LANDFILL GAS GENERATION AND RISK ASSESSMENT

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A plan accompanied with appropriate cross-sections, which identifies all the potential receptors of landfill gas emissions and relevant compliance points. These plans and cross sections should also identify all the potential pathways.

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1.0 INTRODUCTION

1.1 Report Context

White Rock Geo Environmental Limited were instructed by Mold Investments Limited (MIL), the Operator, to prepare an application for an Environmental Permit for Parry's Quarry Inert Landfill and Waste Transfer Station (WTS) in Mold, Flintshire under the Environmental Permitting (EP) (England and Wales) Regulations 2016.

The site is situated within the existing Parry's Quarry in Alltami, Flintshire and bounded by the A494 to the south, A55 to the north and Pinfold Road to the west. The National Grid Reference (NGR) for the entrance to the site is SJ 27478 66278, presented at Figure 1 below and is detailed at Drawing ESSD 1.

Access to the site is directly off Pinfold Lane through lockable steel security gates.

The site is currently operated as a brick clay quarry which covers an area of approximately 17 hectares. An area of the wider site holds an EP (Ref: EPR/TB3590HJ) for the transfer and reprocessing of inert waste. This EP application seeks to consolidate this activity within the overall landfill EP for the site.

The overall design is to now provide and engineering development platform using on site clays and crushed sandstone and the shortfall to be made up of imported inert waste which will then have a suitable engineering clean cover break over it which will comply with NHBC development protocols and requirements.

The site will be operated on hydraulic containment principles.

This report presents a review of the Landfill Gas from on site in relationship to the surrounding environment.

This report covers all Phases of the site from the advance works previously carried out and the proposed landfill area the finish with the development platform and long term gas release and risk to any future development.

1.2 Conceptual Site Model – Landfill Gas

This includes summary details cross referenced to ESSD report and drawings relating to the following.

Sources

The nature of the waste proposed at Parrys Quarry Landfill is inert waste producing negligible volumes of methane and carbon dioxide. The permit application is to accept only inert waste to the site. Therefore there is no

likelihood of gas production, and gas extraction will not be required and utilisation is not feasible due to

- the inert nature of the wastes.

- The design of the containment, collection and treatment systems are therefore not applicable.

Pathways

- The primary pathways are direct aerial emissions of migration through the sub strata towards the receptors identified in the ESSD Report and detailed on Drawing ESSD 2.

Receptors

- The identification of all potential residential receptors.

Table 1: Residential Receptors

• Property Reference or Name	Direction from site	Approximate Distance from Boundary
Parrys Cottages	SE	20m
Pottery Cottages	SE	200m
Properties off Smithy Lane	SE	400m
Properties off A494	SE	550m
Unnamed property accessed via the service station	E	55m
The Box	N	80m
Ewloe House	N	120m
Pinfold House	NW	130m
Old Farm Cottages	N	360m
Penfold Cottage	NW	400m
Gell Farm	N	300m
Oak Farm	S	350m
Ewloe Green Farm	E	750m
Brook Park Farm	N	500m

- The receptors are considered to be of low sensitivity due to the nature of the waste being inert and the distance to the nearest receptors.

- All of the receptors are locally built on bedrock or glacial tills with a generally low permeability.
- Baseline data for methane and carbon dioxide has been obtained.
- The prioritisation and initial assessment of the potential impacts on each receptor. No impact is considered on each receptor due to the inert nature of the wastes
- Quantification of emissions and dispersion. Carbon dioxide has been recorded within the surrounding external boreholes.

All identified receptors at re listed in Table 2.

Table 2: All identified receptors

Receptor Name	Receptor Type	Direction from Site	Approximate Distance from Site Boundary
Environmental Site Setting within 1km of the EP boundary as shown on Drawing ESSD2			
A494	Public Transport Network	South	Adjacent
Pinfold Lane	Public Transport Network	West	Adjacent
Commercial properties	Commercial	North	Adjacent
Woodland	Woodland	South	Adjacent
A55 Northop Services including Costa Coffee, UK Diner,	Service station	East	20
Disused Quarry	Industrial	West	20
Commercial/Industrial area including AH Plant Hire and Fire Doors	Commercial/Industrial	West	20
Flintshire County Council Offices and Depot	Council	West	20
A55 North Wales Expressway	Road Network	North, East	40
Thorncliffe Building Supplies	Commercial	South	75
Alltami Brook	Surface Water	Southwest, West, Northwest	250

Oaks Farm	Farm/Agricultural	South	260
Northop Services	Service Station	North	450
Werpe Brook	Surface Water	North	700
Northop Hall Bowling Club	Recreational	North	850
Cultural and Natural Heritage identified receptors located within 2km of the EP boundary as shown on Drawing ESSD3			
Deeside and Buckley Newt SAC	SAC	South	Adjacent
Buckley Claypits and Commons SSSI	SSSI	South	Adjacent
Site of Pinfold Lane Pottery	Scheduled Monument	South	740
Connahs Quay Ponds and Woodlands SSSI	SSSI	Northeast	760
Maes y Grug SSSI	SSSI	West	950
Greenbank Farm Farmhouse	Listed Building	West	1200

2.0 LANDFILL GAS RISK ASSESSMENT

2.1 The Nature of the Landfill Gas Risk Assessment

Due to the inert nature of the waste a simple assessment has been carried out using GASSIM to establish the concentrations of any emissions. All have been reported at Below Reporting Threshold (BRT). All monitoring carried out on site shows no presence of odours but there are soil gases presently associated with former local landfilling. Carbon dioxide is present outside the site associated with former landfilling and natural background soil gas.

2.2 The Proposed Assessment Scenarios

2.2.1 Lifecycle Phases

The inert landfill will have an operational phase, completion and restoration and will then undergo aftercare. There is no change expected in groundwater conditions, there is no mining subsidence and no long-term change expected to the waste mass composition with time.

2.2.2 Accidents and their Consequences

A primary concern would be due to damage of any internal monitoring points. In the event of damage these would be retro drilled.

The justification for whether the specified accidents require quantitative assessment or not is not considered applicable.

Table 3: Risks and consequences

Potential Accident	Likelihood	Implication	Consequence	Likelihood of Non-compliance
Fires / subterranean combustion	Extremely Unlikely	Damage to mineral liner / desiccation & increased permeability	Significant	Fairly Probable
Explosions	Extremely Unlikely	Loss of structural integrity of cell walls and breach of mineral liner	Significant	Probable

2.3 The Generated Gases to be Modelled

Gas concentrations are set out in Appendix LFGRA 1.

Trace methane gas has been detected within the permit footprint but elevated carbon dioxide has been recorded and only soil gas atmospheres of carbon dioxide. The nature of the waste to be landfilled is inert and no motive forces are expected within the landfill mass and the gas monitoring points will help reduce any potential motive force pressures.

2.4 Numerical Modelling

2.4.1 Justification for Modelling Approach and Software

Model selection has been to run GASSIM to assess if any likely production of gases would be above reporting thresholds.

GASSIM was considered to be a simple tool to use for an inert landfill site.

2.4.2 Model Parameterisation

The nature of the waste is inert.

This is based on site observations and dimensions of the site were taken from ESSD 2.

A realistic appraisal of the use of conservative and worst-case inputs.

2.4.3 Sensitivity Analysis

The site is simple and has no sensitivity analysis carried out due to the inert type of waste previously deposited and proposed in the permit application.

The consideration of assessment limitations, the assessment of uncertainties and the need for safety factors is not applicable.

2.4.4 Model Validation

The comparison of modelled output against what is observed in the field and represented within the conceptual landfill gas model (e.g. is the modelled gas generation compatible with that observed, etc.).The model shows no gas generation and this is considered similar to the monitoring data reported to date at the nearby Meriden landfill.

Justification that the model provides a sufficiently adequate representation of reality is considered to be acceptable as no methane has been reported in any monitoring points and outer boreholes at Meriden.

2.5 Risks to the Environment and Human Health

The landfill gas risk assessment has addressed each of the considered scenarios (i.e. the different modelled phases of the lifecycle and the potential impact of accidents).

2.5.1 Landfill Gas Emissions

The estimated emissions from the site via the sub-surface, surface, gas engines and flares (including operational periods for the gas plant if appropriate) is considered to be zero.

A gas generation profile forecast for the installation including uncertainty estimates is shown on the model to be zero.

2.5.2 Sub-surface Migration and Vegetation Stress

Predicted leakage through proposed barriers. Not applicable

Comparison of predicted levels with background concentrations and the corresponding environmental benchmarks, see Appendices LFGRA 1.

2.5.3 Atmospheric Dispersion and Odour

This is considered to be zero(0).

2.5.4 Exposure

The estimates of concentration or doses to which the population may be exposed are considered at all of the receptors to be zero(0).

2.5.5 Global Atmospheric Impact

The global impact is therefore considered as negligible from the gas monitoring points and the environmental setting in which the site is located including identification of all relevant receptors including global atmosphere. All properties around the site are currently located within 25 metres of the proposed operations, however due to the inert nature of the waste and the impermeable geological setting with no underground services risk is considered low. Global impact would be minimal

2.6 Landfill Gas Completion Criteria

Landfill completion requires a consideration of whether the site, as a result of the disposal of controlled wastes, is likely or unlikely to cause pollution of the environment or harm to human health. As the landfill gas risk assessment must be undertaken for the whole lifecycle of the landfill, it follows that the process should result in the initial production criteria that

identify when the unmanaged site is unlikely to cause pollution or harm and the licence can be surrendered.

The site will only accept inert waste, which produces extremely low concentrations of methane, less than 1% and low concentrations of carbon dioxide, typically less than soil gas atmospheres of 3%.

Baseline trigger levels will be set during the permit application period setting levels based on ICOP protocols.

3.0 LANDFILL GAS MANAGEMENT PLAN

The gas management plan provides a framework for the management, monitoring and sampling of ground and potential landfill gas.

3.1 Control Measures

To include details relating to containment, collection and treatment of landfill gas. In particular the following should be considered.

- Development to operate the site as an inert land raise.
- Collection system (including the year you propose to start collecting landfill gas). Not applicable
- Condensate management. Not applicable
- Utilisation, flaring and treatment. Not applicable
- Geological side wall barrier is to be constructed to prevent potential gas migration

Inspection, maintenance and servicing. Check that the boreholes and internal monitoring points are free from obstruction on a quarterly basis.

3.2 Monitoring and Sampling Plan

Gas monitoring boreholes and gas monitoring points within the waste mass are shown on ESSD7. Gas monitoring will be carried out on a quarterly basis at each of the gas monitoring points and gas monitoring boreholes using an infra-red gas analyser. Gas monitoring boreholes and gas monitoring points are summarised in Table 4 below:

Table 4: The nature and location of in-waste landfill gas wells and perimeter monitoring points

Phase 1	**GMP1.1-1.9**	Monitoring Point in waste	Design detail on ESSD 7
Perimeter	**BH G1-G14**	Monitoring Borehole outside waste. Combined gas and groundwater	Design detail on ESSD 7

Sampling will be undertaken by staff appropriately trained in environmental monitoring procedures, and who are familiar with the equipment and its limitations. The Company warrants that the personnel engaged in monitoring activities are trained to undertake the task. These will comprise the companies own technical personnel, the site manager or nominated deputy, following appropriate training by technical personnel. All monitoring staff undergo a period of job training and in addition external courses are used to supplement internal training. Results will be validated by the sampling personnel detailed above.

Monitoring is to be carried out on a monthly basis. Monitoring points inside waste mass are at 2 per hectare built up thought the waste. There are proposed to have eight external combined gas and groundwater monitoring boreholes. These are shown on Drawing ESSD 7. Data will be stored in the form of hard copies on site and an electronic version of the results.

Monitoring from each in waste monitoring point and external borehole will be for the following;

The gas monitoring frequency and determined range has been developed based on the landfill gas risk assessment and is summarised below in Table 5.

Table 5: Monitoring frequencies for landfill gas

Determinands	**Monitoring Frequencies**	**Units and Accuracies**
Methane (CH_4)	Quarterly	%v/v ±0.5%
Carbon Dioxide (CO_2)	Quarterly	%v/v ±0.5%
Carbon Monoxide (CH_4)	Quarterly	-
Oxygen (O_2)	Quarterly	%v/v ±0.5%
Atmospheric Pressure	Quarterly	±1 mb
Differential pressure	Quarterly	±0.1 mb
Meteorological Data	Quarterly	-

3.3 Action Plan

The criteria used to determine the severity of an event. If a concentration of methane in a monitoring point or monitoring borehole is reported at a concentration of greater than the established baseline compliance limit then weekly monitoring will be carried out. Baseline monitoring to data is presented at Appendix LFGRA 3 and compliance levels are to be developed over the period of obtaining a permit.

Actions taken by the operator as a result of:

Abnormal changes observed in collected monitoring data, frequency of monitoring will be increased;
Identified operational problems or failures of the gas control system not applicable;
A reported event e.g. an odour complaint, detailed investigation on site including use of a walk over survey using an FID to attempt to identify the source;
Emergency procedures and protocols. Retro drilling and or covering and capping or isolate the area.

4.0 CONCLUSIONS

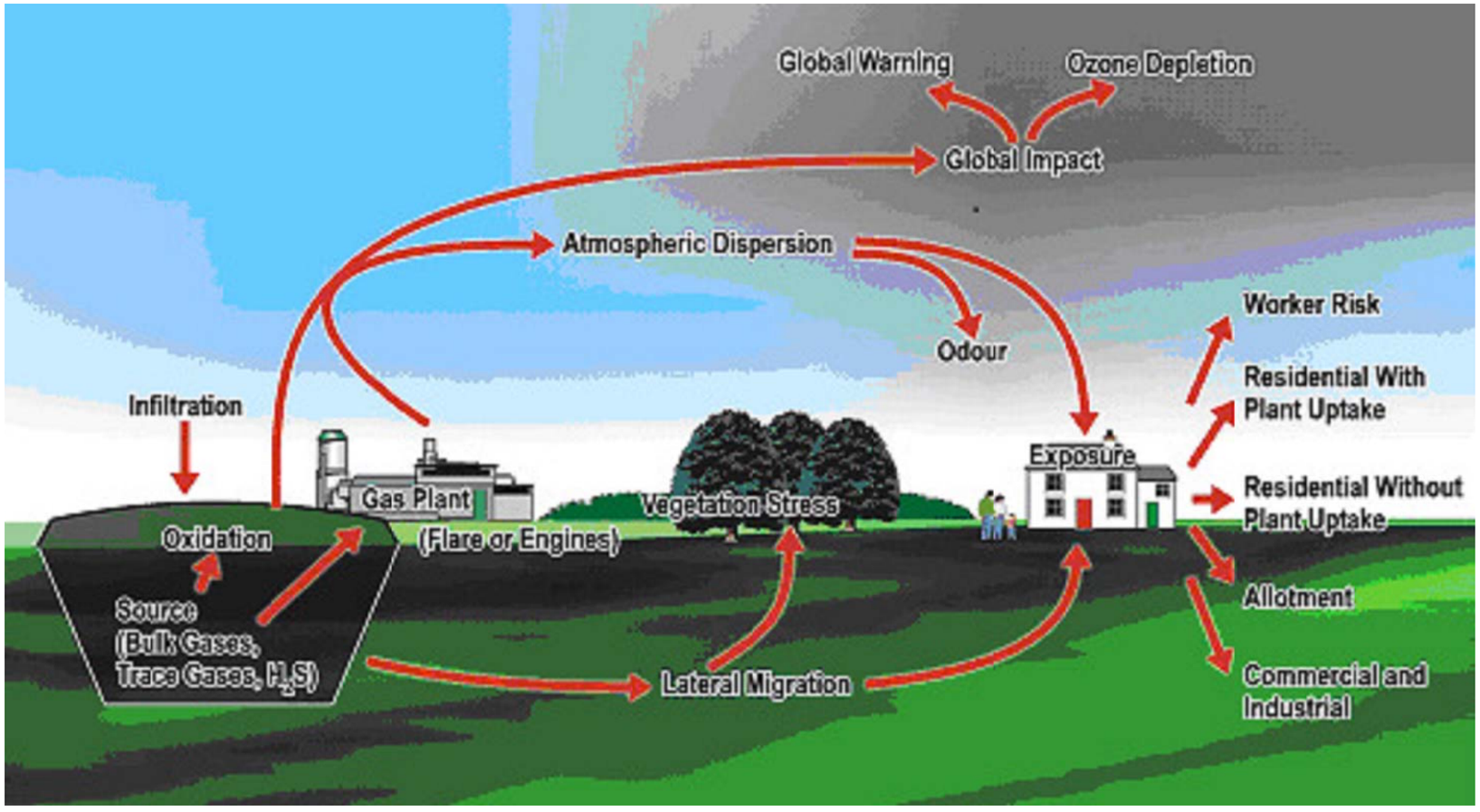
4.1 Compliance with the Environmental Permitting Regulations, 2016

The Parrys Quarry Landfill will operate as an inert site and the provisions are in accordance with the requirements of the Environmental Permitting Regulations 2016 and all landfill gas controls are in accordance with inert waste guidance issued under the Environmental Permitting Regulations. These relate to the following.

- The Parrys Quarry landfill is an inert site and will therefore not produce landfill gas. Internal monitoring points are constructed in the site to help reduce any potential motive forces. These are appropriate measures for this type of facility that must be taken in order to control the accumulation and migration of landfill gas.

DRAWING

NORTH



Legend

Client: **Mold Investments Ltd**

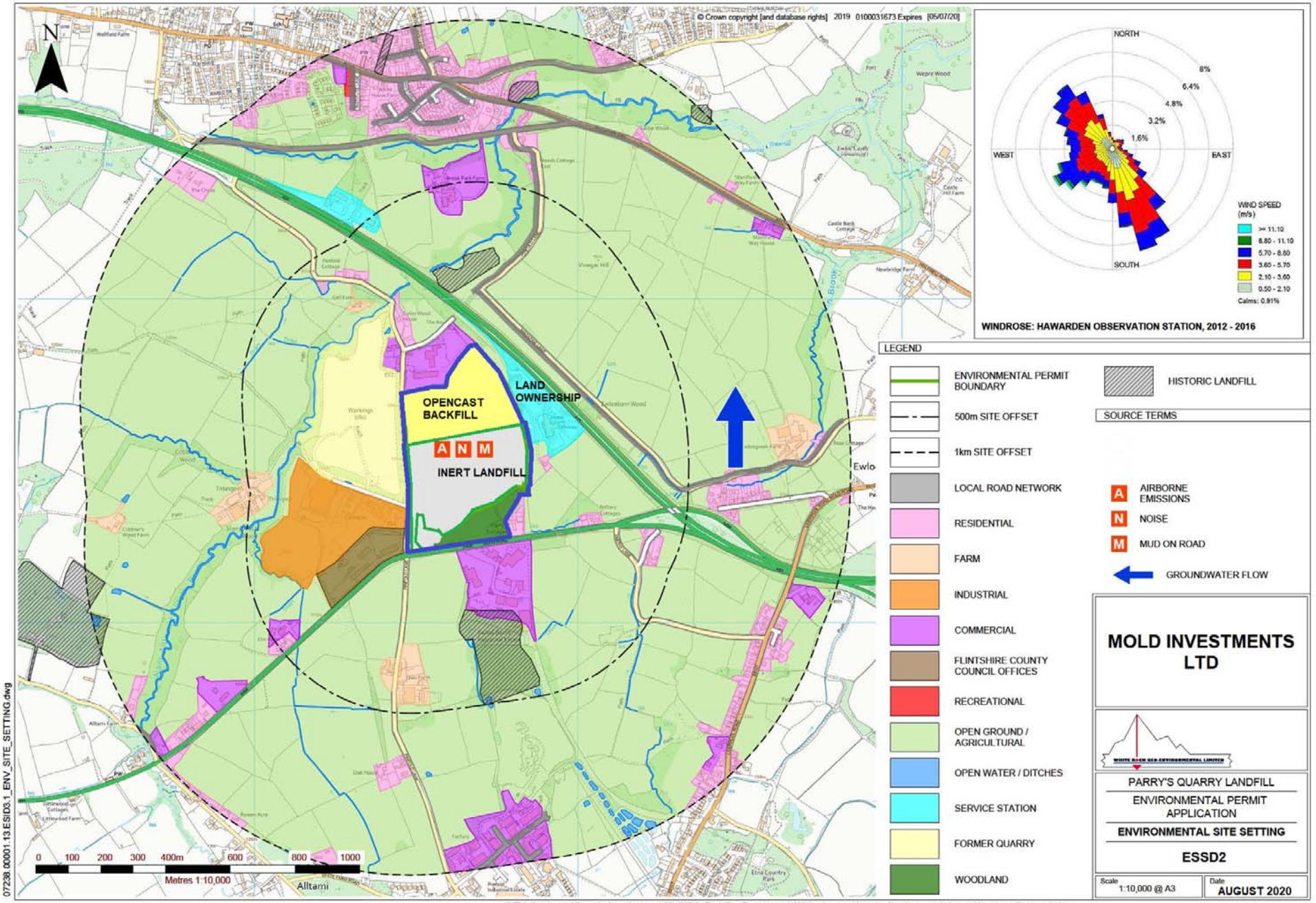
Project: **Parrys Quarry**

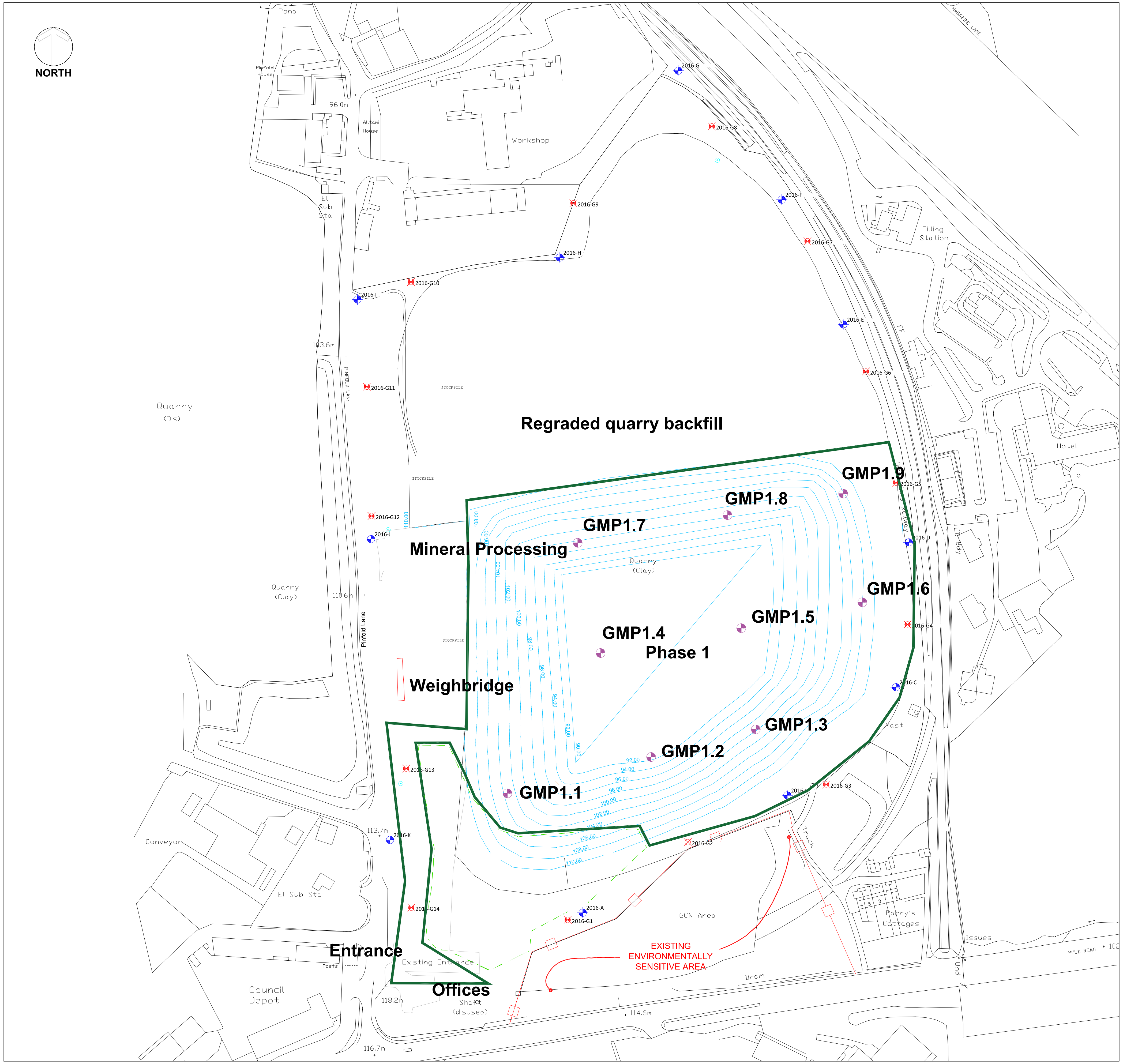
Title: Landfill Gas Conceptual Model

CAD Ref:	Version:	Drawn by:	Scale:	Date:
WRGE/PQ/1	1	ARM		June 2020

WHITE ROCK GEO-ENVIRONMENTAL LIMITED

Drawing: **LFGRA 1**




NORTH
Regraded quarry backfill
Mineral Processing
Weighbridge
Entrance
Offices
GMP1.1
GMP1.2
GMP1.3
GMP1.4
Phase 1
GMP1.5
GMP1.6
GMP1.7
GMP1.8
GMP1.9
EXISTING
ENVIRONMENTALLY
SENSITIVE AREA
Workshop
Filling Station
Hotel
Quarry (Dis)
Quarry (Clay)
Council Depot
Parry's Cottages
GCN Area
Pinfold Lane
Conveyor
El Sub Sta
Existing Entrance
Shaft (disused)
Mast
Drain
Track
Pond

Legend

Proposed Permit Boundary

Excavation contours

GAS MONITORING BOREHOLE CONSTRUCTION DETAIL

SECTION THROUGH INTERNAL GAS MONITORING POINT

PROPOSED GAS MONITORING POINT CONSTRUCTION DETAIL

SECTION THROUGH INTERNAL MONITORING POINT

Client: **Mold Investments Ltd**

Project: **Parrys Quarry**

Title: Landfill Gas Management

CAD Ref:	Version:	Drawn by:	Scale:	Date:
EL/MQBH/1	1	ARM		August 2020

WHITE ROCK GEO-ENVIRONMENTAL LIMITED

Drawing: **ESSD7**

APPENDIX LFGRA 1:

GASSIM Model

APPENDIX LFGRA 2:

Pollution Inventory Reporting Concentrations

GasSim Version 2.05
Project Name : Parrys Quarry Landfill
Client Name : Mold Investmenets Ltd

Gas	CAS	Reporting Threshold	Value to report	Amount Produced 25%	75%
Inorganics					
Ammonia	7664-41-7	1000 kg	n/a		
Asbestos	1332-21-4	1 kg	n/a		
Carbon Dioxide - 'chemical'	124-38-9	10000000 kg	brt		
Carbon Dioxide - 'thermal'	124-38-9	10000000 kg	brt		
Carbon disulphide	75-15-0	1000 kg	n/a		
Carbon monoxide	630-08-0	100000 kg	n/a		
Hydrogen chloride	7647-01-0	10000 kg	n/a		
Hydrogen cyanide	74-90-8	100 kg	n/a		
Nitrous oxide	10024-97-2	10000 kg	n/a		
Phosgene	75-44-5	10 kg	n/a		
Sulphur hexafluoride	2551-62-4	10 kg	n/a		
Organics					
Acetaldehyde [Ethanal]	75-07-0	100 kg	n/a		
Acrolein	107-02-8	10 kg	n/a		
Acrylamide [2-Propenamide]	79-06-1	10 kg	n/a		
Acrylonitrile [2-Propenenitrile]	107-13-1	1000 kg	n/a		
Aldrin	309-00-2	1 kg	n/a		
Allyl alcohol [2-Propen-1-ol]	107-18-6	10 kg	n/a		
Amitrole [3-Amino-1,2,4-triazole]	61-82-5	1 kg	n/a		
Aniline [Benzeneamine]	62-53-3	10 kg	n/a		
Anthracene	120-12-7	10 kg	n/a		
Benzene	71-43-2	1000 kg	n/a		
Benzo(a)pyrene	50-32-8	1 kg	n/a		
Benzo(b)fluoranthene	205-99-2	1 kg	n/a		
Benzo(g,h,i)perylene	191-24-2	1 kg	n/a		
Benzo(k)fluoranthene	207-08-9	1 kg	n/a		
Benzo butyl phthalate (BBP)	85-68-7	10 kg	n/a		
Benzyl chloride	100-44-7	10 kg	n/a		
Bromoethene	593-60-2	10 kg	n/a		
Butadiene [1,3-Butadiene]	106-99-0	100 kg	n/a		
Butene - all isomers	-	1000 kg	n/a		
Carbon tetrachloride [Tetrachloromethane]	56-23-5	10 kg	n/a		
Chlordane	57-74-9	1 kg	n/a		
Chlordecone	143-50-0	1 kg	n/a		
Chlororethane	75-00-3	10 kg	n/a		
Chloroform [Trichloromethane]	67-66-3	100 kg	n/a		
Chloroprene	126-99-8	10 kg	n/a		
Chrysene	218-01-9	10 kg	n/a		
Crotonaldehyde	4170-30-3	10 kg	n/a		
Cumene hydroperoxide	80-15-9	10 kg	n/a		
Dibutyl phthalate	84-74-2	10 kg	n/a		
p-Dichlorobenzene [1,4-Dichlorobenzene]	106-46-7	1 kg	n/a		
Dichlorodiphenyltrichloroethane (DDT)	50-29-3	1 kg	n/a		
Dichloromethane (DCM) [Methylene chloride]	75-09-2	1000 kg	n/a		
Dieldrin	60-57-1	1 kg	n/a		
Diethyl aniline [N,N-Diethyl benzeneamine]	91-66-7	10 kg	n/a		
Di(2-ethylhexyl)phthalate (DEHP)	117-81-7	10 kg	n/a		
Diethyl ether	60-29-7	10 kg	n/a		
Diisopropyl ether	108-20-3	10 kg	n/a		
Dimethylaniline [N,N-Dimethyl benzeneamine]	121-69-7	10 kg	n/a		
Dimethyl sulphate	77-78-1	1 kg	n/a		
Dimethylformamide	68-12-2	1000 kg	n/a		
Dimethyl-o-toluidine	609-72-3	10 kg	n/a		
Dimethyl-p-toluidine	99-97-8	10 kg	n/a		
1,4-Dioxane	123-91-1	10 kg	n/a		
Diphenylamine	122-39-4	10 kg	n/a		
Endrin	72-20-8	1 kg	n/a		
2-Ethoxyethanol [Ethyleneglycol ethylether]	110-80-5	10 kg	n/a		
2-Ethoxyethyl acetate [Ethyleneglycol ethylether acetate]	111-15-9	1 kg	n/a		
Ethyl acrylate	140-88-5	10 kg	n/a		
Ethyl benzene	100-41-4	100 kg	n/a		
Ethyl bromide [Bromoethane]	74-96-4	10 kg	n/a		
1-Ethyl-3,5-dimethylbenzene	934-74-7	10 kg	n/a		
Ethylene [Ethene]	74-85-1	1000 kg	n/a		
Ethylene dichloride [1,2-Dichloroethane]	107-06-2	1000 kg	n/a		
Ethylene oxide [1,2-Epoxyethane]	75-21-8	1000 kg	n/a		
Ethyl toluene - all isomers	25550-14-5	10 kg	n/a		
Fluoranthene	206-44-0	1 kg	n/a		
Formaldehyde [Methanol]	50-00-0	10 kg	n/a		
Heptachlor	76-44-8	1 kg	n/a		
Hexabromobiphenyl	36355-1-8	0.1 kg	n/a		
Hexabromocyclododecane	25637-99-4	10 kg	n/a		
Hexachlorobenzene	118-74-1	1 kg	n/a		
Hexachlorocyclohexane - all isomers	608-73-1	1 kg	n/a		

Gas	CAS	Reporting Threshold	Value to report	Amount Produced 25%	75%
Hexane	110-54-3	10 kg	n/a		
1-Hexene	592-41-6	10 kg	n/a		
Indeno(1,2,3-cd)pyrene	193-39-5	1 kg	n/a		
Iodomethane	74-88-4	10 kg	n/a		
Isophorone	78-59-1	10 kg	n/a		
Isophorone diisocyanate	4098-71-9	1 kg	n/a		
Isoprene	78-79-5	10 kg	n/a		
Lindane	58-89-9	1 kg	n/a		
Maleic anhydride	108-31-6	10 kg	n/a		
Methane	74-82-8	10000 kg	brt		
Methanol	67-56-1	100 kg	n/a		
2-(Methoxyethoxy)ethanol	111-77-3	10 kg	n/a		
2-Methoxyethanol	109-86-4	10 kg	n/a		
2-Methoxyethyl acetate	110-49-6	10 kg	n/a		
Methyl bromide [Bromomethane]	74-83-9	100 kg	n/a		
2-Methyl-2-butene	513-35-9	10 kg	n/a		
3-Methyl-1-butene	563-45-1	100 kg	n/a		
Methyl chloride [Chloromethane]	74-87-3	1000 kg	n/a		
Methyl chloroform [1,1,1-Trichloroethane]	71-55-6	10 kg	n/a		
4,4'-Methylene-bis(2-chloroaniline)	101-14-4	1 kg	n/a		
4,4'-Methylene dianiline	101-77-9	10 kg	n/a		
4,4'-Methylenediphenyl diisocyanate	101-68-8	1 kg	n/a		
Methyl isocyanate	624-83-9	1 kg	n/a		
Mirex	2385-85-5	1 kg	n/a		
Naphthalene	91-20-3	100 kg	n/a		
Nitrobenzene	98-95-3	10 kg	n/a		
2-Nitropropane	79-46-9	1 kg	n/a		
Pentachlorobenzene	608-93-5	1 kg	n/a		
Pentachlorophenol	87-86-5	1 kg	n/a		
Pentane	109-66-0	100 kg	n/a		
Pentene - all isomers	25377-72-4	1000 kg	n/a		
Phenol	108-95-2	10 kg	n/a		
Propylbenzene	103-65-1	10 kg	n/a		
Propylene	115-07-1	10000 kg	n/a		
Propylene oxide	75-56-9	100 kg	n/a		
Styrene	100-42-5	100 kg	n/a		
Tetrachloroethane [1,1,2,2-Tetrachloroethane]	79-34-5	10 kg	n/a		
Tetrachloroethylene	127-18-4	100 kg	n/a		
Tetrafluoroethylene	116-14-3	10 kg	n/a		
Toluene	108-88-3	100 kg	n/a		
Toluene diisocyanate - all isomers	-	10 kg	n/a		
Toxaphene	8001-35-2	1 kg	n/a		
Trichlorobenzene - all isomers	12002-48-1	1 kg	n/a		
Trichloroethylene	79-01-6	1000 kg	n/a		
Trichlorotoluene	98-07-7	10 kg	n/a		
Trimellitic anhydride	552-30-7	1 kg	n/a		
Trimethylbenzene - all isomers	25551-13-7	10 kg	n/a		
Vinyl acetate	108-05-4	10 kg	n/a		
Vinyl chloride	75-01-4	1000 kg	n/a		
Xylene - all isomers	1330-20-7	1000 kg	n/a		
Metals and compounds					
Antimony	7440-36-0	1 kg	n/a		
Arsenic	7440-38-2	1 kg	n/a		
Beryllium	7440-41-7	1 kg	n/a		
Boron	7440-42-8	1000 kg	n/a		
Cadmium	7440-43-9	1 kg	n/a		
Chromium	7440-47-3	10 kg	n/a		
Copper	7440-50-8	10 kg	n/a		
Lead	7439-92-1	100 kg	n/a		
Manganese	7439-96-5	10 kg	n/a		
Mercury	7439-97-6	1 kg	n/a		
Nickel	7440-02-0	10 kg	n/a		
Selenium	7782-49-2	100 kg	n/a		
Vanadium	7440-62-2	10 kg	n/a		
Zinc	7440-66-6	100 kg	n/a		
Other substances					
Brominated diphenylethers - penta, octa and deca	-	10 kg	n/a		
Chlorine and total inorganic compounds - as HCl	7782-50-5	10000 kg	n/a		
Chlorofluorocarbons (CFCs)	EDF-079	1 kg	n/a		
Dioxins and furans (PCDDs/PCDFs) - WHO-TEQ	-	0.00001 kg	n/a		
Dioxins and furans (PCDDs/PCDFs) - I-TEQ	-	0.00001 kg	n/a		
Fluorine and total inorganic compounds - as HF	7782-41-4	1000 kg	n/a		
Halons	-	1 kg	n/a		
Hydrobromofluorocarbons (HBFCs)	-	10 kg	n/a		
Hydrochlorofluorocarbons (HCFCs)	-	1 kg	n/a		
Hydrofluorocarbons (HFCs)	-	100 kg	n/a		
Nitrogen oxides - NO and NO2 as NO2	-	100000 kg	n/a		
Non-methane volatile organic compounds (NMVOCs)	-	10000 kg	n/a		
Particulate matter - PM2.5	-	1000 kg	n/a		
Particulate Matter - PM10	-	1000 kg	brt		

Gas	CAS	Reporting Threshold	Value to report	Amount Produced 25%	75%
Particulate Matter - total	-	10000 kg	n/a		
Perfluorocarbons (PFCs)	-	10 kg	n/a		
Polychlorinated biphenyls (PCBs)	1336-36-3	0.1 kg	n/a		
Polychlorinated Biphenyls (PCBs) - as WHO TEQ	1336-36-3	0.00001 kg	n/a		
Sulphur oxides - SO2 and SO3 as SO2	-	100000 kg	n/a		

GasSim Version 2.05
Project Name : Parrys Quarry Landfill
Client Name : Mold Investmenets Ltd

Gas	CAS	Reporting Threshold	Value to report	Amount Produced 25%	75%
Inorganics					
Ammonia	7664-41-7	1000 kg	n/a		
Asbestos	1332-21-4	1 kg	n/a		
Carbon Dioxide - 'chemical'	124-38-9	10000000 kg	brt		
Carbon Dioxide - 'thermal'	124-38-9	10000000 kg	brt		
Carbon disulphide	75-15-0	1000 kg	n/a		
Carbon monoxide	630-08-0	100000 kg	n/a		
Hydrogen chloride	7647-01-0	10000 kg	n/a		
Hydrogen cyanide	74-90-8	100 kg	n/a		
Nitrous oxide	10024-97-2	10000 kg	n/a		
Phosgene	75-44-5	10 kg	n/a		
Sulphur hexafluoride	2551-62-4	10 kg	n/a		
Organics					
Acetaldehyde [Ethanal]	75-07-0	100 kg	n/a		
Acrolein	107-02-8	10 kg	n/a		
Acrylamide [2-Propenamide]	79-06-1	10 kg	n/a		
Acrylonitrile [2-Propenenitrile]	107-13-1	1000 kg	n/a		
Aldrin	309-00-2	1 kg	n/a		
Allyl alcohol [2-Propen-1-ol]	107-18-6	10 kg	n/a		
Amitrole [3-Amino-1,2,4-triazole]	61-82-5	1 kg	n/a		
Aniline [Benzeneamine]	62-53-3	10 kg	n/a		
Anthracene	120-12-7	10 kg	n/a		
Benzene	71-43-2	1000 kg	n/a		
Benzo(a)pyrene	50-32-8	1 kg	n/a		
Benzo(b)fluoranthene	205-99-2	1 kg	n/a		
Benzo(g,h,i)perylene	191-24-2	1 kg	n/a		
Benzo(k)fluoranthene	207-08-9	1 kg	n/a		
Benzo butyl phthalate (BBP)	85-68-7	10 kg	n/a		
Benzyl chloride	100-44-7	10 kg	n/a		
Bromoethene	593-60-2	10 kg	n/a		
Butadiene [1,3-Butadiene]	106-99-0	100 kg	n/a		
Butene - all isomers	-	1000 kg	n/a		
Carbon tetrachloride [Tetrachloromethane]	56-23-5	10 kg	n/a		
Chlordane	57-74-9	1 kg	n/a		
Chlordecone	143-50-0	1 kg	n/a		
Chlororethane	75-00-3	10 kg	n/a		
Chloroform [Trichloromethane]	67-66-3	100 kg	n/a		
Chloroprene	126-99-8	10 kg	n/a		
Chrysene	218-01-9	10 kg	n/a		
Crotonaldehyde	4170-30-3	10 kg	n/a		
Cumene hydroperoxide	80-15-9	10 kg	n/a		
Dibutyl phthalate	84-74-2	10 kg	n/a		
p-Dichlorobenzene [1,4-Dichlorobenzene]	106-46-7	1 kg	n/a		
Dichlorodiphenyltrichloroethane (DDT)	50-29-3	1 kg	n/a		
Dichloromethane (DCM) [Methylene chloride]	75-09-2	1000 kg	n/a		
Dieldrin	60-57-1	1 kg	n/a		
Diethyl aniline [N,N-Diethyl benzeneamine]	91-66-7	10 kg	n/a		
Di(2-ethylhexyl)phthalate (DEHP)	117-81-7	10 kg	n/a		
Diethyl ether	60-29-7	10 kg	n/a		
Diisopropyl ether	108-20-3	10 kg	n/a		
Dimethylaniline [N,N-Dimethyl benzeneamine]	121-69-7	10 kg	n/a		
Dimethyl sulphate	77-78-1	1 kg	n/a		
Dimethylformamide	68-12-2	1000 kg	n/a		
Dimethyl-o-toluidine	609-72-3	10 kg	n/a		
Dimethyl-p-toluidine	99-97-8	10 kg	n/a		
1,4-Dioxane	123-91-1	10 kg	n/a		
Diphenylamine	122-39-4	10 kg	n/a		
Endrin	72-20-8	1 kg	n/a		
2-Ethoxyethanol [Ethyleneglycol ethylether]	110-80-5	10 kg	n/a		
2-Ethoxyethyl acetate [Ethyleneglycol ethylether acetate]	111-15-9	1 kg	n/a		
Ethyl acrylate	140-88-5	10 kg	n/a		
Ethyl benzene	100-41-4	100 kg	n/a		
Ethyl bromide [Bromoethane]	74-96-4	10 kg	n/a		
1-Ethyl-3,5-dimethylbenzene	934-74-7	10 kg	n/a		
Ethylene [Ethene]	74-85-1	1000 kg	n/a		
Ethylene dichloride [1,2-Dichloroethane]	107-06-2	1000 kg	n/a		
Ethylene oxide [1,2-Epoxyethane]	75-21-8	1000 kg	n/a		
Ethyl toluene - all isomers	25550-14-5	10 kg	n/a		
Fluoranthene	206-44-0	1 kg	n/a		
Formaldehyde [Methanol]	50-00-0	10 kg	n/a		
Heptachlor	76-44-8	1 kg	n/a		
Hexabromobiphenyl	36355-1-8	0.1 kg	n/a		
Hexabromocyclododecane	25637-99-4	10 kg	n/a		
Hexachlorobenzene	118-74-1	1 kg	n/a		
Hexachlorocyclohexane - all isomers	608-73-1	1 kg	n/a		

Gas	CAS	Reporting Threshold	Value to report	Amount Produced 25%	75%
Hexane	110-54-3	10 kg	n/a		
1-Hexene	592-41-6	10 kg	n/a		
Indeno(1,2,3-cd)pyrene	193-39-5	1 kg	n/a		
Iodomethane	74-88-4	10 kg	n/a		
Isophorone	78-59-1	10 kg	n/a		
Isophorone diisocyanate	4098-71-9	1 kg	n/a		
Isoprene	78-79-5	10 kg	n/a		
Lindane	58-89-9	1 kg	n/a		
Maleic anhydride	108-31-6	10 kg	n/a		
Methane	74-82-8	10000 kg	brt		
Methanol	67-56-1	100 kg	n/a		
2-(Methoxyethoxy)ethanol	111-77-3	10 kg	n/a		
2-Methoxyethanol	109-86-4	10 kg	n/a		
2-Methoxyethyl acetate	110-49-6	10 kg	n/a		
Methyl bromide [Bromomethane]	74-83-9	100 kg	n/a		
2-Methyl-2-butene	513-35-9	10 kg	n/a		
3-Methyl-1-butene	563-45-1	100 kg	n/a		
Methyl chloride [Chloromethane]	74-87-3	1000 kg	n/a		
Methyl chloroform [1,1,1-Trichloroethane]	71-55-6	10 kg	n/a		
4,4'-Methylene-bis(2-chloroaniline)	101-14-4	1 kg	n/a		
4,4'-Methylene dianiline	101-77-9	10 kg	n/a		
4,4'-Methylenediphenyl diisocyanate	101-68-8	1 kg	n/a		
Methyl isocyanate	624-83-9	1 kg	n/a		
Mirex	2385-85-5	1 kg	n/a		
Naphthalene	91-20-3	100 kg	n/a		
Nitrobenzene	98-95-3	10 kg	n/a		
2-Nitropropane	79-46-9	1 kg	n/a		
Pentachlorobenzene	608-93-5	1 kg	n/a		
Pentachlorophenol	87-86-5	1 kg	n/a		
Pentane	109-66-0	100 kg	n/a		
Pentene - all isomers	25377-72-4	1000 kg	n/a		
Phenol	108-95-2	10 kg	n/a		
Propylbenzene	103-65-1	10 kg	n/a		
Propylene	115-07-1	10000 kg	n/a		
Propylene oxide	75-56-9	100 kg	n/a		
Styrene	100-42-5	100 kg	n/a		
Tetrachloroethane [1,1,2,2-Tetrachloroethane]	79-34-5	10 kg	n/a		
Tetrachloroethylene	127-18-4	100 kg	n/a		
Tetrafluoroethylene	116-14-3	10 kg	n/a		
Toluene	108-88-3	100 kg	n/a		
Toluene diisocyanate - all isomers	-	10 kg	n/a		
Toxaphene	8001-35-2	1 kg	n/a		
Trichlorobenzene - all isomers	12002-48-1	1 kg	n/a		
Trichloroethylene	79-01-6	1000 kg	n/a		
Trichlorotoluene	98-07-7	10 kg	n/a		
Trimellitic anhydride	552-30-7	1 kg	n/a		
Trimethylbenzene - all isomers	25551-13-7	10 kg	n/a		
Vinyl acetate	108-05-4	10 kg	n/a		
Vinyl chloride	75-01-4	1000 kg	n/a		
Xylene - all isomers	1330-20-7	1000 kg	n/a		
Metals and compounds					
Antimony	7440-36-0	1 kg	n/a		
Arsenic	7440-38-2	1 kg	n/a		
Beryllium	7440-41-7	1 kg	n/a		
Boron	7440-42-8	1000 kg	n/a		
Cadmium	7440-43-9	1 kg	n/a		
Chromium	7440-47-3	10 kg	n/a		
Copper	7440-50-8	10 kg	n/a		
Lead	7439-92-1	100 kg	n/a		
Manganese	7439-96-5	10 kg	n/a		
Mercury	7439-97-6	1 kg	n/a		
Nickel	7440-02-0	10 kg	n/a		
Selenium	7782-49-2	100 kg	n/a		
Vanadium	7440-62-2	10 kg	n/a		
Zinc	7440-66-6	100 kg	n/a		
Other substances					
Brominated diphenylethers - penta, octa and deca	-	10 kg	n/a		
Chlorine and total inorganic compounds - as HCl	7782-50-5	10000 kg	n/a		
Chlorofluorocarbons (CFCs)	EDF-079	1 kg	n/a		
Dioxins and furans (PCDDs/PCDFs) - WHO-TEQ	-	0.00001 kg	n/a		
Dioxins and furans (PCDDs/PCDFs) - I-TEQ	-	0.00001 kg	n/a		
Fluorine and total inorganic compounds - as HF	7782-41-4	1000 kg	n/a		
Halons	-	1 kg	n/a		
Hydrobromofluorocarbons (HBFCs)	-	10 kg	n/a		
Hydrochlorofluorocarbons (HCFCs)	-	1 kg	n/a		
Hydrofluorocarbons (HFCs)	-	100 kg	n/a		
Nitrogen oxides - NO and NO2 as NO2	-	100000 kg	n/a		
Non-methane volatile organic compounds (NMVOCs)	-	10000 kg	n/a		
Particulate matter - PM2.5	-	1000 kg	n/a		
Particulate Matter - PM10	-	1000 kg	brt		

Gas	CAS	Reporting Threshold	Value to report	Amount Produced 25%	75%
Particulate Matter - total	-	10000 kg	n/a		
Perfluorocarbons (PFCs)	-	10 kg	n/a		
Polychlorinated biphenyls (PCBs)	1336-36-3	0.1 kg	n/a		
Polychlorinated Biphenyls (PCBs) - as WHO TEQ	1336-36-3	0.00001 kg	n/a		
Sulphur oxides - SO2 and SO3 as SO2	-	100000 kg	n/a		

APPENDIX LFGRA 3:

Baseline Gas Monitoring Data

DATE		BH1			BH2			BH3			BH4			BH5			BH6			BH7			BH8		Atmospheric Pressure	Relative Pressure	Temperature	Weather
	CH4%	CO2%	O2%	CH4%	CO2%	O2%	CH4%	CO2%	O2%	CH4%	CO2%	O2%	CH4%	CO2%	O2%	CH4%	CO2%	O2%	CH4%	CO2%	O2%	CH4%	CO2%	O2%	mb	mb	°C	
24/9/2019	0.0	0.1	21.4	0.0	0.2	21.1	0.0	0.2	20.7	0.0	0.1	20.8	0.0	0.1	20.9	0.0	0.1	20.9	0.0	0.1	20.9	0.0	0.1	20.9	1006	-0.28	19	Sun
24/10/2019	0.0	0.5	20.0	0.0	0.5	20.0	0.0	0.2	20.6	0.0	0.2	20.7	0.0	0.1	20.7	0.0	0.2	20.7	0.0	0.3	20.5	0.0	0.6	19.8	992	-0.31	14	Cloud
27/11/2019	0.0	0.1	20.6	0.0	0.1	20.6	0.0	0.1	20.6	0.0	0.1	20.6	0.0	0.1	20.5	0.0	0.1	20.6	0.0	0.2	20.4	0.0	0.2	20.3	994	-0.28	12	Drizzle
10/12/2019	0.0	0.1	20.5	0.0	0.2	20.3	0.0	0.2	20.3	0.0	0.2	20.3	0.0	0.1	20.4	0.0	0.3	20.3	0.0	0.3	20.4	0.0	0.2	20.4	1002	-0.15	9	Rain
26/1/2020	0.0	0.2	20.1	0.0	0.3	19.9	0.0	0.2	20.2	0.0	0.1	20.2	0.0	0.2	20.1	0.0	0.4	19.8	0.0	0.3	20.0	0.0	0.2	20.1	992	-0.14	7	Cloud
28/2/2020	0.0	0.2	20.6	0.0	0.3	20.5	0.0	0.1	20.6	0.0	0.2	20.6	0.0	0.1	20.6	0.0	0.3	20.4	0.0	0.2	20.5	0.0	0.1	20.6	985	-0.43	6	Rain,sleet
13/3/2020	0.0	0.1	21.2	0.0	0.1	21.4	0.0	0.1	21.8	0.0	0.1	21.8	0.0	0.1	21.8	0.0	0.2	21.6	0.0	0.2	21.8	0.0	0.1	21.7	1008	-0.09	9	Overcast