APPLICATION FOR A PERMIT TO OPERATE A PART A INSTALLATION UNDER THE POLLUTION PREVENTION AND CONTROL (SCOTLAND) REGULATIONS 2012

APPLICATION REFERENCE PPC/A/1136072

RESPONSE TO SCHEDULE 4 REQUEST FOR FURTHER INFORMATION

Prepared for:

FCC WASTE SERVICES (UK) LIMITED, MILLERHILL, MIDLOTHIAN

July 2015

ECL Document Reference P2154/R011

Prepared by:

Environmental Compliance Limited
Unit G1, The Willowford, Main Avenue,
Treforest Industrial Estate, Pontypridd CF37 5YL

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ABBREVIATIONS AND ACRONYMS USED

AQMA	Air Quality Management Area
AQO	Air Quality Strategy Objective
AQS	Air Quality Standard
BAT	Best Available Techniques
CHP	Combined Heat and Power
CO	Carbon Monoxide
EA	Environment Agency
EAL	Environmental Assessment Level
EfW	Energy from Waste
ELV	Emission Limit Value
EPAQS	Expert Panel on Air Quality Standards
EP Regulations	Environmental Permitting (England and Wales) Regulations 2010
EQS	Environmental Quality Standard
GLC	Ground Level Concentration
HCl	Hydrogen Chloride
HF	Hydrogen Fluoride
HPP	Heat and Power Plan
Millerhill RERC	Millerhill Recycling and Energy Recovery Centre
NH_3	Ammonia
NO_x	Oxides of Nitrogen
NO_2	Nitrogen Dioxide
PC	Process Contribution
PEC	Predicted Environmental Concentration
PPC Regulations	Pollution Prevention and Control (Scotland) Regulations 2012
SEPA	Scottish Environment Protection Agency

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1. INTRODUCTION

1.1. FCC Waste Services (UK) Limited ("FCC") submitted an application to the Scottish Environment Protection Agency ("SEPA") on 24th April 2015 for a Part A environmental permit to operate a waste treatment facility at Millerhill in Midlothian under the Pollution Prevention and Control (Scotland) Regulations 2012 ("PPC Regulations"). The facility - known as the Millerhill Recycling and Energy Recovery Centre ("Millerhill RERC") - will incorporate primary treatment and secondary treatment techniques to process residual household waste and Commercial and Industrial waste ("C & I waste"). SEPA subsequently issued the reference number PPC/A/1136072 to the application.

1.2. On 8th May 2015, SEPA issued a Notice requiring further information under Paragraph 7 of Schedule 4 of the PPC Regulations ("Schedule 4 Notice"). Table 1 below details the requirements of the Schedule 4 Notice.

Table 1 Requirements of Schedule 4 Notice

Information Required	Date Information Required
1. Planning Permission:	
"Please provide confirmation and evidence that detailed planning permission has been approved by the Local Authority."	1st July 2015
2. Air Quality:	
"Additional information justifying the impact of the plant on the air quality standard for NOx in the area surrounding the plant, and specifically the Musselburgh AQMA should be provided."	5th June 2015 (see Note below)

Table 1 Requirements of Schedule 4 Notice (cont)

Information Required	Date Information Required
3. Heat and Power Plan:	
"a) Please provide a definition of the CHPQA site boundary as described in the SEPA Thermal Treatment of Waste Guidelines 2014. *b) Additional information on the assumptions and working behind the Heat and Power Plan calculations should be provided to SEPA."*	5th June 2015 (see Note below)
4. Noise Mitigation BAT Assessment:	
"Your application refers to noise mitigation measures that will be incorporated into the plant and gives some examples of potential techniques and equipment. Please provide details of these measures, or if not yet available, the proposed measures. Please also include a BAT assessment to ensure that potential noise issues are designed out or minimised from the plant."	5th June 2015 (see Note below)
5. Initial Site Condition and Baseline Reports:	
"Please provide an assessment of the substances that will be used on site in accordance with SEPA Site and Baseline Report Guidance (IED TG02). This should assess their properties against Article 3 of the Hazardous Substance Regulation. This assessment should be used to determine the need for a baseline report (which would be required under a Pre Operating Condition, if necessary)."	5th June 2015 (see Note below)
6. FCC Lincoln Monitoring:	
"Please provide the three quarterly extractive monitoring reports referenced in your application for the FCC EFW plant."	5th June 2015 (see Note below)

Note to Table 1

It was agreed with SEPA that the date for responses to Items 1, 2, 5 and 6 would be extended until 1st July 2015 and for Items 3 and 4 until 13th July 2015.

1.3. This document provides FCC's responses to Items 1, 2, 5 and 6 of the Schedule 4 Notice. Responses to Items 3 and 4 are to follow (see Note to Table 1 above).

2. PLANNING PERMISSION

2.1. Schedule 4 Notice Requirements

"Please provide confirmation and evidence that detailed planning permission has been approved by the Local Authority."

2.2. Response

It is now expected that the planning application will be determined by Midlothian Council on 25th August 2015. Evidence that planning permission has been granted will be provided to SEPA as soon as possible thereafter.

3. AIR QUALITY

3.1. Schedule 4 Notice Requirements

"Additional information justifying the impact of the plant on the air quality standard for NOx in the area surrounding the plant, and specifically the Musselburgh AQMA should be provided."

3.2. Response

3.2.1. The impact of emissions of oxides of nitrogen ("NO_x"),expressed as nitrogen dioxide ("NO_2") arising from the proposed facility - the Millerhill Recycling and Energy Recovery Centre ("the Millerhill RERC") - on the surrounding area may be found in ECL Report P2154/R008 submitted in conjunction with the permit application. Both long-term and short-term impacts of NO_2 were screened out as being insignificant at the point of maximum ground level concentration (located at NGR 332603, 670812), and, consequently, at all of the sensitive receptors considered in the study.

3.2.2. Following the same methodology, and input parameters as outlined in ECL Report P1254/R008, the impact of NO_x emissions from the Millerhill RERC on the Musselburgh AQMA was predicted. The maximum predicted annual and 1-hourly mean NO_2 ground level concentrations ("GLCs") - process contributions ("PCs") - at the Musselburgh AQMA are presented in Table 1 for the Millerhill RERC operating in isolation and in combination with emissions from the adjacent Aluna Renewable Energy ("ARE") facility. Process contributions have been compared with the long and short term air quality standards ("AQSs") for NO_2 for both scenarios. The grid reference for the Musselburgh AQMA used in the assessment was NGR 334290, 672611 - High Street, Musselburgh - the closest point of the AQMA to the proposed Millerhill RERC.

Table 1 Impact of NO_x (as NO_2) Emissions on the Musselburgh AQMA

Source	Averaging Period	PC ($\mu g/m^3$)	AQS ($\mu g/m^3$)	PC as a %age of the AQS
Millerhill RERC	annual	0.224	40	0.56
	1-hour (99.79th percentile)	1.473	200	0.74
Millerhill RERC in combination with ARE	annual	0.354	40	0.88
	1-hour (99.79th percentile)	2.137	200	1.07

3.2.3. It can be seen from the data in Table 1, that the long term and short term process contributions from the Millerhill RERC in isolation and in combination with the ARE facility are considered not significant (i.e. both long term NO_2 PCs are less than 1%

of the long term NO_2 AQS, and both short term PCs are less than 10% of the short term NO_2 AQS). Accordingly, no further assessment is required.

3.2.4. The Musselburgh AQMA lies within East Lothian, and it is known that in some parts of the AQMA the annual mean AQS for NO_2 is exceeded. Discussions have been held with the Principal Environmental Protection Officer ("PEPO") from East Lothian Council who has provided further information on the AQMA. It is known that there is an action plan currently being developed to reduce NO_2 emissions within the AQMA, however, at time of writing, no further information is available on the measures that will be required, or the timescales for East Lothian to publish the associated Action Plan. In addition to the work on the AQMA, further work is being undertaken in East Lothian with respect to modelling of transportation and associated emissions. Again, this work is unlikely to be completed before the end of 2015. Consequently, whilst the Millerhill RERC does add to background levels of NO_x, it is considered that the contribution can be deemed not significant in accordance with SEPA's H1 guidance note.

3.2.5. It is important to note that whilst East Lothian Council is a consultee to both the planning and environmental permit application processes, the decision to allow and permit the development rests with Midlothian Council and SEPA, respectively, as was confirmed by the East Lothian PEPO during discussions on the matter.

4. HEAT AND POWER PLAN

4.1. Schedule 4 Notice Requirements

"a) Please provide a definition of the CHPQA site boundary as described in the SEPA Thermal Treatment of Waste Guidelines 2014.

b) Additional information on the assumptions and working behind the Heat and Power Plan calculations should be provided to SEPA."

4.2. Response

To follow.

5. NOISE MITIGATION BAT ASSESSMENT

5.1. Schedule 4 Notice Requirements

"Your application refers to noise mitigation measures that will be incorporated into the plant and gives some examples of potential techniques and equipment. Please provide details of these measures, or if not yet available, the proposed measures. Please also include a BAT assessment to ensure that potential noise issues are designed out or minimised from the plant."

5.2. Response

To follow.

6. INITIAL SITE CONDITION AND BASELINE REPORTS

6.1. Schedule 4 Notice Requirements

"Please provide an assessment of the substances that will be used on site in accordance with SEPA Site and Baseline Report Guidance (IED TG02). This should assess their properties against Article 3 of the Hazardous Substance Regulation. This assessment should be used to determine the need for a baseline report (which would be required under a Pre Operating Condition, if necessary)."

6.2. Response

6.2.1. The substances to be used on site are listed in Table 4 of ECL report P2154/R005 provided as Appendix 3 (Initial Site Condition Report) of the Application Supporting Information Document (ECL Report P2154/R004). This Table has been updated to include an assessment of the hazardous properties (against Article 3 of the Hazardous Substance Regulations) of the various substances used on site, and is provided as Table 2 below. Each of the three stages of assessment, as outlined in SEPA Technical Guidance Note IED TG02 *Content and Scope of Site Reports* (November 2013), has been considered and are addressed in Table 2.

Table 2: Potentially Polluting Substances

Stage 1 Chemicals Handled	Stage 2 Chemical Characteristics and Toxicity					Stage 3 Site Specific Characteristics					Stage 4 Site Specific Risk
							Delivery, Storage and Containment Arrangements				
Substances	**Physical State**	**Hazard Classification**	**Labelling According to Regulation (EC) 1272/2008**	**Environmental Fate and Behaviour**	**Potential Pollution Risk**	**Quantity Stored on Site**	**Primary**	**Secondary**	**Tertiary**	**Use**	**Comments/ Chemical of Concern**
Waste to be processed	Solid	Non-Hazardous	Not Applicable	Potential for windblown pollution.	No	1,250t	Delivered to site by waste delivery vehicle and off-loaded to tipping bay within waste building.	Waste is stored within a waste bunker which has an impermeable surface connected to a sealed drainage system.	Site surfacing - impermeable.	Feedstock	Material can be easily cleaned up in the event of a spill/release and therefore not considered a potential risk.
Calcium Hydroxide (hydrated lime)	Solid powder	Causes skin irritation. Causes serious eye damage. May cause respiratory irritation. Toxic to aquatic life.	H315 H318 H335 H401	May increase pH of receiving environment if a spill occurs with resulting ecological damage.	Yes if released to environment	180m^3	Pneumatic off-load from delivered trucks directly to silos (2x80m^3) each fitted with fabric filters for de-dusting.	De-dusted air is exhausted back to the atmosphere, dust contained within filters is blown back into silo after filling.	Site surfacing - impermeable and drainage system - double skinned, discharge via interceptor.	Used abatement of acid gases in incinerator off-gases.	Potential for spillages of powder or dust release. However, the risk is considered low due to the control measures in place.
24.5% Aqueous Ammonia	Liquid	Causes severe skin burns and eye damage. May cause respiratory irritation.	H314 H335 H401	May increase pH of receiving environment if a spill occurs with resulting ecological damage.	Yes if released to environment	44m^3	Delivered to site by tankers and stored in above ground, double walled, glass-reinforced plastic storage silo.	Silo located within dedicated sealed bund with a containment volume of 50m^3.	Site surfacing - impermeable and drainage system - double skinned, discharge via interceptor.	Used for abatement of oxides of nitrogen in incinerator off-gases.	Site containment measures and handling measures are considered appropriate. Potential for spillages. However, the risk is considered low due to the control measures in place.
Activated Carbon	Solid powder	Non-Hazardous	Not Applicable	Potential for windblown pollution.	No	80m^3	Pneumatic off-load from delivered trucks directly to silo (1x80m^3) fitted with fabric filters for de-dusting	De-dusted air is exhausted back to the atmosphere, dust contained within filters is blown back into silo after filling.	Site surfacing - impermeable.	Used for abatement of organic micropollutants and heavy metals in incinerator off-gases.	Material can be easily cleaned up in the event of a spill/release and therefore not considered a potential risk.
Demineralised Water Plant Chemicals: 30% Sodium Hydroxide	Liquid	Causes severe burns and eye damage. Toxic to aquatic life.	H314 H401	May increase pH of receiving environment if a spill occurs with resulting ecological damage.	Yes if released to environment	5m^3	Delivered to site by tankers and stored in above ground, storage silo	Stored in suitably bunded area within the demineralisation plant. The bund will have a capacity of 110% of the total storage volume.	Site surfacing - impermeable and drainage system - double skinned, discharge via interceptor.	Used to regenerate the demineralisation plant ion exchange resins.	Site containment measures and handling measures are considered appropriate. Potential for spillages. However, the risk is considered low due to the control measures in place.
Demineralised Water Plant Chemicals: 35% Hydrochloric Acid	Liquid	Causes severe skin burns and eye damage. May cause respiratory irritation. Toxic to aquatic life.	H314 H335 H401	May decrease pH of receiving environment if a spill occurs with resulting ecological damage.	Yes if released to environment	5m^3	Delivered to site by tankers and stored in above ground storage silo	Stored in suitably bunded area within the demineralisation plant. The bund will have a capacity of 110% of the total storage volume. During delivery, exhausted air will be vented through a scrubber to prevent hydrogen chloride releases to atmosphere.	Site surfacing - impermeable and drainage system - double skinned, discharge via interceptor.	Used to regenerate the demineralisation plant ion exchange resins.	Site containment measures and handling measures are considered appropriate. Potential for spillages. However, the risk is considered low due to the control measures in place.

Table 2: Potentially Polluting Substances (cont)

Stage 1 Chemicals Handled	Stage 2 Chemical Characteristics and Toxicity					Stage 3 Site Specific Characteristics					Stage 4 Site Specific Risk
							Delivery, Storage and Containment Arrangements				
Substances	Physical State	Hazard Classification	Labelling According to Regulation (EC) 1272/2008	Environmental Fate and Behaviour	Pollution Risk?	Quantity Stored on Site	Primary	Secondary	Tertiary	Use	Site Specific Risk
Boiler Treatment Chemicals: Trisodium Phosphate	Liquid	Causes skin irritation Causes serious eye damage May cause respiratory irritation	H315 H318 H335	May act as plant nutrient and precipitate heavy metals in aqueous environment.	Yes if released to environment	400l	Delivered to site by tankers and stored in above ground storage silo	Stored in suitably bunded area within the demineralisation plant. The bund will have a capacity of 110% of the total storage volume.	Site surfacing - impermeable and drainage system – double skinned, discharge via interceptor.	Used to prevent boiler tube corrosion	Site containment measures and handling measures are considered good. Potential for spillages. However, the risk is considered low due to control measures in place.
Low Sulphur Gas Oil	Liquid	Causes skin irritation. Harmful if inhaled. Causes damage to organs through prolonged exposure. Toxic to aquatic life. Toxic to aquatic life with long lasting effects.	H315 H332 H373 H401 H411	Can cause contamination of ground, groundwater and soil.	Yes if released to environment	100m^3	Delivered to site by road tanker direct to double walled steel storage tank.	Liquid transfer direct to 110% bunded storage tank with all delivery points contained within the bund.	Site surfacing - impermeable and drainage system – double skinned, discharge via interceptor.	Auxiliary Fuel	Site containment measures and handling measures are considered good. Potential for spillages. However, the risk is considered low due to control measures in place.
Diesel	Liquid	irritation. Harmful if inhaled. Causes damage to organs through prolonged exposure. Toxic to aquatic life. Toxic to aquatic life with long lasting effects.	H315 H332 H373 H401 H411	Can cause contamination of ground, groundwater and soil.	Yes if released to environment	85m^3	Delivered to site by road tanker direct to double walled steel storage tank.	Liquid transfer direct to 110% bunded storage tank with all delivery points contained within the bund.	Site surfacing - impermeable and drainage system – double skinned, discharge via interceptor.	Fuel for the back up generators.	Site containment measures and handling measures are considered good. Potential for spillages. However, the risk is considered low due to control measures in place.
Air Pollution Control (APC) Residue	Solid	Causes severe burns and eye damage. Causes skin irritation.	H314 H315	Potential for windblown pollution. May increase pH of receiving environment if a spill occurs with resulting ecological damage.	Yes if released to environment	247m^3	Contained within bag filters	Pneumatic transfer to buffer tank, pneumatic storage vessel and pipes to storage silos which are kept under negative pressure with air evacuated via a particulate filter.	Site surfacing - impermeable.	Waste arising from EfW plant	Site containment measures and handling measures are considered good. Potential for spillages. However, the risk is considered low due to control measures in place, and any spillages can be easily cleaned up.
Incinerator Bottom Ash (IBA)	Solid	Non-hazardous	Not applicable	Potential for windblown pollution.	No	904m^3	Contained within water filled bottom ash extractor	Integrated conveyor transfer to storage bunker	Site surfacing - impermeable.	Waste arising from EfW plant	Material can be easily cleaned up in the event of a spill/release and therefore not considered a potential risk.

Table 2: Potentially Polluting Substances (cont)

Stage 1 Chemicals Handled	Stage 2 Chemical Characteristics and Toxicity					Stage 3 Site Specific Characteristics					Stage 4 Site Specific Risk
							Delivery, Storage and Containment Arrangements				
Substances	Physical State	Hazard Classification	Labelling According to Regulation (EC) 1272/2008	Environmental Fate and Behaviour	Pollution Risk?	Quantity Stored on Site	Primary	Secondary	Tertiary	Use	Site Specific Risk
Solid Recovered Fuel (SRF) Bales	Solid	Non-hazardous	Not applicable	Potential for windblown pollution.	No	4,100t	Delivered to site by waste delivery vehicle and off-loaded to bale storage area.	SRF bales are stored within a dedicated storage which has an impermeable surface connected to a sealed drainage system.	Site surfacing - impermeable	Feedstock	Material can be easily cleaned up in the event of a spill/release and therefore not considered a potential risk.

6.2.2. The proposed installation is to be located in an area which has been previously used as a colliery and railway sidings and retains a number of structures associated with the sidings. The main sources of on-site contamination are on-site Made Ground containing substances of potentially elevated levels of calorific value which could lead to combustion of the land; locally identified asbestos fibres; elevated methane and carbon dioxide; and locally elevated sulphate concentrations.

6.2.3. Previous site investigations carried out at the site indicate that it contains relatively low concentration of contaminants, with the exception of localised areas of amosite and chrysotile asbestos. Localised slightly elevated concentration of leachable contaminants have been identified, although it is presumed that these pose a low risk to water receptors.

6.2.4. Earlier site investigations have been undertaken, as described in ECL Report P2154/R005, however, the Environmental Statement submitted with the Planning Application for the facility states that further intrusive investigations will be required prior to construction. The results of the investigation would be used to update the current conceptual site model and risk assessment and ensure a more detailed assessment of potential risks can be made and any required remediation can be designed and updated. On this basis it is suggested that the initial site condition report be updated following the further site investigation works and any required remediation in order to provide an accurate, pre-construction baseline report, and that this report be submitted to SEPA prior to the commencement of operations. The preliminary design for the site investigation is provided in Appendix 1 of this document, however, this will be formally submitted to SEPA for approval prior to the investigation being undertaken.

7. FCC LINCOLN MONITORING

7.1. Schedule 4 Notice Requirements

"Please provide the three quarterly extractive monitoring reports referenced in your application for the FCC EFW plant."

7.2. Response

Copies of the monitoring reports requested are provided in Appendix 2 of this document.

Please note that there is a typographical error in Table 16 of the permit application Supporting Information- Document ECL document reference P2154/R004 - the column headings "Quarter 1", "Quarter2" and "Quarter 3" should read "Quarter 2", "Quarter3" and "Quarter 4" respectively (as referenced in the third paragraph of Section 12.1.3.2. of the document).

APPENDIX 1

PRELIMINARY METHOD STATEMENT FOR SITE BASELINE INVESTIGATION

PRELIMINARY METHOD STATEMENT FOR SITE BASELINE INVESTIGATION

1. OVERVIEW

1.1. This document represents the design for the initial site investigation to be undertaken at the installation in order to provide baseline ground and groundwater information for the PPC Permit.

1.2. An intrusive investigation is required to be undertaken to characterise substances identified as being potentially present in, on or under the ground/groundwater identified from previous studies, or based on the materials that will be stored on site.

1.3. The site has been subject to a number of site investigations, and consequently remediation of the site is required prior to commencement of construction of the installation. The baseline site investigation, will therefore serve as a validation report for the remediation works in addition to providing base line ground conditions for the installation. The baseline site investigation will only be undertaken when all grouting and remediation works have been completed.

1.4. This document also contains the scope of the investigations required in order to collect baseline data.

2. INTRUSIVE INVESTIGATION

2.1. The objectives of the intrusive investigation are to:

- collect data to produce an accurate conceptual site model based on the site in the "post remediation" state,
- collect sufficient data on the substances identified in the initial site condition report (i.e. the hazardous substances stored onsite) which due to their chemical and physical properties, may have the potential to adversely affect the ground conditions;
- install any additional permanent monitoring points required to supplement those already in place at the site to facilitate operational monitoring of the groundwater conditions

2.2. The baseline intrusive investigation will commence on completion of all site remediation works, including those relating to mine-workings, but prior to any construction activities.

2.3. It is likely that the intrusive investigation will require a combination of trial pits and window sampling. There are existing groundwater/ground gas monitoring installations at the site, where possible, these locations will be retained.

2.4. The locations of all intrusive sampling points will be:

- agreed in advance with SEPA (should during the course of the investigation the locations will be required to be moved, these will be agreed with SEPA if the

location moves by more than 10 metres);
- accurately plotted on a site map;
- based on a review of all available data relating to ground conditions, post remediation and grouting;
- based on the storage locations of potentially polluting substances identified in the initial site condition report.

2.5. A suitably qualified and experienced geotechnical engineer will supervise the investigation and will undertake the following activities:

- determining the location of the sampling points;
- prepare logs of the ground conditions encountered;
- if required modify the site investigation dependant on the ground conditions encountered;
- determine the samples to be sent for analysis;
- supervising the installation of any groundwater monitoring wells.

3. SOIL INVESTIGATION AND SAMPLING TECHNIQUES AND PROTOCOLS

3.1. Sample Locations

Sampling locations will be agreed in advance with SEPA and will be based on a review of the existing site condition information and the remedial works that will be undertaken prior to construction of the facility.

3.2. Trial Pits

3.2.1. Trial pits are exploratory holes excavated into the ground by hand or by mechanical excavator. Trial pits allow faster inspection of a larger proportion of the groundmass and are a means of obtaining larger quantities of soil samples. In addition trial pits allow flexibility during investigation as trial pits can often be moved slightly, rather than re-started, if obstructions are encountered.

3.1.2. Trial pits are generally approximately 2m long by 0.5m - 1m wide, and up to 3m deep. Trial pits can be hand dug to 1.2m, but the usual method is to use mechanical plant with a skilled operator. The plant most commonly used is a wheeled backhoe loader (using the backactor arm) which is frequently referred to as a "JCB", irrespective of the actual make. With a conventional digging arm these can achieve depths of around 3.5m and with an extendable arm they can achieve depths around 5m.

3.3. Protocol for Excavating Trial Pits

The protocol for the excavating trial pits is as follows:

- ensure a trial pit log is filled in prior and during the works;
- the locations of the trial pits will be set on an approved drawing, however, may change depending on the nature of the ground conditions encountered;
- a "before" photograph is taken (ensure photograph identification boards are used);
- if required, it may be necessary to protect the ground surface from contaminated arisings with plastic sheeting, wooden boards etc;

- the excavator driver will manoeuvre the excavator into a suitable position for the trial pit location, taking into account factors such as the position of the sun/other bright lights (good visibility is essential) and wind direction (in relation to vehicle exhaust fumes, ground gases, odours etc);
- samples will be taken an appropriate depths, and logged;
- final depth of the pit will be recorded;
- any groundwater strikes and the final level of groundwater will be recorded;
- re-instatement works will be undertaken as required, irrespective of whether formal re-instatement works are to be carried out, it is important that the borehole and surrounding area are left in a safe condition. Open pits and excavation equipment should not be left unattended unless securely roped, coned or fenced off.

3.4. Window Sampling

3.4.1. Window sampling is essentially a percussive method of creating small diameter boreholes. A window sampler is a high tensile steel tube with a hardened cutting shoe to penetrate hard materials. Each sampler is usually 1m or 2m long with a series of "windows" or slots cut in the wall of the tube through which to view or extract soil samples. Samplers are driven down into the ground using a percussive hammer.

3.4.2. The depth limit tends to be around 8m to 10m although the technique is usually used to a maximum depth of around 5m. In practice, the limiting factor tends not to be how deep the samplers can be driven in but rather whether the ground conditions are such that they may then be pulled back out.

3.4.3. A full sampler will reveal a complete or partial ground profile although guidance from the Drill Supervisor will be needed on any compression that may have occurred and resulted in, for example, a 1.5m sample occupying a 1m space in the sampler.

3.4.4. With some window sampling systems, samples can be recovered in a thin walled transparent liner placed inside the steel tubes. The liner is removed for visual inspection or capped at each end for transporting to the laboratory.

3.4.5. Window sampling causes minimal disturbance to the ground surface.

3.5. Protocol for Window Sampling

The protocol for the excavating trial pits is as follows:

- ensure a window sample log is filled in prior and during the works;
- the locations of the window samples will be set on an approved drawing, however, may change depending on the nature of the ground conditions encountered;
- a "before" photograph is taken (ensure photograph identification boards are used);
- the general requirements for drilling, sampling, *in situ* tests and the design of the groundwater/gas monitoring installation (if needed) etc. are confirmed before the window sampling is started. It is usually desirable, however for some flexibility to be maintained as the borehole is drilled and the conditions emerge;
- as the window samples develops the geotechnical engineer will liaise with the drilling crew on precise sampling and groundwater measurement requirements;

- if there is spoil in excess of that needed for sampling/backfilling purposes, this is placed directly into bags and stored in such a way that they may be disposed of appropriately once the investigation has finished;
- once the desired depth is reached, a groundwater/gas monitoring installation will be constructed carefully by the drilling crew (if required) and the top of the borehole fitted with an appropriate cover. If an installation is not needed, the hole will be backfilled with the arisings.

3.6. Sampling Techniques - Soils

3.6.1. Samples from trial pits and window samples will be taken at the discretion of the Geotechnical Engineer. Each sample is given a unique sample identification number. In addition the samples will labelled with:

- the name of the laboratory;
- sample reference number;
- transportation information (i.e. fragile);
- sample type;
- site name;
- job number; and
- date of sampling.

3.6.2. A record is made of the number and description of samples taken and also the reasoning for taking such a sample (e.g. suspicious odour or colour).

3.6.3. The samples will be stored in appropriate containers and placed immediately in cool boxes to prevent any deterioration of soil samples. At the end of each working day, the samples are collected by courier and sent to a UKAS accredited laboratory for analysis. All samples must be accompanied by a chain-of-custody form

3.7. Sampling Techniques - Groundwaters

3.7.1. Groundwater samples will be taken where groundwater is encountered during the intrusive investigation and also a minimum of 2 weeks after the investigation from existing or new installations. All sample points will be purged prior to samples being taken, and groundwater extracted with a bailer.

3.7.2. Each sample is given a unique sample identification number. In addition the samples will labelled with:

- the name of the laboratory;
- sample reference number;
- depth to groundwater;
- transportation information (i.e. fragile);
- sample type;
- site name;
- job number; and

3.7.3. A record is made of the number and description of samples taken and also the reasoning for taking such a sample (e.g. suspicious odour or colour).

3.7.4. The samples will be stored in appropriate containers and placed immediately in cool boxes to prevent any deterioration of soil samples. At the end of each working day the samples are collected by courier and sent to a UKAS accredited laboratory for analysis. All samples must be accompanied by a chain-of-custody form.

3.8. Sampling Techniques - Soil Gas and Vapour

Ground gas testing will be undertaken from existing and proposed ground gas monitoring points. A potable gas meter will be used for sampling and analysis.

3.9. Analytical Suites

Table 1 details the analytical suites proposed for each environmental medium being tested.

Table 1 Proposed Analytical Suites

Determinand	Soil	Groundwater	Ground Gas
pH	✓	✓	-
Ammoniacal Nitrogen	✓	✓	-
Nitrite	✓	✓	-
Chloride	✓	✓	-
Cyanide	✓	✓	-
Aluminium	✓	✓	-
Arsenic	✓	✓	-
Boron	✓	✓	-
Cadmium	✓	✓	-
Chromium	✓	✓	-
Copper	✓	✓	-
Iron	✓	✓	-
Lead	✓	✓	-
Manganese	✓	✓	-
Mercury	✓	✓	-
Nickel	✓	✓	-
Selenium	✓	✓	-
Sulphate	✓	✓	-
Sodium	✓	✓	-
Tin	✓	✓	-
Zinc	✓	✓	-
Total Petroleum Hydrocarbons - CWG and Banded	✓	✓	-
Conductivity	✓	✓	-
Suspended solids	✓	✓	-
Phenols	✓	✓	-
Speciated and Total Polyaromatic Hydrocarbons	✓	✓	-
Moisture	✓	-	-
Soil Organic Matter	✓	-	-
Volatile Organic Compounds	✓	✓	-
Semi-volatile Organic Compounds	✓	✓	-
Asbestos	✓	-	-

Table 1 Proposed Analytical Suites (cont)

Determinand	Soil	Groundwater	Ground Gas
Methane	-	-	✓
Carbon Dioxide	-	-	✓
Oxygen	-	-	✓

APPENDIX 2

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EMISSIONS MONITORING REPORTS