ARUP

Subject	Ness EfW Gas Assessment		
Date	18 December 2020	**Job No/Ref**	256683-33

NESS EfW – Ground Gases Note to address SEPA Ser 8

1 Introduction

SEPA have resulted further clarification on ground gases as follows:

SEPA Ser	Issue raised
8	**Ground Gases** **(guidance presented in BS:8485: 2019)** Further clarification is required with respect to the ground gas risk assessment to be carried out in accordance with the guidance presented in BS:8485: 2019 (to ensure that buildings are protected from any potential ground gas ingress issues) and how this has been considered/mitigated with respect to wider site accident potential

2 Gas Monitoring

Gas monitoring was undertaken by White Young Green between November 2018 and February 2019. The results of the gas monitoring are present in full in the following report:

- White Young Green: Aberdeen City Council. Ness EfW, Greenbank Crescent. Ground Investigation Factual Report. Final. March 2019.

A summary of the gas results is presented in Appendix A.

3 Ground Gas Assessment

3.1 Potential Sources and Pathways

The problems associated with ground gas generation and migration are varied. Methane is flammable in air at concentrations between 5% and 15% by volume, where carbon dioxide is an asphxyiant when present in confined spaces at levels of 1.5% by volume and greater.

Any material having an organic or biodegradable content, eg pits backfilled with degradable materials or naturally organic rich deposits such as peat or silts, will have the potential to produce landfill gases including methane, carbon dioxide and hydrogen sulphide and for the depletion of oxygen, with associated hazards of explosion or asphyxiation. These gases may migrate from the soils into confined spaces within the buildings.

The ground investigations undertaken at the site have established that made ground was present across the site. It is understood from discussions with Acciona, that nearly all of the made ground has been removed from site as part of the earthworks undertaken ahead of the construction of the facility.

Potential sources of ground gas have also been identified at the base of the made ground where buried topsoil/silt deposits have been encountered. Localised pockets of organic material were also encountered in some of the natural superficial deposits, with organic odours observed at some locations.

3.2 Potential Receptors

The principal receptors from potential gas migration and accumulation are future occupiers/users of the proposed development and construction/maintenance workers in any isolated areas where there could be a potential for gas accumulation.

There are only two buildings on-site which will occupied by staff, namely the gate house and administration building.

3.3 Gas Monitoring Data

The gas monitoring data is presented in full in the WYG Factual report and is summarised in Appendix A of this report.

The majority of the monitoring visits did not detect methane to be present in the standpipes. Borehole 104A recorded methane at 7.2% during the first round of monitoring, but the subsequent round of monitoring on this standpipe did not detect any methane to be present at a steady state.

Carbon dioxide was detected to be present in a number of the standpipes. Concentrations above 5% were detected in BH102, BH110A, WB103B, WB104 and WB112B.

Depleted oxygen (concentrations below 18%) was observed in nearly all of the standpipes. Hydrogen Sulphide and VOCs were not detected in any of the standpipes during the monitoring visits and a maximum concentration of carbon monoxide was recorded at 1ppm.

Gas flow rates varied across the site with a maximum flow rate of 0.7l/hr.

3.4 Gas Risk Assessment

BS8485 and CIRIA C665 provide guidance on the assessment of gas risk by developing a characteristic gas situation through site characterisation. A method widely used by regulators and consultants to assess the risk posed by gases was developed by Wilson and Card (1999) and is the basis for the gas assessment described in CIRIA guidance C665 – Assessing risks posed by

hazardous ground gases to buildings and in BS8485 – Code of Practice for the characterisation and remediation from ground gas in affected developments.

Both gas concentrations and borehole flow rates measured in the field are used to calculate the limiting borehole gas volume flow, or Gas Screening Value (GSV) for gases presenting high risks. The GSV is equal to the maximum borehole flow rate (l/h) multiplied by the maximum gas concentrations (%v/v). The calculated GSV is then compared to the classification system described in C665 to determine the characteristic situation defining the general scope of gas protection measures required

Table 1: Calculation of gas screening values

Standpipe	Strata	Potential source of ground gas	Proposed development in area of standpipe	Max methane concentration (%)	Max carbon dioxide concentration (%)	Max. flow in standpipe (l/hr)	Calculated methane GSV(l/hr)	Calculated carbon dioxide GSV (l/hr)
WB101	MG, sand and clay	Strong solvent odours and hydrocarbon sheens	Proposed car park	0	4.0	0.2	-	0.008
WB103B	MG, sand	Reworked natural at top of strata	Bottom ash hall and perimeter road	0	10.9	0.1	-	0.011
WB104	Sand and clay	-	Perimeter road	0	5.2	0.2	-	0.0104
WB105	Sand and gravel	Silt 2.3-2.5m. Sand with occ organic material 2.5m	Road and out weighbridge	0	4.7	0.7	-	0.0329
BH102	Made ground	MG with ash. Hydrocarbon odour and strong solvent odour	Waste reception hall	0.1	6.1	0.3	-	0.0183
BH104	Made ground and sandy and gravel	MG sand with organic inclusions. Moderate organic odours	Waste reception hall/waste storage bunker/admin block	7.2	1.9	0.9	0.009	0.0171
BH105	Made ground & sand	MG sand with lenses of organic material. Mild organic odours	Waste storage bunker and road	0	4.2	0.3	-	0.0216
BH110A	Made ground & clay	Buried topsoil	Road	0.3	10.4	0.2	0.0006	0.0208
BH112B	MG, sand & gravel, clay	-	Road	0	9.2	0.7	-	0.064
BH114A	MG and sand	Silt strong organic odour	Detention basin/road	0	4.7	0.2	-	0.0094

Findings of gas risk assessment

In accordance with CIRIA C665 and BS8485, the gas screening values place the site within Characteristic Situation 1 where no gas remedial measures would be required.

4 Operational phase of facility

The proposed installation will result in a number of hazardous substances being stored and used on-site. However, the proposed development will include extensive containment measures for the process areas which have the potential to release contaminants and these will limit the potential for spills or leaching of pollutants from the site directly to the underlying soils. The facility reuses wastewater within the process ensuring that there is no aqueous emission from the facility. The surface water drainage system will collect, manage and control run-off from roofs, site roads and other areas of impermeable surfacing. All SuDs features include impermeable liners to ensure the run-off water is kept within eth system and does not pollute the underlying groundwater.

Appropriate health, safety and environmental mitigation and monitoring measures are proposed as part of the development, including bunding of tanks and use of level alarms and segregation of foul and surface water drainage systems. It is therefore considered unlikely that accidental spills or leaks will cause ground gas issues in the future.

Appendix A – Results of Gas Monitoring

Appendix 1 – Results of Gas Monitoring

Borehole	Response zone (m bgl)	Strata	No of visits	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Hyrdogen sulphide (ppm)	Carbon monoxide (ppm)	VOC (ppm)	Steady flow rate (l/hr)	Groundwater level (m bgl)
BH101	0.50 – 3.5	Made ground and clay	5	0	0.1 – 0.2	10.7 – 19.8	0	0	0	-9.1 – 0.1	1.9
BH102	0.5 – 2.5	Made ground	3	0 – 0.1	5.7 – 6.1	2.9 – 8.8	0	0	0	0.3	1.5 – 2.5
BH103A	2 – 4.2	Sand	5	0	0.2 – 0.4	20.3 – 21.2	0	0	0	-11.9 – 0.2	1.0 – 1.5
BH103B	5.5 - 12	Clay	1	0	0.3	20.5	0	0	0	0.3	1.68
BH104A	0.5 – 4.2	Made ground and sandy and gravel	2	0 – 7.2	0.7 – 1.9	11 – 18.1	0	0	0	0.1 – 0.9	1.1 - 1.72
BH105	0.5 - 6	Made ground & sand	6	0	0.1 – 4.2	17.1 – 21.3	0	0	0	-0.3 – 0.3	0.82 – 2.2
BH106A	0.5 – 6.0	Made ground & sand	2	0	0.2 – 0.3	20.4 – 20.5	0	0	0	-0.1 – 0.1	0.41 – 0.59
BH110A	0 – 0.3	Made ground & clay	5	0 – 0.3	6.7 – 10.4	8.7 – 14.7	0	0	0	-0.3 – 0.2	dry
BH111A	1 – 5.0	Sand	6	0	0.1 – 0.8	19.1 – 21.3	0	0	0	-0.3 – 0.3	4.0 – 4.22
BH114A	0.5 – 6.0	MG and sand	6	0	0.1 – 4.7	0 – 21.5	0	0	0	-10.2 – 0.2	2.04 – 3.12
BH115A	0.5 – 6.5	Sand and clay	3	0 – 0.6	0.4 – 1.6	0 – 19.3	0	0	0	-0.2 – 0.2	1.4 – 2.03
WB101	1 – 5.5	MG, sand and clay	6	0	0.2 – 4.0	16.4 – 21.1	0	0 - 1	0	-0.2 – 0.2	1.74 – 1.96
WB103B	1 – 4.0	MG, sand	5	0	0 – 10.9	6 – 22.1	0	0	0	-9.9 - 0	1.0 – 1.37
WB104	1 – 4.5	Sand and clay	6	0	1.1 – 5.2	7.4 – 19.0	0	0	0	-0.3 – 0.2	2.41 – 3.46
WB105	1 – 5.5	Sand and gravel	5	0	4.2 – 4.7	14.4 – 17.1	0	0	0	0.2 – 0.7	2.04 – 3.12
WB106	1 – 2.5	Sand	5	0	0.1 – 0.5	19.2 – 21.6	0	0 - 1	0	-4.6 - 0	1.02 – 1.13
WB112B	0.5 – 8.0	MG, sand & gravel, clay	5	0	0.6 – 9.2	12.7 – 19.8	0	0	0	-0.1 – 0.7	3.05 – 3.22