in PM10 emissions from the soil processing due to the reduced plant timescales.

The additional storage areas will allow a one way traffic system to be employed and avoid the vehicle restrictions and delays during delivery into the asbestos building. This will significantly decrease the time the lorry is present on site and result in a reduction in PM10 emissions.

All internal and external storage areas and treatment processes must collect, extract and direct all process emissions to an appropriate abatement system for treatment before release. Where that is not possible, you must minimise these emissions.

The emissions from the biotreatment pad are collected by the undersoil pipework with liquids treated in the water treatment system and air treated by the biofilter. This approach is well established.

Asbestos fibres are not generated on site above the detection limit so no abatement system is required.

Dust generation is largely on haul roads and road sweeping/dust suppression is undertaken at source to prevent or minimise dust emissions occurring.

PM10 emissions are largely from heavy plant and vehicle traffic. Emissions from vehicles delivering soils to site are to be reduced by having external reception areas rather than the existing system of delivering inside a building which often leads to queuing vehicles.

The use of a soil screener in the asbestos processing will result in a tenfold reduction in PM10 emissions compared to the existing emissions.

To reduce point source emissions to air (dust, PM10 and asbestos fibres) from the internal and external storage areas, treatment processes and handling of waste, you must use an appropriate combination of abatement techniques, including one or more of the following systems: adsorption (for example, activated carbon), biofiltration, wet scrubbing, fabric filters, high efficiency particulate (HEPA) filtration, condensation and cryogenic condensation, cyclonic separation, electrostatic precipitation and thermal oxidation.

The majority of emissions described previously are prevented from occurring and do not require further mitigation after the initial suppression. Monitoring will provide verification to the effectiveness of the suppression works.

A water treatment plant is present on site to continuously treat water as it is collected from treatment areas.

A biofilter is used to treat continuous emissions from the biotreatment area and is deemed a point source emission and is currently monitored as per Table S3.1 of the permit.

Only the presence of PM10 that could accumulate inside the asbestos building is deemed to potentially require mitigation as a point source. This is released by the treatment plant from inside the asbestos building as a result of soil screener and 360 excavator. In the event that monitoring data shows that the emissions are within 25% of the thresholds in Table 3 then the building will have HEPA filters installed to mitigate point source emissions.

Mitigation of PM10 in a situation where concentrations are at 250µg/m3 or above, would comprise of using HEPA filters located near to the exhaust of the soil screener and on the ground close to the 360 excavator loading the screener. The type of HEPA filter utilised would allow 5,000m3/hr per unit and 2 units would be employed to allow for 10,000m3/hr flow rate. A typical HEPA filter employed on construction sites is shown below on the attached link.

https://www.dustarrest.com/product/dustblocker-5000-air-filtration-cleaner

You must identify the main chemical constituents of the site's point source emissions as part of the site's inventory of emissions to air.

Table 2. Chemical Constituents of Emissions

Source	Chemical Constituents
Biotreatment area	TPH, PAHs, BTEX, total VOCs
Asbestos building	PM10 from indoor soil screener and excavator unless electric or hybrid plant is used

All other sources are suppressed and therefore prevented from occurring. PM10 emissions from vehicles/plant outside of the asbestos building are not deemed to be point source emissions.

You must make an assessment of the impact of the substances emitted to air, following the Environment Agency's guidance; Control and monitor emissions for your environmental permit https://www.gov.uk/guidance/control-and-monitor-emissions-for-your-environmental-permit#dust-mud-and-litter

A historical assessment of the impact of substances to air was completed in 2016 by Amec in the Air Quality Assessment document for the treatment of 150,000t of soils at the treatment facility. This assessment has not changed despite the inclusion of asbestos contaminated soils to the permit. There are no additional emissions from this activity above those permitted in 2016 as the restrictions placed on waste acceptance prevents airborne asbestos emissions from occurring. The same standards will be maintained if the permit variation is approved with an improvement in air quality as a result of reduced plant use. There is a change however in areas of the site being used for soil treatment with the extension in use of the building and adjacent soil storage area. However, the measures detailed in Table 1 of this response are utilised to mitigate any emissions to the limits provided in Table 3.

You must design, operate and maintain an appropriate monitoring system on site to ensure dust, PM10 and asbestos fibres releases are prevented, if not minimised, from leaving the site boundary.

Table 3 provides detail of the existing monitoring undertaken on site for reporting as a permit condition, additional monitoring undertaken for internal management and control of emissions (but not required to be reported as a permit condition) with an update on locations in Appendix A to reflect the change in layout proposed for the site.

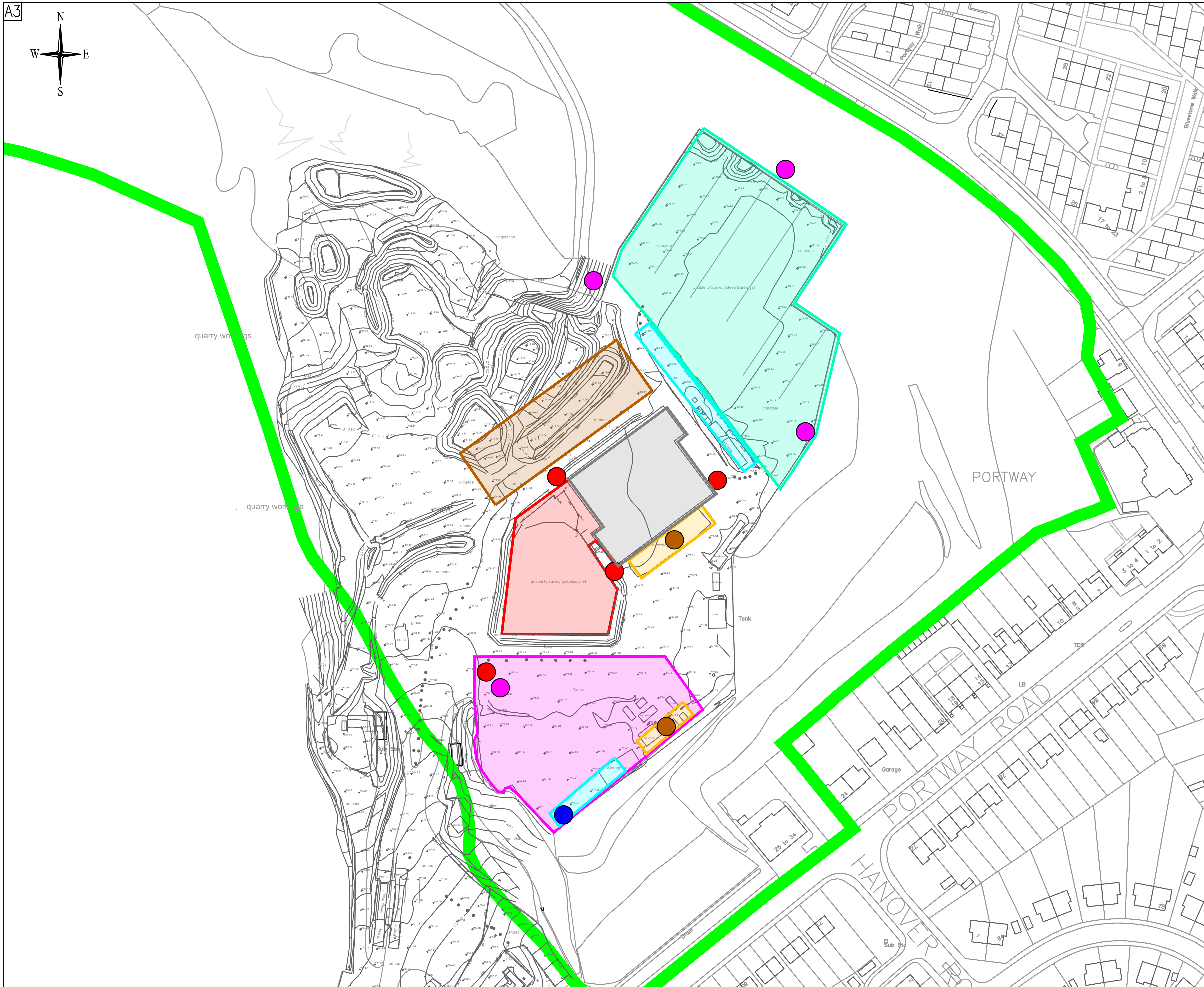
All equipment is calibrated at a frequency dictated by the manufacturer rather than a 4 monthly interval.

Table 3. Emissions Monitoring

Parameter	Frequency	Thresholds	Comments
Asbestos (TCM)	Daily during initial soil screening	<0.01f/ml	Proposed for permit variation to replace monitoring during hand picking. Method as described in M17 guidance and Table S3.3. This frequency is far in excess of other similarly permitted facilities.
Asbestos (SEM)	Quarterly		Added reassurance to ensure baseline of asbestos emissions is not changing. Method is as described in M17 guidance. Detection limit anticipated to be <0.0005f/ml. This monitoring is far in excess of other similarly permitted facilities.
Dust	Monthly	200mg/m2/day	Frisbee dust gauge method as described in M17 guidance.
Soil moisture content	Reception testing of soils as per	15% moisture content	To ensure soils received have low potential for dust release
Asbestos content in soils	Reception testing of soils	<0.1% chrysotile, <0.01% other types of asbestos fibres. No visible unbound asbestos or insulation	To ensure soils received cannot generate airborne emissions of asbestos above the method detection limit
PM_{10}	Weekly or as required if dust is suspected	250µg/m3/15 minute TWA*	Use of hand held nephelometer – not used for compliance against EU Directive Limit for PM_{10} as stated in EA Guidance M8, but provides real time results for implementing immediate mitigation if results are within 25% of threshold. A hand held mobile device for discrete monitoring around working areas. This method is preferred to support operational control of emissions rather than a fixed monitoring system for general air quality analysis at fixed locations (e.g. Filter Dynamics Measurement System/Beta Attenuation Monitor)
TPH/BTEX/PAHs	Monthly	None stated in permit	Biofilter Monitoring as described in Table S3.1
VOCs	Weekly or as required	1mg/m3 benzene	Use of calibrated PID around working areas on biotreatment pad. For ensuring RPE requirements are respected and biofilter is not overloaded with VOCs from incoming soils.
Odour	Daily	Absent	To ensure site activities do not cause nuisance
Noise	Monthly	85dBA	Occupational exposure monitoring in close proximity to working plant.
Treated water	Monthly	As required by trade effluent consent	Reported to Severn Trent to ensure compliance with trade effluent consent

*Mitigation implemented if within 25% of threshold due to accuracy of nephelometer method
Grey shading means the analysis results are already reported as required by the permit

A3



GENERAL NOTES

1. SURVEY INFORMATION SUPPLIED BY THE WASTE RECYCLING GROUP .
2. DO NOT SCALE
3. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM
4. ANY ANOMALIES ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF BYRNE LOOBY

KEY

- PERMIT BOUNDARY
- NON-HAZARDOUS SOIL STORAGE AND SCREENING AREA
- BIOLOGICAL TREATMENT AREA
- BIOFILTERS
- HAZARDOUS SOILS STORAGE AREA
- BIOLOGICAL TREATMENT AREA/SOIL WASHING AREA
- WATER TREATMENT PLANTS
- SOIL TREATMENT BUILDING
- AIR SAMPLING: ASBESTOS/PM10
- AIR SAMPLING: TPH/BTEX/PAH'S
- AIR SAMPLING: DUST/NOISE/ODOUR
- WATER SAMPLING: SEVERN TRENT

Rev	Date	Description	By	Chk	App

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CLIENT

waste recycling GROUP

PROJECT

EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

DRAWING TITLE

EMMISIONS MONITORING PLAN

STATUS

FINAL

Date: 20.06.23	Scale: 1:1500	Drawn: JM	Chk: JW	App: JW

Project No:	Drg. No:	Rev:
K0182	K0182.2.003	01

STC – WI 014 – EMISSIONS CONTROL AND MONITORING

Author:	Jon Owens - STCM	**Approved By:**	Steve Langford - MD
Distribution:	Z/QMS/Work Instructions - STC		

Document Changes

Revision No:	**Summary of Changes**	**Date**
1	N/A	05/03/18
2	Addition of SEM testing detection limit	30/09/20
3	Inclusion of new treatment areas	06/06/22

Introduction

This Work Instruction (WI) sets out the measures taken to manage and control emissions of dust, PM10, asbestos fibres and VOCs/odours as part of permit requirements for Edwin Richards Soil Treatment Centre – EPR/HP3632RP/V003. This procedure is in addition to existing monitoring and measures undertaken by Provectus and FCC on site.

Principle of Operations

The main objective of the operation is to monitor, manage and minimise dust, PM10 and asbestos fibres from potentially being released at the soil treatment facility.
WI 007 – Environmental Monitoring outlines the sites current monitoring regime which includes dust and PM10 monitoring around the site. While *WI 011 – Processing of Asbestos Contaminated Soils* describes the measures in place with regards to ambient asbestos fibre monitoring in the air.

Procedure

All soils entering the Soil Treatment Centre (STC) undergo pre-assessment where the suitability is checked to ensure it meets the acceptance criteria such as asbestos type and fibre content.

Once on site soils are sampled for compliance and moisture content. Where soils are found to be too dry, they can be acted upon by damping down. For soils stored externally it is highly unlikely that they become dry enough to generate dust due to the UK climate.

Any soils that fail the compliance criteria shall be segregated and rejected from site and sent to an appropriately licensed facility.

Soils containing asbestos for picking are to either be placed directly in the asbestos shed or in the external storage areas shown on the attached drawing. Current monitoring undertaken within the asbestos shed has shown that fibres are not detected >0.01f/ml or >0.0005f/ml at any point (depending on what method is used for monitoring). When in use, the asbestos shed access road is to be routinely sprayed down with a propriety surfactant mixture. Dust levels on the roads in and around site are controlled through regular damping down and sweeping.

Externally, asbestos containing soils are to be covered with a tarpaulin or equivalent once formed into a static batch. If the soils are being moved to the asbestos shed, or being added to, then the tarpaulin can be temporarily removed.

Soil moisture content for exposed soils within the shed and also in the external storage area is to be checked to ensure moisture levels are above 15%. Soils with moisture content below 15% shall be dampened down using the irrigation system on site

Monitoring

Monitoring locations will be placed around the perimeter of site. These locations are to be monitored on a weekly basis for PM10 using a *Dustmate* – which will be calibrated as per the manufacturer's guidance. Action will be taken if dust results record levels greater than 250µg/m^3 over a 15 minute TWA, such as additional dust suppression on the roads via a water bowser, road sweeper or damping down soils with a pressure washer.

Additionally, frisbee dust gauges shall also be placed at these monitoring locations. This shall be sent to an accredited laboratory monthly for testing of deposited dust. Should levels of deposited dust exceed 200mg/m^2/day then actions as previously described, shall be taken.

Ambient asbestos fibre monitoring shall continue in the shed whilst activities are occurring to ensure compliance with the permit level of <0.01f/ml or the WHO levels of <0.0005f/ml. Additional monitoring shall take place externally around the storage area to confirm that fibres are not being released though site activities. This will be done via an accredited asbestos monitoring contractor. All of this monitoring is to confirm that no emissions are being generated on site.

Noise

The noise thresholds are contained within the noise assessment and are monitored on a weekly basis. It is not anticipated that the addition of the biotreatment pad will increase the noise levels at the site due to the acoustic insulation used on all equipment and previous monitoring that has shown that noise levels are not exceeding 5dB above background at the site boundary.

Odour

There is a low potential for odour at the site. Odour monitoring is undertaken on a daily basis with the target of no odour detected at the site boundary.

Biofilter Emissions

The point emissions from the STC biotreatment process to air are controlled through the site biofilter that is present on two separate biotreatment areas. On a monthly basis, sampling of the gases directly <u>exhausted</u> from the biofilter will be undertaken by 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. The biofilter is periodically changed or refreshed to ensure that it remains effective.

All results of monitoring shall be stored on the company server and/or site files.

Appendix E – Asbestos Emissions Report

Asbestos Emissions Report

RRMG/AER/001

FCC Environment Ltd

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

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

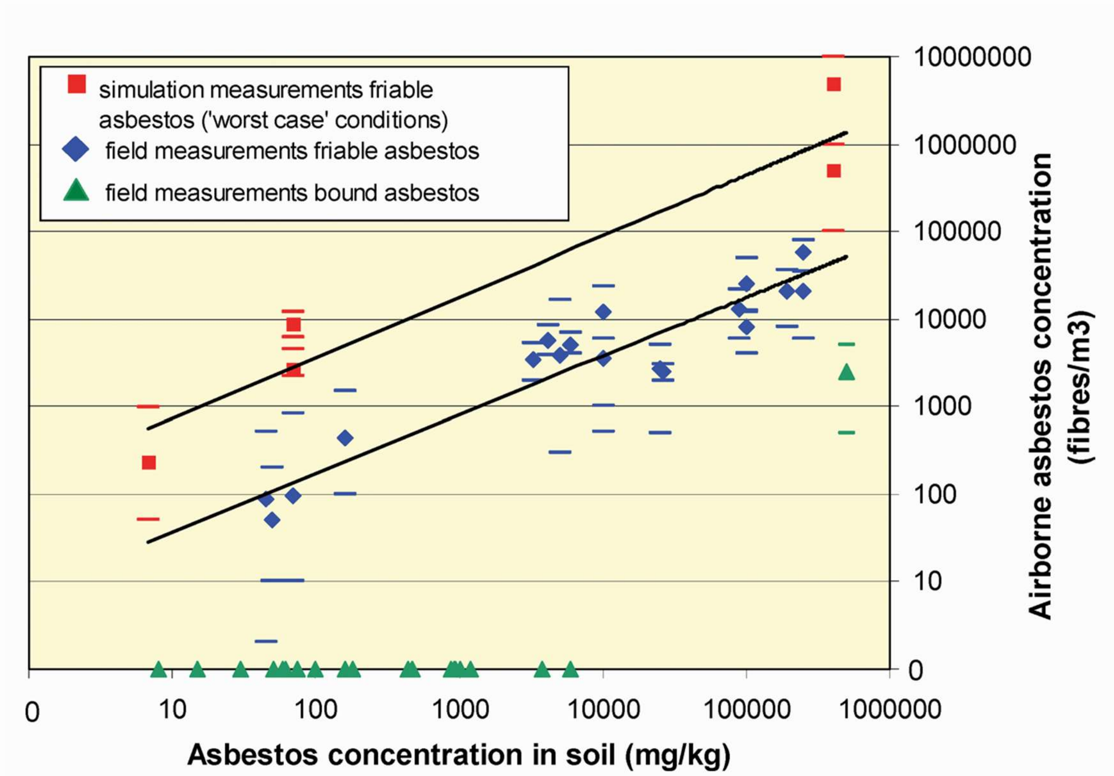

Figure 1. Relationship of Airborne Asbestos Concentration and Soil Concentrations (source: Frank A. Swartjes and Peter C. Tromp, 2008).

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.

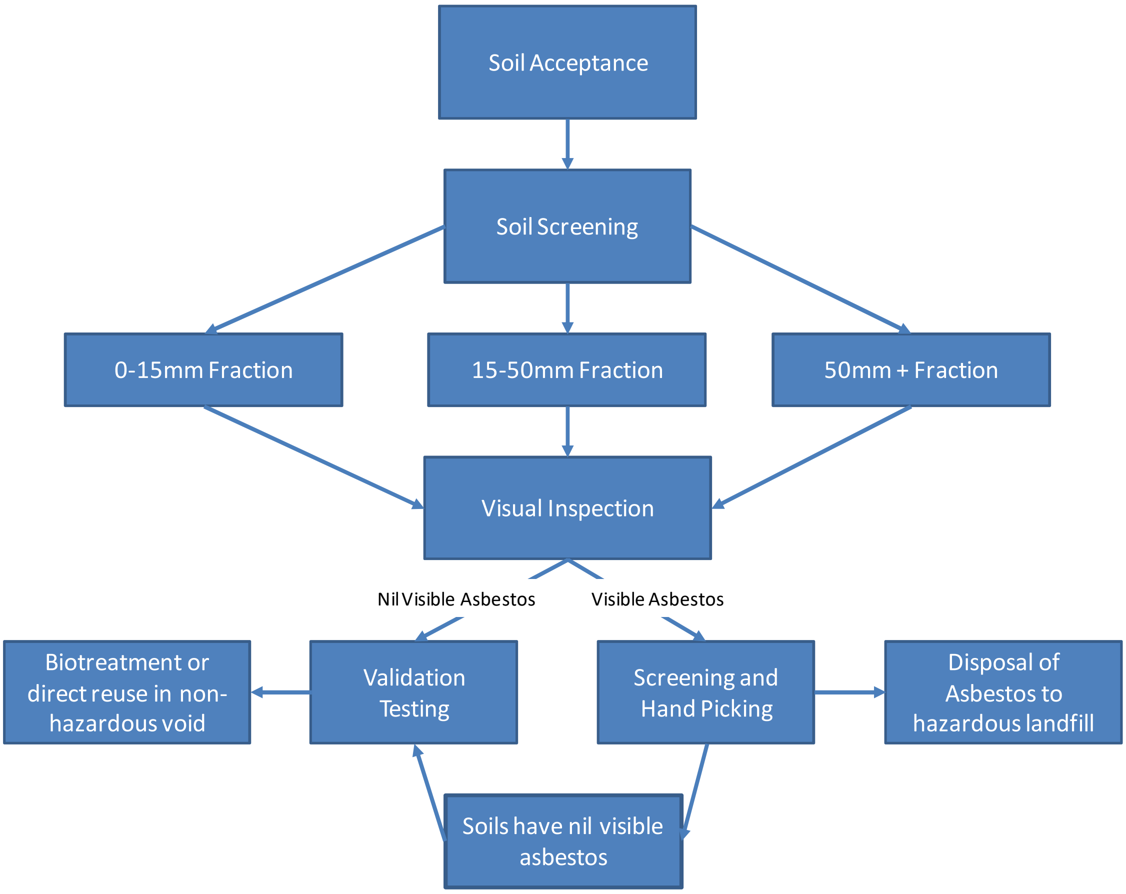

Figure 2. Soil Treatment Overview

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.

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[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).

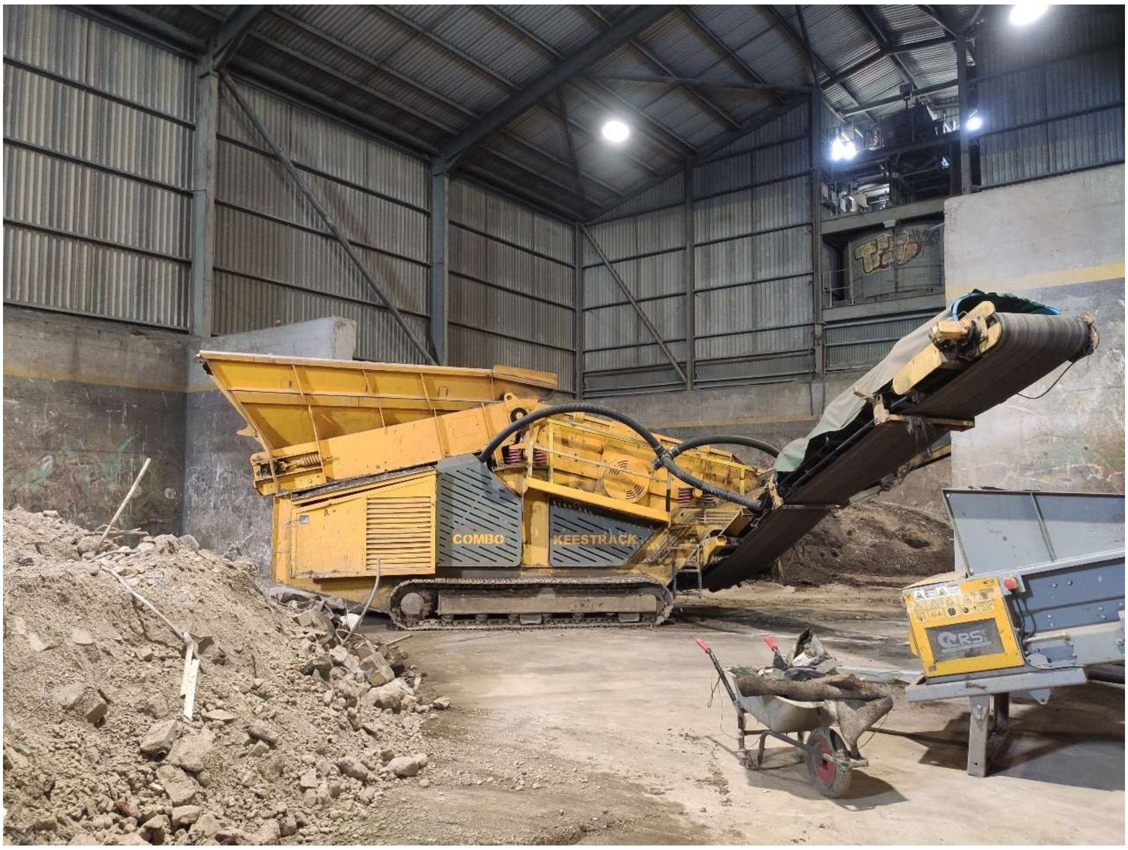


Figure 5. Uncovered soil screener inside asbestos building (Rowley Regis)

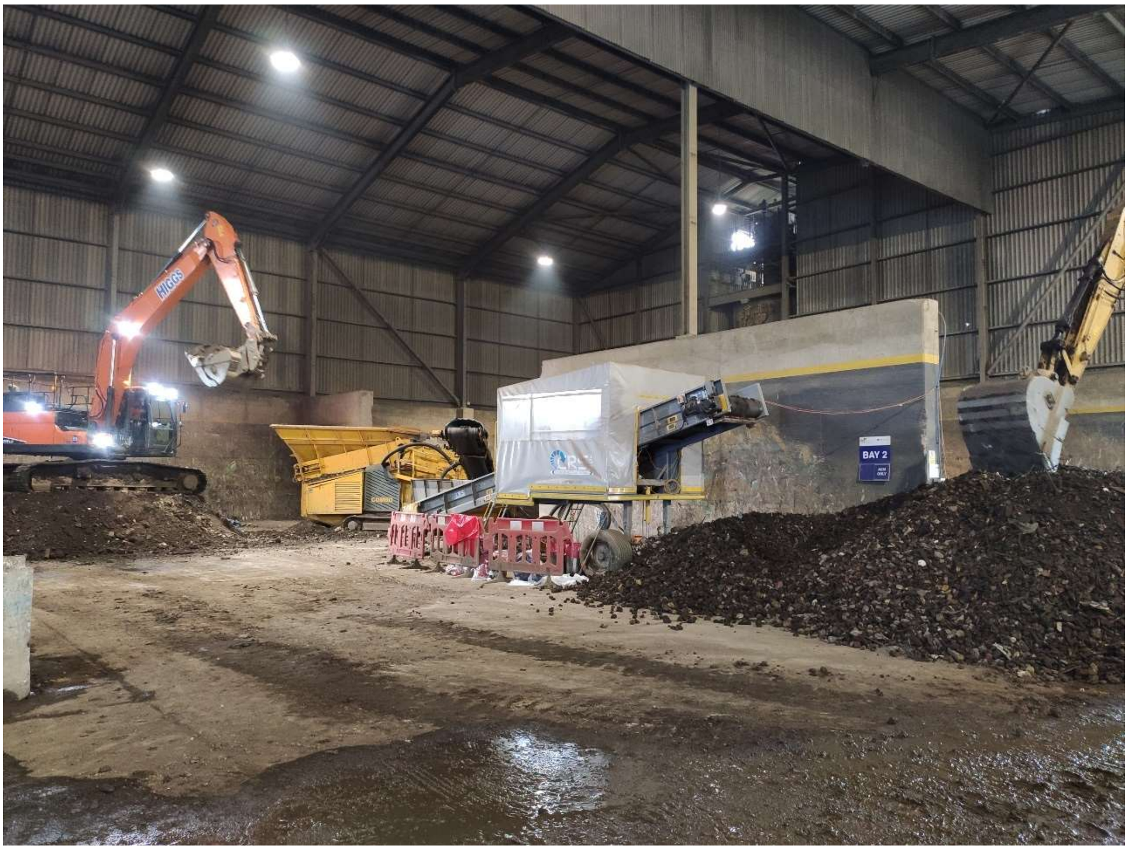


Figure 6. Soil screening and hand picking of soil (Rowley Regis)

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.

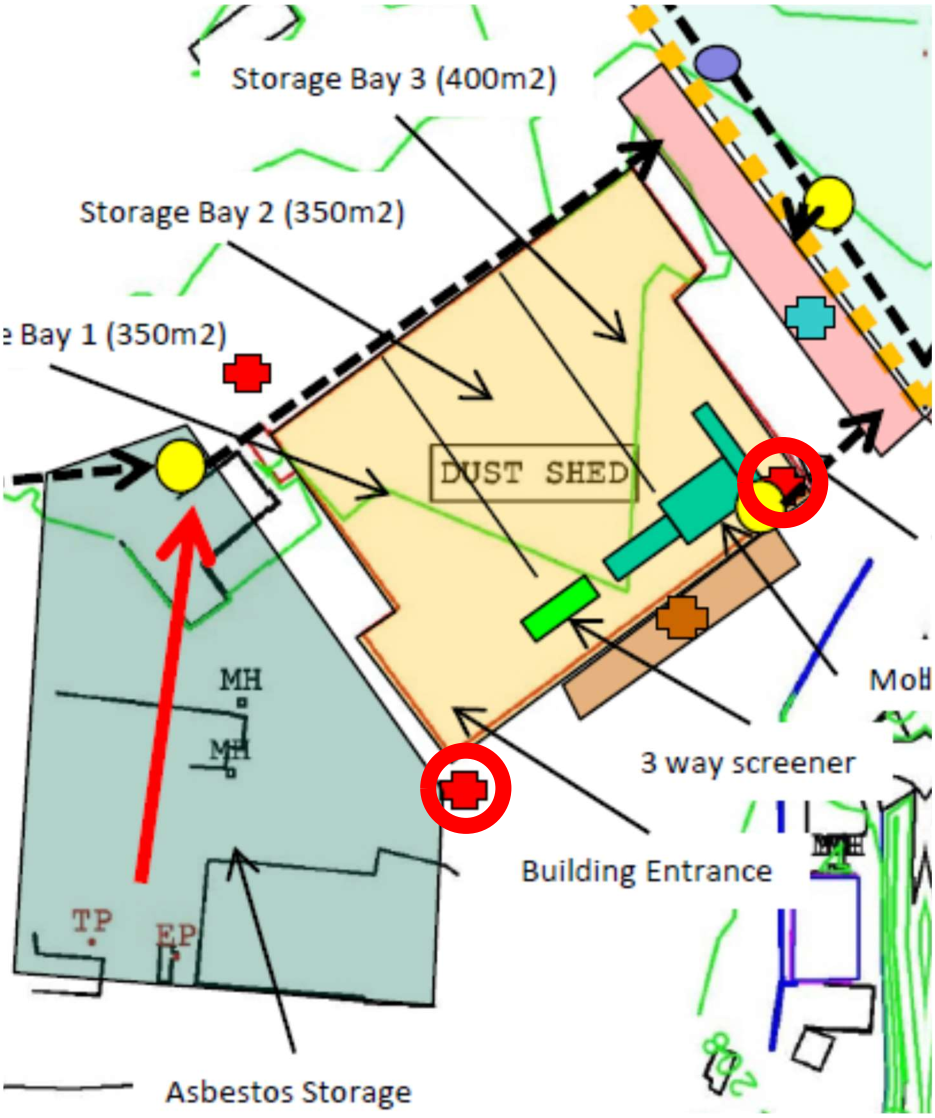


Figure 8. Initial Sampling Locations (circled in red)

PROVECTUS

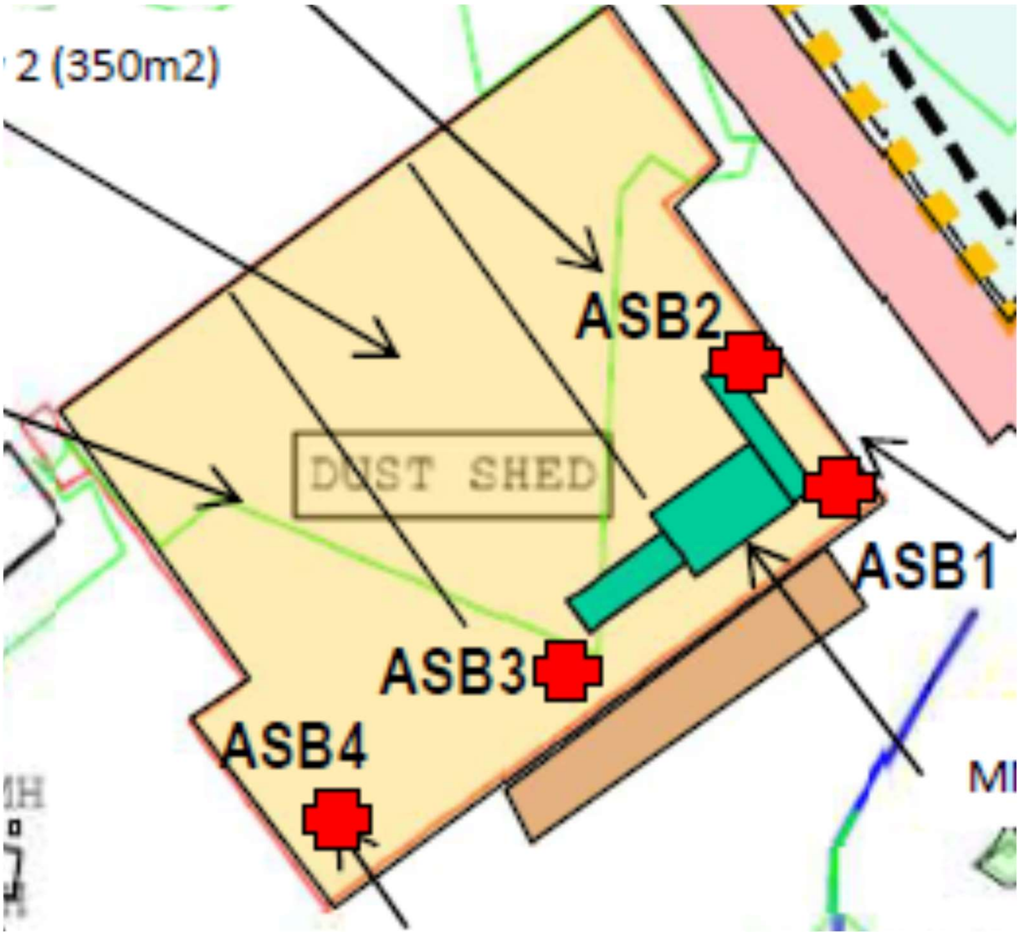


Figure 9. Internal Monitoring Locations 1-4 Sampling Locations (in red)

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.

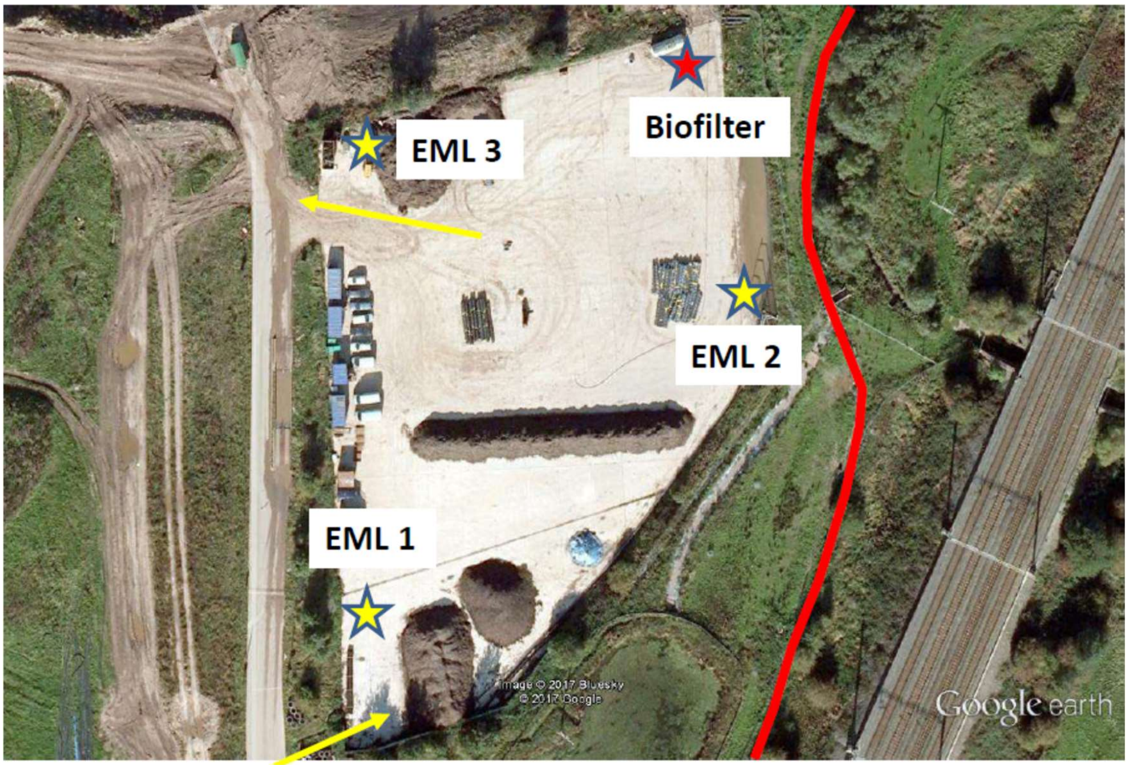


Figure 10. Environmental Monitoring Locations 1-3 Sampling Locations

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

PROVECTUS

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

Environment Agency

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.

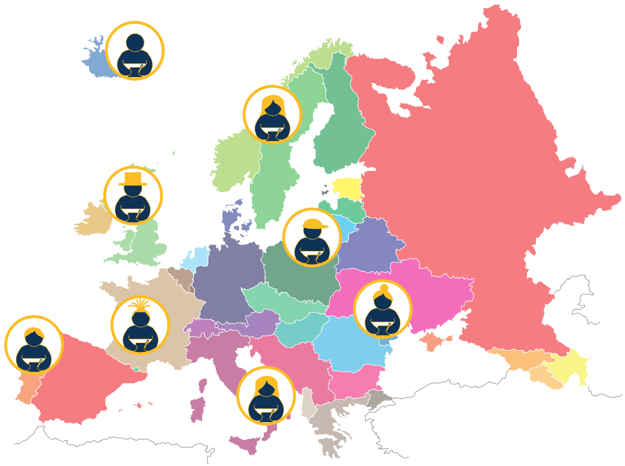


Figure 2.1 NICOLE Network Survey of members

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

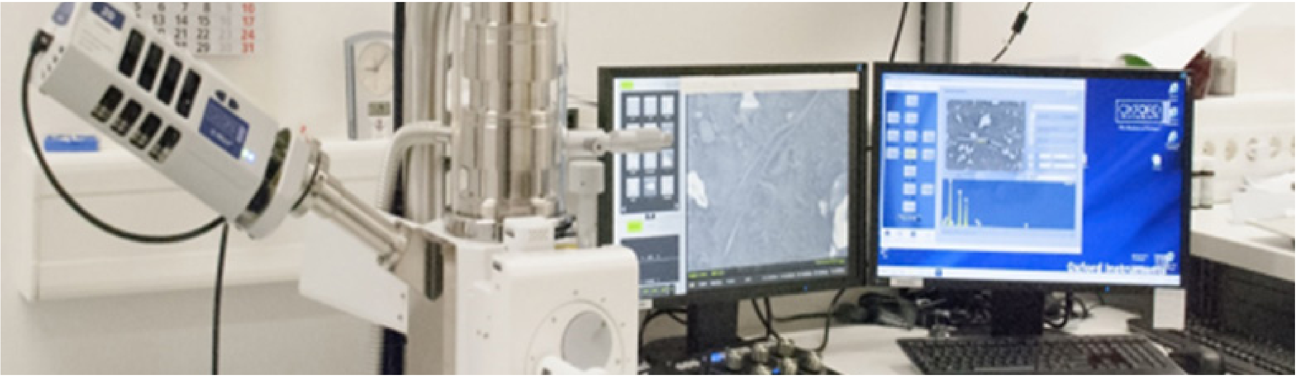
As noted previously the Dutch and Belgian authorities, and SoBRA in the UK, advocate taking larger samples for asbestos compared to typical size of soil samples taken for other contaminant testing because of the greater uncertainties involved in sampling for asbestos in soil.

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.

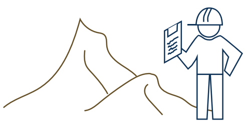
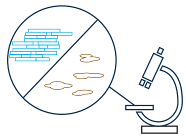
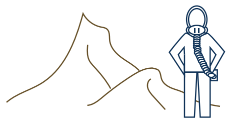
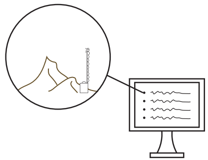
Tier	Tier 1	Tier 2	Tier 3	Tier 4
Data	Basic soil characterisation 	Differentiation in asbestos form and type 	Respirable fibre content in soil. Particle size fraction of interest 	Site-specific fibre-release data 
Criteria	Generic assessment criteria (not asbestos type specific)	Generic assessment criteria 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 stakeholders 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 sustainability of the output from those frameworks is worth further consideration.

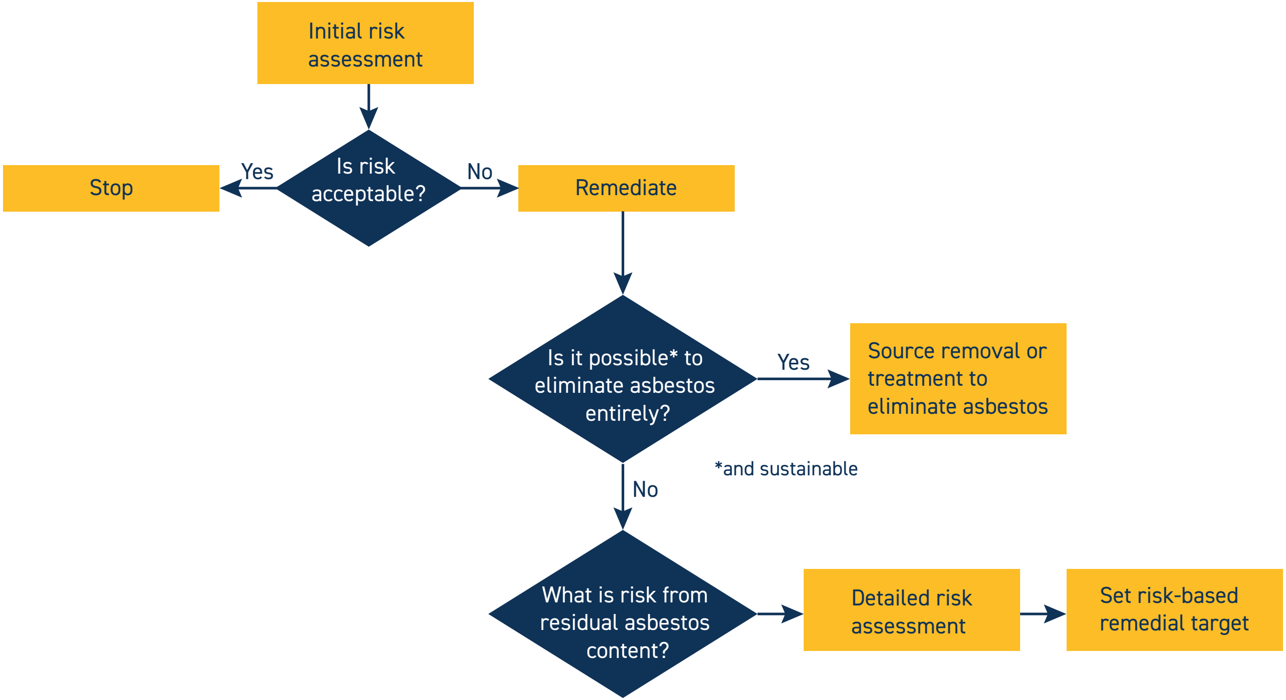


Figure 11.1 Approaches to Risk Management

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?	What is the risk characterisation?
Management of current situation (land condition and use)	Negligible risk and no regulatory driver for further action/intervention
Regulatory intervention	Low risk - potential to manage risk without extensive remedial action
Preparation for site divestment/acquisition	Higher risk - requires more detailed consideration of remediation options
Preparation for site for new use	
Construction activity requiring asbestos containing soil to be excavated and/or constructed on	

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.

Asbestos finds | John F Hunt

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

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.

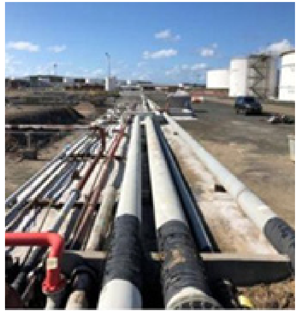
Throughout the works the air was monitored by an independent Asbestos Analyst to demonstrate that the control measures were suitable.

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

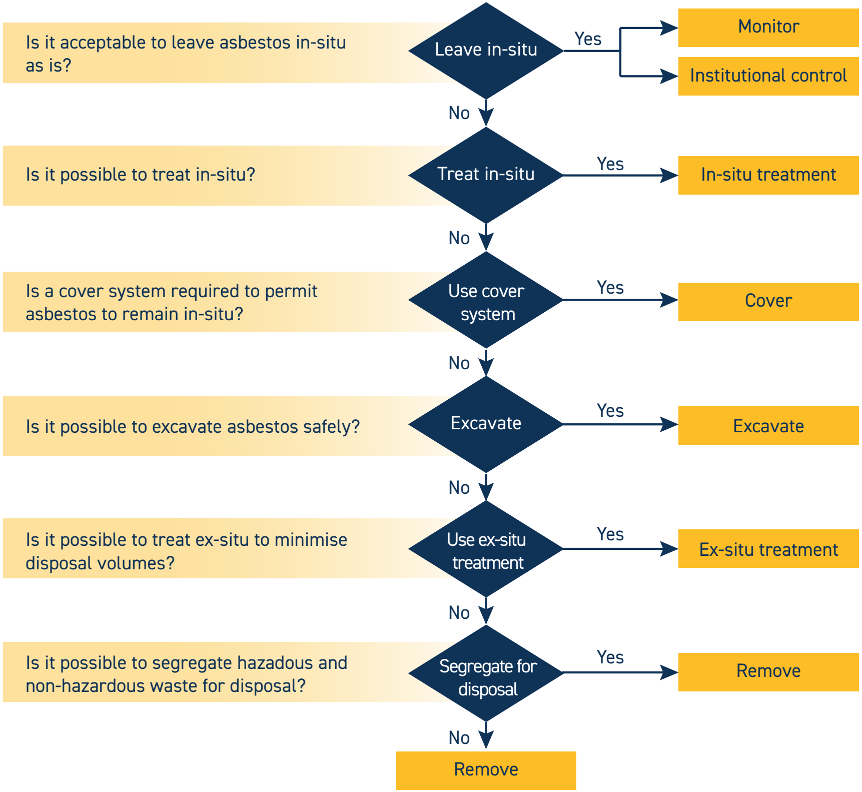


Figure 13.2 Example of a Remediation Decision Flowchart

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

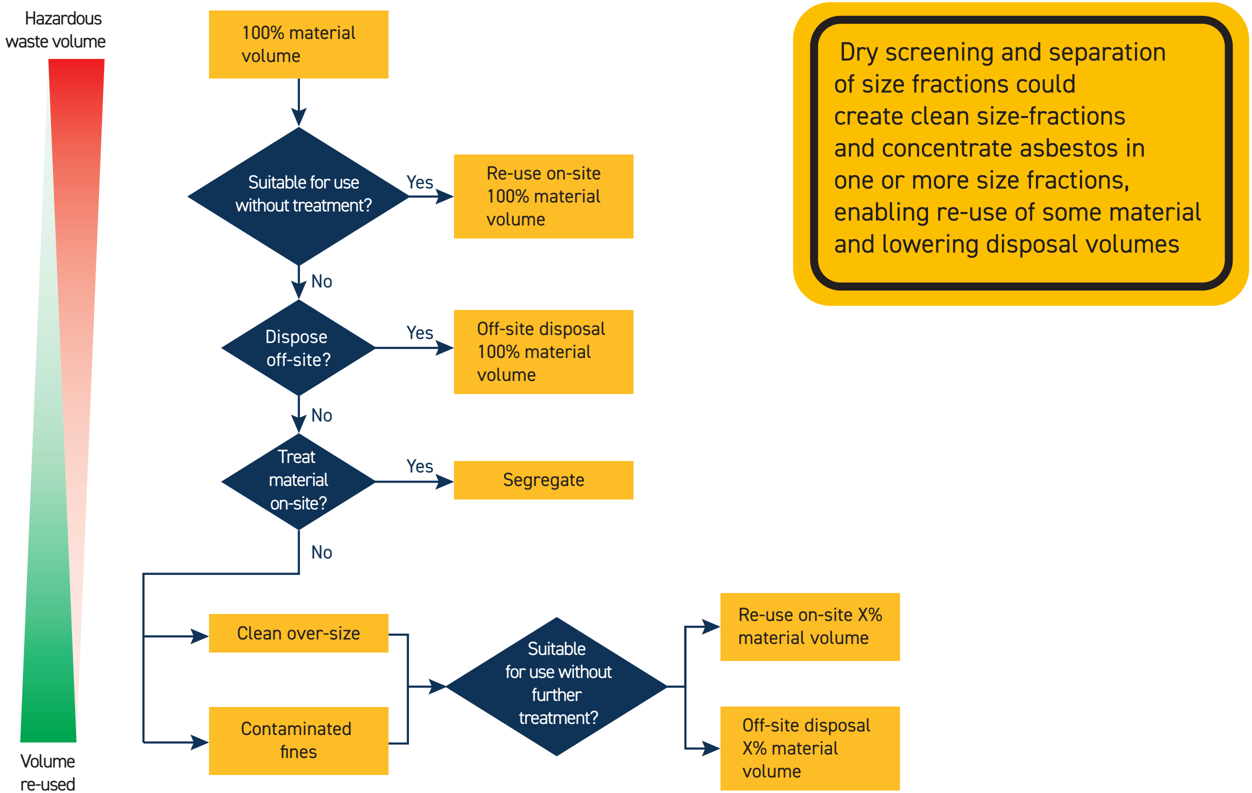


Figure 14.1 An example of a treatment decision process for dry screening as a sustainable option

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 bio-remediation. 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.

Asbestos finds | AECOM

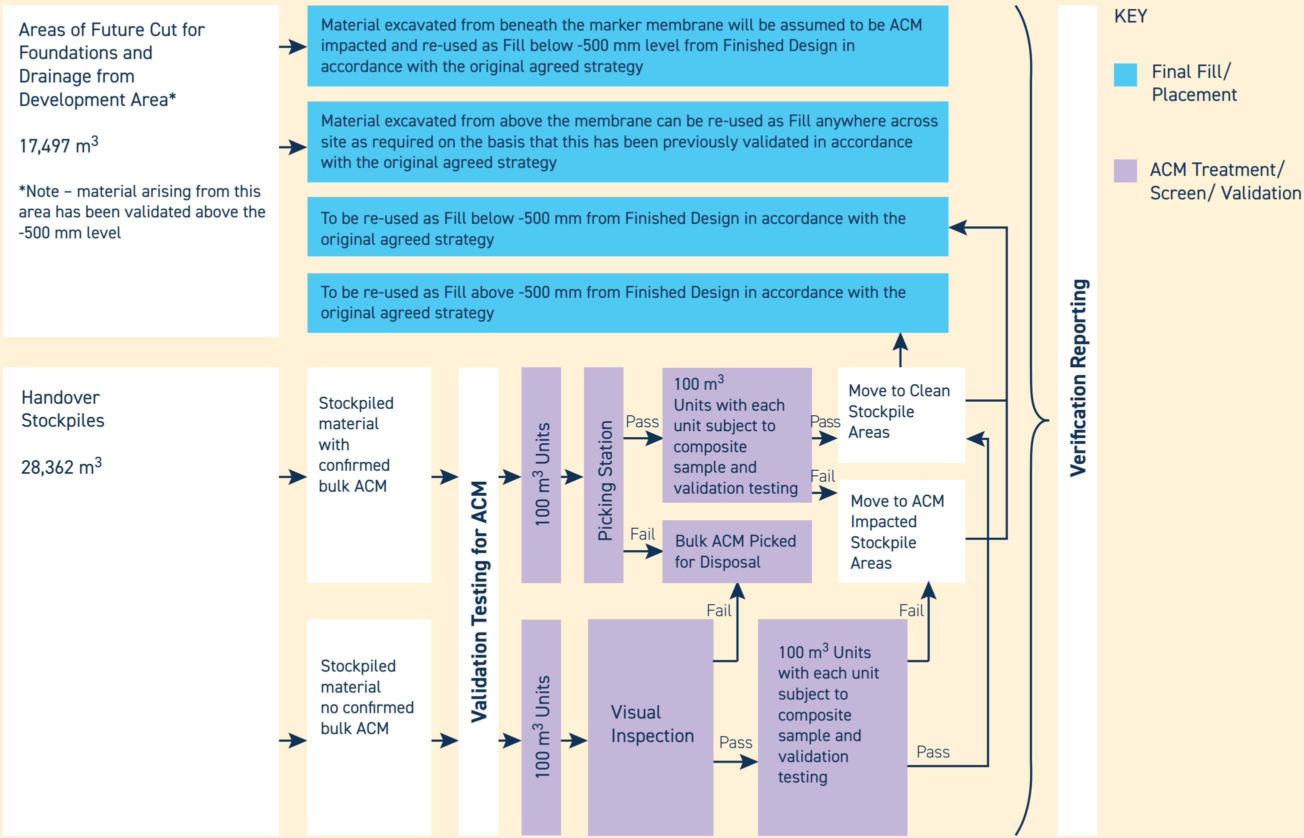


Figure C2.1 Material Management Flowchart

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

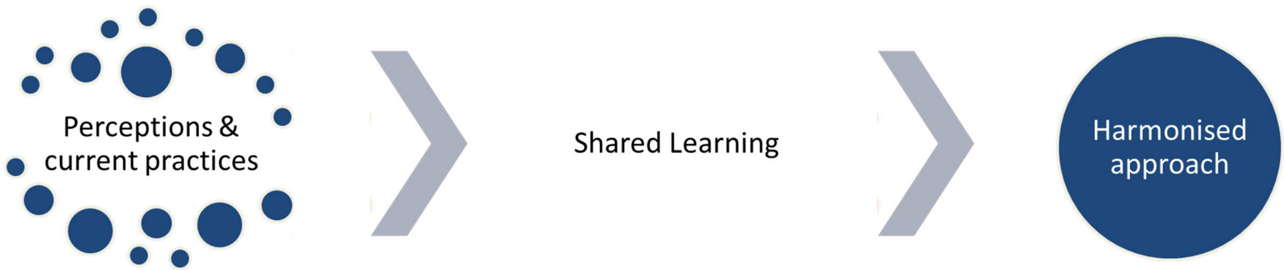


Figure 15.1 Harmonised approach

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

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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.**

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 – 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

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: 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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CONTRACT NO: S26732a
DATE OF ISSUE: 19.07.22

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 (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.

CONTRACT NO: S26732a
DATE OF ISSUE: 19.07.22

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.

Steve Clark

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S Clark
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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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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 (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.

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: 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.

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: ………………………
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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:**	S27272 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

CONTRACT NO: S27272
DATE OF ISSUE: 17.08.22

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 (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.

AUTHORISED BY: 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.

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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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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

CERTIFICATE OF ANALYSIS

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

CONTRACT NO: S27684

DATE OF ISSUE: 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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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 (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

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:**	S26545b 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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CONTRACT NO: S26545b
DATE OF ISSUE: 11.07.22

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 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
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: 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.

CONTRACT NO: S26732b
DATE OF ISSUE: 19.07.22

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.

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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CONTRACT NO: S27685
DATE OF ISSUE: 12.09.22

RESULTS:

Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre 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 (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.

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
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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

UKAS TESTING
0374

CONTRACT NO: S27805
DATE OF ISSUE: 16.09.22

RESULTS:

Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre 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.

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: 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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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 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.

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

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: 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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CONTRACT NO: S27685
DATE OF ISSUE: 12.09.22

RESULTS:

Client Ref: PO – RR151

Sample No.	Volume (l)	(1) No. of Resp. Fibres Found	(1) No. of Fields Searched	Total Fibres *Fibre 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 (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.

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

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

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.

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

ANALYSIS REQUESTED BY: Provectus Soils Management
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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.**

www.iom-world.org

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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 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.

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: 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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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 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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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: 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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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 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.

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 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:

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.

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: S27631

DATE OF ISSUE: 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.

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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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 (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.

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: 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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Registered Address: Research Avenue North, Riccarton, Edinburgh, EH14 4AP, United Kingdom
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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.

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.

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

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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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.

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

ANALYSIS REQUESTED BY: Provectus Soils Management
Regent House
Bath Avenue
Wolverhampton
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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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.

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

ANALYSIS REQUESTED BY: Provectus Soils Management
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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

CONTRACT NO: S28333
DATE OF ISSUE: 18.10.22

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(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

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: S28532

DATE OF ISSUE: 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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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(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.

AUTHORISED BY: Steve Clark ………………………
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.

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AUTHORISED BY: Steve Clark ………………………
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: 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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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.

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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: S29003

DATE OF ISSUE: 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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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(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

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Appendix F – Nature and Heritage Conservation Screen

Nature and Heritage Conservation

Screening Report: Bespoke Installation

Reference	**EPR/HP3632RP/V004**
NGR	**SO9698388526**
Buffer (m)	**220**
Date report produced	**06/04/2022**
Number of maps enclosed	**3**

The nature and heritage conservation sites and/or protected species and habitats identified in the table below must be considered in your application.

Nature and heritage conservation sites	Screening distance (km)	Further Information
Special Areas of Conservation (cSAC or SAC)	10	Joint Nature Conservation Committee
Fens Pools (SAC)		
Local Nature Reserve (LNR)	2	Natural England
Bumble Hole (LNR)		
Warren's Hall Country Park (LNR)		
Local Wildlife Sites (LWS)	2	Appropriate Local Record Centre (LRC)
Portway Hill Open Space, Rowley Hills		
Tansley Hill		
Warrens Hall Farm		

Warrens Hall Woodland, Tansley Hill

Warrens Hall Park

Dudley Golf Course

Sledmere

Gads Green, Bumble Hole

Rough Hill Quarry

Barncroft Road, Tividale Hall

Darby's Hill Road

Darby's Hill, Rowley Hills

Hollyhock Road

Jasmine Road

Massey's Bank, Rowley Hills

Bury Hill Park, Rowley Hills

Gower Branch Canal

Darby End Disused Railway

Mousesweet Brook Valley

Where protected species are present, a licence may be required from Natural England to handle the species or undertake the proposed works.

The relevant Local Records Centre must be contacted for information on the features within local wildlife sites. A small administration charge may also be incurred for this service.

Please note we have screened this application for protected and priority sites, habitats and species for which we have information. It is however your responsibility to comply with all environmental and planning legislation, this information does not imply that no other checks or permissions will be required.

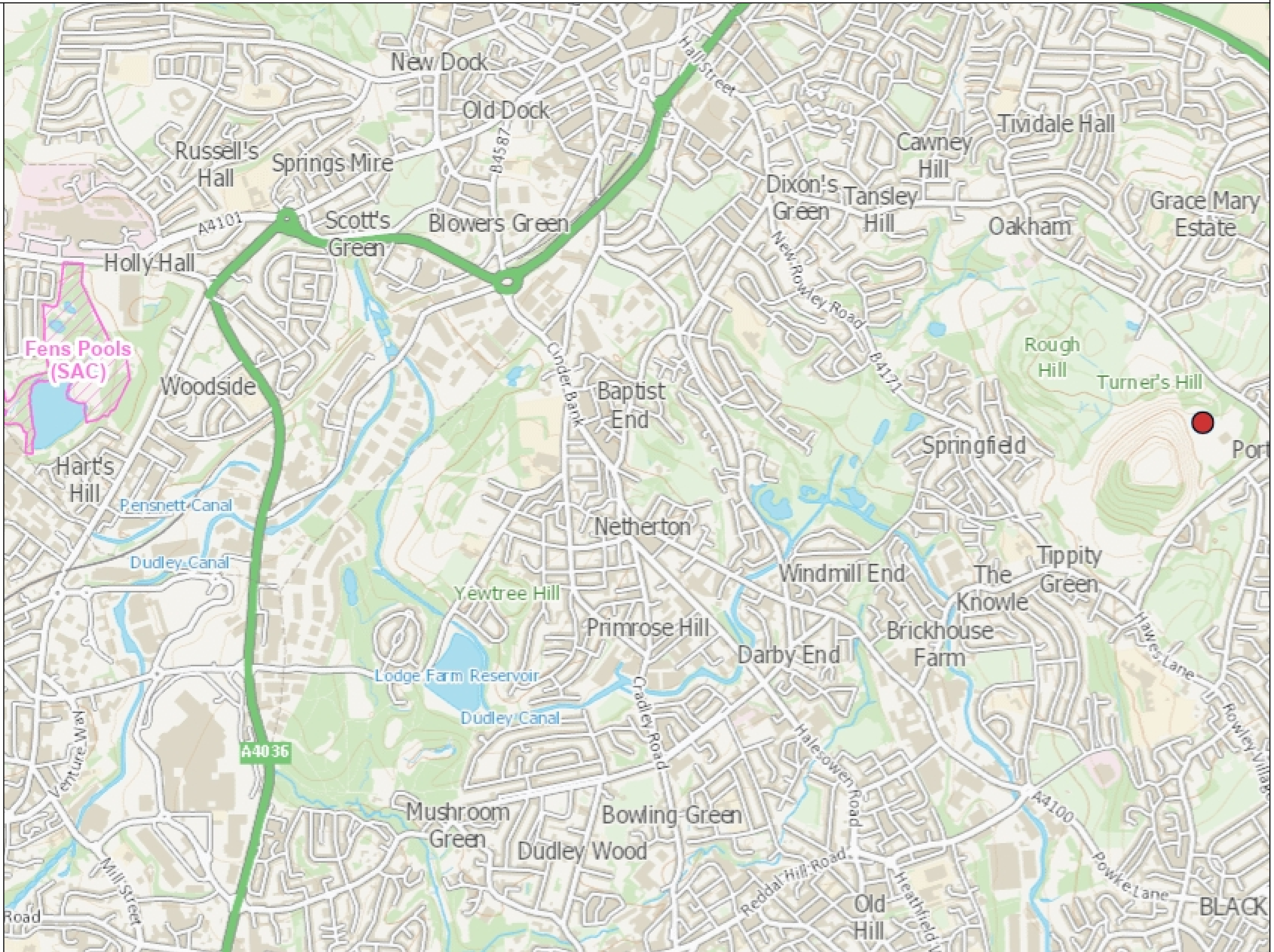
Please note the nature and heritage screening we have conducted as part of this report is subject to change as it is based on data we hold at the time it is generated. We cannot guarantee there will be no changes to our screening data between the date of this report and the submission of the permit application, which could result in the return of an application or requesting further information.

Special Areas of Conservation

Environment Agency

Legend

SAC (England)



1: 25,000

0 625

Metres

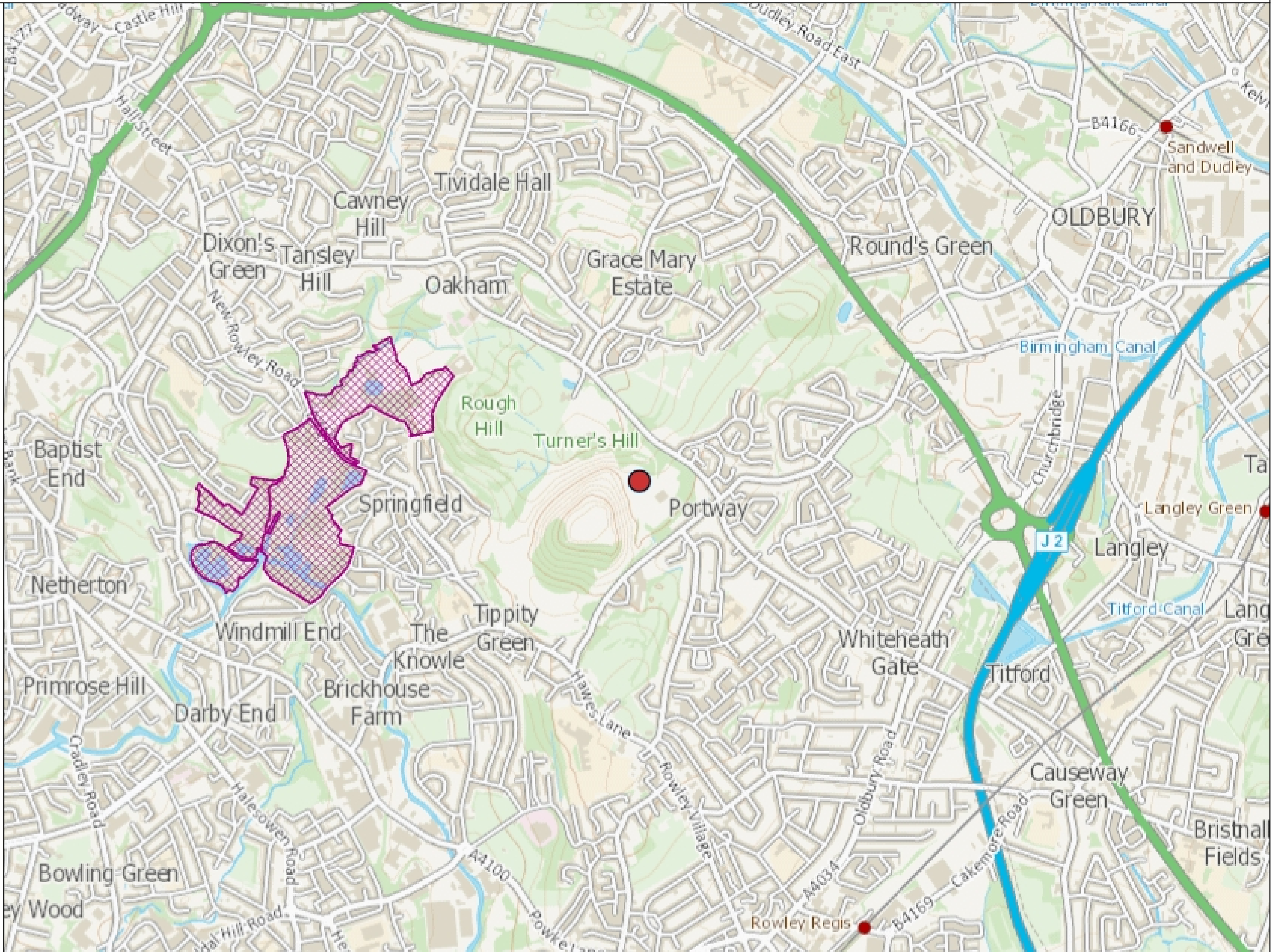
N W E S

Local Nature Reserve

Environment Agency

Legend

LNR (England)



1: 25,000

0 625

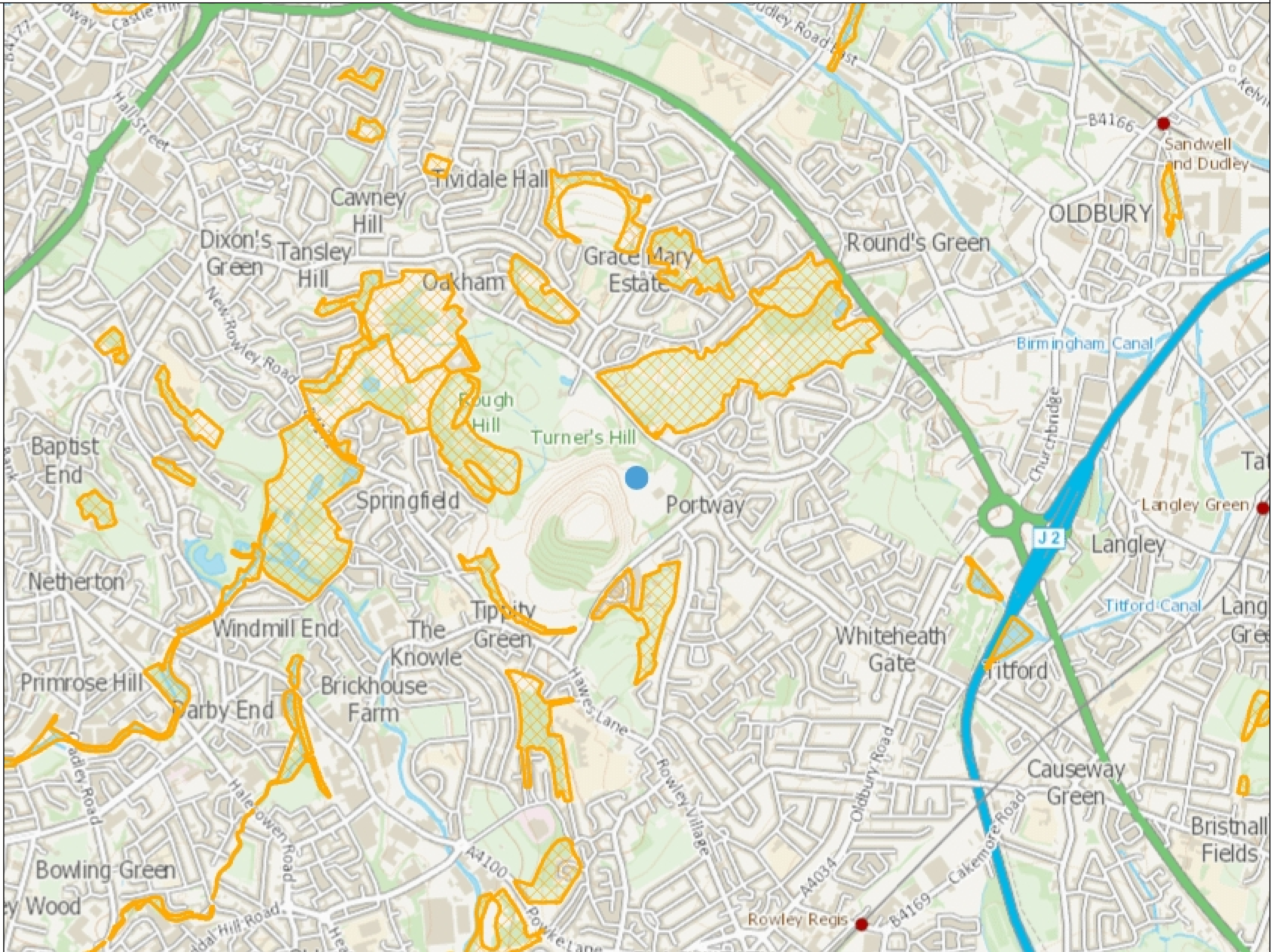
Metres

N
W E
S

Local Wildlife Sites

Legend

Local Wildlife Sites



1: 25,000

0 625

Metres

N W E S

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Appendix G – Drawings

GENERAL NOTES

1. SURVEY INFORMATION SUPPLIED BY THE WASTE RECYCLING GROUP .
2. DO NOT SCALE
3. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM
4. ANY ANOMALIES ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF BYRNE LOOBY

KEY

- PERMIT BOUNDARY
- NEW BIOREMEDIATION AREA
- 85.0 / 86.0 EXISTING GROUND CONTOURS
- BUFFER ZONE
- 9 RECEPTOR MARKER

Rev	Date	Description	By	Chk	App
01	23/12	BOUNDARIES ADDED	GH	EG	CF

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CLIENT

waste recycling GROUP

PROJECT

EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

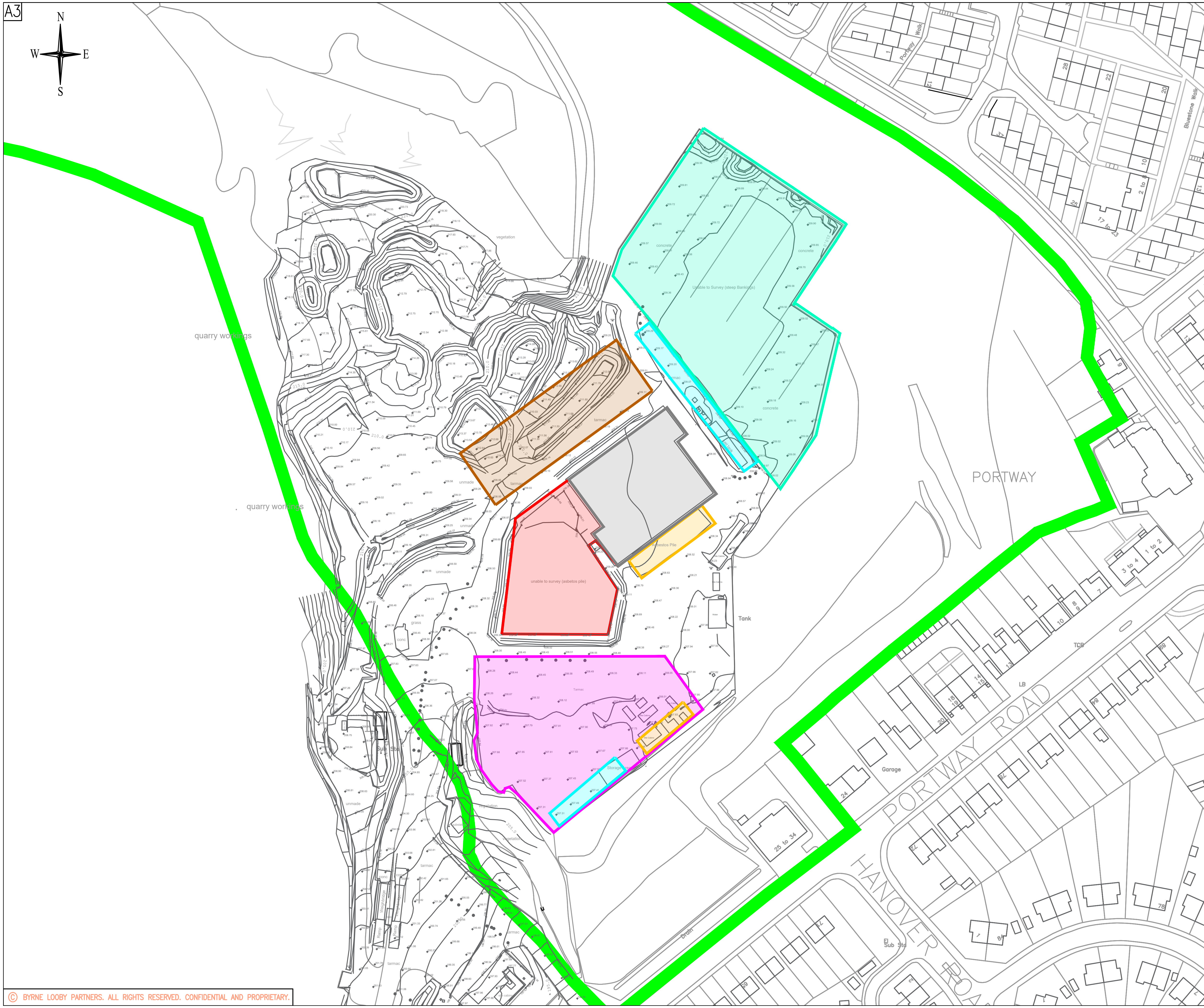
DRAWING TITLE

SENSITIVE RECEPTOR PLAN

STATUS

FINAL

Date: 21.12.22	Scale: N/A	Drawn: JM	Chk: JW	App: JW
Project No: K0182	Drg. No: K0182.1.001			Rev: 01



GENERAL NOTES

1. SURVEY INFORMATION SUPPLIED BY THE WASTE RECYCLING GROUP .
2. DO NOT SCALE
3. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM
4. ANY ANOMALIES ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF BYRNE LOOBY

KEY

- PERMIT BOUNDARY
- NON-HAZARDOUS SOIL STORAGE AND SCREENING AREA
- BIOLOGICAL TREATMENT AREA
- BIOFILTERS
- HAZARDOUS SOILS STORAGE AREA
- BIOLOGICAL TREATMENT AREA/SOIL WASHING AREA
- WATER TREATMENT PLANTS
- SOIL TREATMENT BUILDING

Rev	Date	Description	By	Chk	App

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PROJECT

EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

DRAWING TITLE

SITE LAYOUT PLAN

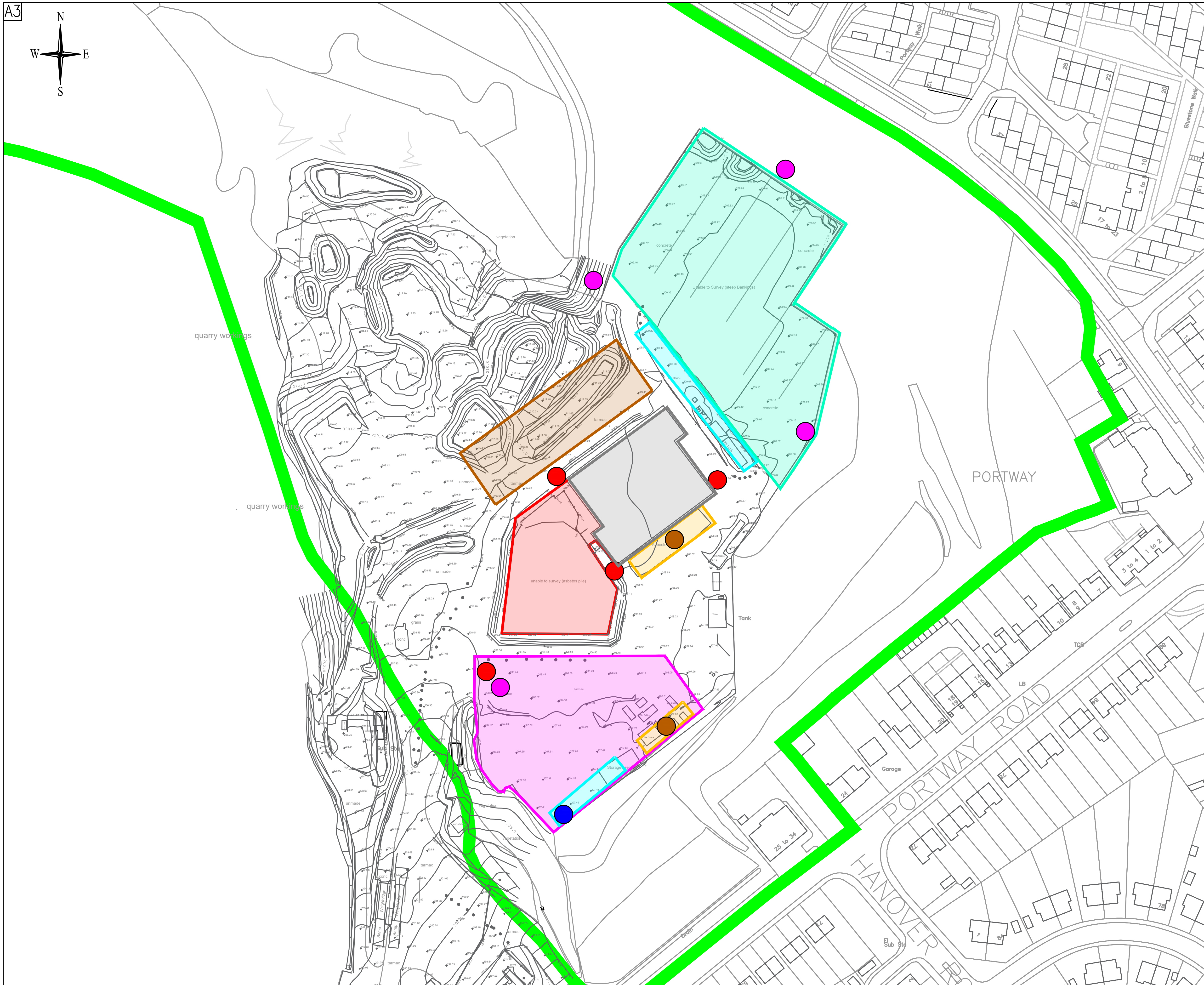
STATUS

FINAL

Date: 20.06.23	Scale: 1:1500	Drawn: JM	Chk: JW	App: JW

Project No:	Drg. No:	Rev:
K0182	K0182.2.002	01

A3



GENERAL NOTES

1. SURVEY INFORMATION SUPPLIED BY THE WASTE RECYCLING GROUP .
2. DO NOT SCALE
3. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM
4. ANY ANOMALIES ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF BYRNE LOOBY

KEY

- PERMIT BOUNDARY
- NON–HAZARDOUS SOIL STORAGE AND SCREENING AREA
- BIOLOGICAL TREATMENT AREA
- BIOFILTERS
- HAZARDOUS SOILS STORAGE AREA
- BIOLOGICAL TREATMENT AREA/SOIL WASHING AREA
- WATER TREATMENT PLANTS
- SOIL TREATMENT BUILDING
- AIR SAMPLING: ASBESTOS/PM10
- AIR SAMPLING: TPH/BTEX/PAH'S
- AIR SAMPLING: DUST/NOISE/ODOUR
- WATER SAMPLING: SEVERN TRENT

Rev	Date	Description	By	Chk	App

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PROJECT
EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

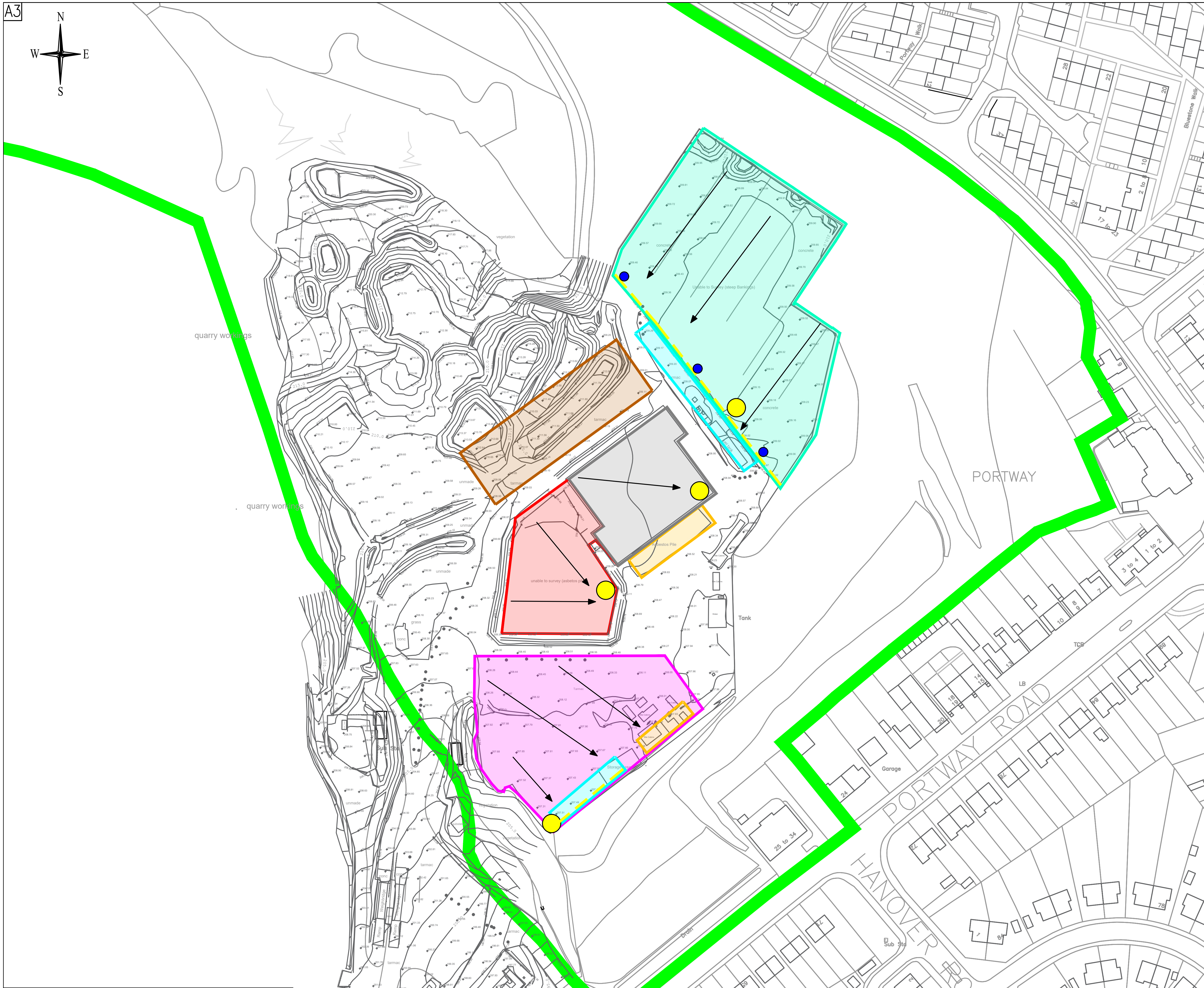
DRAWING TITLE
EMMISIONS MONITORING PLAN

STATUS
FINAL

Date: 20.06.23	Scale: 1:1500	Drawn: JM	Chk: JW	App: JW

Project No:	Drg. No:	Rev:
K0182	K0182.2.003	01

A3



GENERAL NOTES

1. SURVEY INFORMATION SUPPLIED BY THE WASTE RECYCLING GROUP .
2. DO NOT SCALE
3. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM
4. ANY ANOMALIES ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF BYRNE LOOBY

KEY

- PERMIT BOUNDARY
- NON-HAZARDOUS SOIL STORAGE AND SCREENING AREA
- BIOLOGICAL TREATMENT AREA
- BIOFILTERS
- HAZARDOUS SOILS STORAGE AREA
- BIOLOGICAL TREATMENT AREA/SOIL WASHING AREA
- WATER TREATMENT PLANTS
- SOIL TREATMENT BUILDING
- PUMPING CHAMBERS
- DRAINAGE GULLY
- DRAINAGE DIRECTION
- SURFACE WATER DRAINAGE PIPE

Rev	Date	Description	By	Chk	App

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PROJECT

EDWIN RICHARDS QUARRY
SOIL TREATMENT CENTRE

DRAWING TITLE

DRAINAGE PLAN

STATUS

FINAL

Date: 20.06.23	Scale: 1:1500	Drawn: JM	Chk: JW	App: JW

Project No:	Drg. No:	Rev:
K0182	K0182.2.004	01

Technology | Engineering | Consulting

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