

# **Wennington Quarry Landfill: Monitoring Plan**

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## Prepared for

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## Wennington Quarry Landfill: Monitoring Plan

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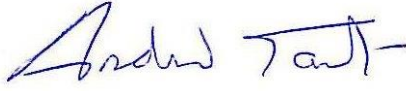


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**66250R5. Final Report**

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# **1 INTRODUCTION**

## **1.1 Report context**

Wennington Quarry Landfill (the Site) is owned by Ingrebourne Valley Ltd (IVL) and is a proposed quarry for the winning and working of minerals, following which it is proposed to restore the quarry by landfill using suitable pre-treated imported inert materials, in order to return the land to agricultural use. The Site location is presented in Drawing 66250D1 and the proposed Environmental Permit boundary is presented in Drawing 66250D2, both of which accompany this Environmental Permit application.

Planning consent for the extraction of mineral at the Site and restoration back to agriculture was granted at Appeal on 4 May 2017 (Appeal referenced: APP/B5480/W/16/3159082).

ESI has presented a water management plan for the mineral extraction phase of works to satisfy conditions and requirements of the approved Planning (ESI, 2017).

This Monitoring Plan has been produced in support of the Environmental Permit application for restoration of the Site by inert landfilling and specifies the monitoring required to support the Environmental Permit. It has been produced in accordance with relevant Environment Agency (EA) guidance LFTGN02 (EA, 2003) and LFTGN03 (EA, 2004).

## **1.2 Data sources**

This Monitoring Plan should be read in conjunction with, and is informed by, the suite of documents presented in support of the Environmental Permit application which include:

- Environmental Setting and Site Design (ESSD) - ESI Report 66250R2;
- Environmental Risk Assessment (ERA) – ESI Report 66250R3; and
- Hydrogeological Risk Assessment (HRA) – ESI Report 66250R4.

## 2 PROPOSED MONITORING

### 2.1 Locations

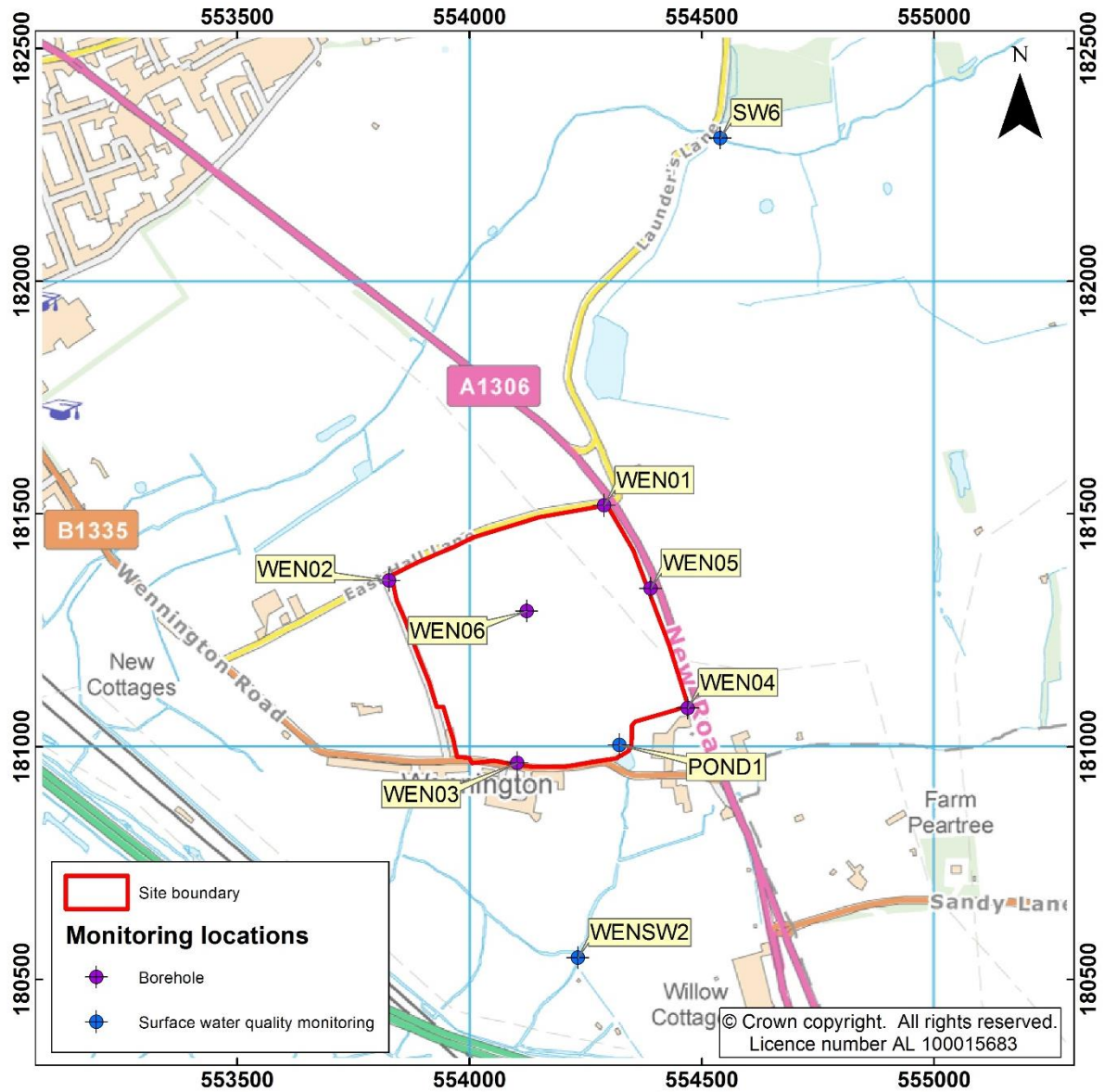
### 2.2 Water monitoring

Proposed groundwater and surface water monitoring will be as per the frequency and locations in Table 2.1. The locations are shown on Figure 2.1.

**Table 2.1 Water monitoring schedule**

Monitoring Location	Monitoring Methodology and Frequency	Comment
<b>Groundwater monitoring wells (levels and water quality)</b>		
WEN1	Monthly for first 12 months of operation, reducing to quarterly thereafter.	Water quality monitoring may change during operation pending impacts from surrounding landfills
WEN2		
WEN3	Quarterly manual level dips and water quality monitoring of parameters in	
WEN4		
WEN5	Table 2.2 with the frequency for individual parameters being either quarterly or annual	
WEN6 (until removed by quarrying)		
<b>Surface water monitoring</b>		
SW6 (up-gradient)	Monthly for 12 months, reducing to quarterly thereafter.	
WENSW2 (down -gradient)	Surface water quality monitoring of parameters in	
POND1	Table 2.2 with the frequency for individual parameters being either quarterly or annual	

**Figure 2.1 Monitoring locations**



**2.3 Water quality monitoring**

Procedures for groundwater and surface water quality monitoring and sampling are described in Appendices A and B. The frequency of water quality measurements should be reviewed along with the monitoring results annually.

The proposed suite for water quality monitoring has been informed by groundwater and surface water quality data available from the Site and Moor Hall Farm landfill which is located to the east and up-gradient of the Site (Refer to accompanying ESSD, ESI report 66250R2). Moor Hall Landfill is a potential source of ammoniacal nitrogen, sulphate, phenol and PAH in groundwater. However, the available water quality data suggests that the pollution effects are relatively localised and may therefore be of limited significance.

Determinands to be analysed are presented in Table 2.2 along with the frequency, minimum reporting value (MRV), units and fraction (total or dissolved component). Determinands have been selected to include suitable baseline data for comparison against standard Waste Acceptance Criteria (WAC) analyses for inert material if required.



**Table 2.2 Minimum reporting values for water analysis**

Determinand	Frequency <sup>1</sup>	Total/Dissolved <sup>2</sup>	MRV	Units
Alkalinity as CaCO <sub>3</sub>	Q	D	5	mg/l
Ammoniacal nitrogen as N	Q	D	0.06	mg/l
Antimony	A	D	< 1.7	µg/l
Arsenic	A	D	0.1	mg/l
Barium	A	D	< 0.05	µg/l
BOD + ATU (5 day)	Q	T	1	mg/l
BTEX	Q	T	<1	µg/l
Cadmium	A	D	0.3	µg/l
Calcium	Q	D	0.09	mg/l
Chloride	Q	D	2	mg/l
Chromium	A	D	0.001	mg/l
COD (total)	Q	T	20	mg/l
Conductivity – electrical 20 deg	Q	T	30	µg/l
Copper	A	D	0.001	mg/l
Dissolved oxygen	Q	D	0.5	mg/l
Dissolved Solids	Q	T	< 4	µg/l
Fluoride	Q	D	< 50	µg/l
Ionic balance	Q	D	0	%
Iron	A	D	30	µg/l
Lead	A	D	0.002	mg/l
Magnesium	Q	D	0.009	mg/l
Manganese	A	D	0.003	mg/l
Mercury	A	D	0.01	µg/l
Molybdenum	A	D	< 0.4	µg/l
Nickel	A	D	0.0009	mg/l
Nitrogen (total oxidised) as N	Q	D	0.3	mg/l
PAH (speciated)	A	D	0.1	ug/l
pH	Q	T	0	pH units
Phenol	A	T	0.1	mg/l
Potassium	Q	D	0.11	mg/l
Selenium	A	D	< 4	µg/l
Sodium	Q	D	0.17	mg/l
Sulphate as SO <sub>4</sub>	Q	D	5	mg/l
Temperature	Q	T	-	° C
TOC (filtered)	Q	T	0.3	mg/l
Zinc	A	D	0.002	mg/l
Additional surface water quality determinands only				
Solids, suspended	Q	T	2	mg/l

<sup>1</sup> Q – Quarterly, A - Annual

<sup>2</sup> T – Total, D – Dissolved fraction

**2.4 Protection of groundwater and surface water quality**

A detailed Hydrogeological Risk Assessment (HRA) is presented in ESI Report 66250R4 which accompanies the Permit application. Control and compliance levels have been set for ammoniacal nitrogen, chloride and nickel as detailed in the HRA and are reproduced in Table 2.3. Water quality data previously compiled for the selected monitoring points has been used to set control and compliance limits for down-hydraulic gradient monitoring boreholes WEN02 and WEN03. Control levels have been set at the mean observed concentrations plus two standard deviations, while the compliance limits are set at the mean plus three standard deviations.

**Table 2.3 Proposed control levels and compliance limits**

Determinand	Unit	Control level		Compliance limit	
		WEN02	WEN03	WEN02	WEN03
NH4 as N	mg/l	0.22	0.87	0.29	1.21
Chloride	mg/l	115	79	132	92
Nickel	mg/l	0.012	0.01	0.015	0.012

It is noted that the background nickel dataset only contains three valid results and therefore it is recommended that the control and compliance limits are reviewed for this determinand once more data has been collected. For ammoniacal nitrogen and chloride ten results per borehole have been used to calculate the proposed action levels.

**2.5 Gas monitoring**

In accordance with EA guidance (EA, 2004), gas monitoring will be carried out as per the frequency and schedule in Table 2.4. The number and location of the in-waste gas monitoring boreholes will be agreed with the EA following completion of each landfill Phase.

**Table 2.4 Gas monitoring schedule**

Monitoring Location	Monitoring Frequency	Analysis
<b>Boundary landfill gas monitoring</b>		
WEN1	Monthly for first 12 months <sup>1</sup> of operation, reducing to quarterly thereafter.  Quarterly	CH <sub>4</sub> , CO <sub>2</sub> , O <sub>2</sub> , barometric pressure, differential pressure and flow  Leachate level dip (assumed to be none)
WEN2		
WEN3		
WEN4		
WEN5		
WEN6 (until removed by quarrying)		
<b>In waste landfill gas monitoring wells (gas and levels)</b>		
To be confirmed	To be installed following the completion of the Site restoration. The number, locations and monitoring frequency will be agreed with the Environment Agency following the Site completion.	CH <sub>4</sub> , CO <sub>2</sub> , O <sub>2</sub> , barometric pressure, differential pressure and flow

<sup>1</sup>If existing background monitoring data exists for these boreholes, monitoring may be carried out quarterly from the outset.

A summary of the proposed monitoring network is outlined in Table 2.1 with the proposed monitoring locations shown in Figure 2.1.

In-waste gas monitoring infrastructure will be installed following the completion of the Site in order to monitor the concentrations of gas within the waste mass in accordance with the EA Technical Guidance Note LFTGN03 (EA, 2004) and the Landfill Directive. Suggested in-waste borehole locations are provided on Drawing 66250D7, however the number, locations and monitoring frequency will be agreed with the EA following the completion of each phase.

Existing perimeter well suitable for gas monitoring are in existence. If background monitoring data is not available, monitoring will be undertaken to record pre-landfilling concentrations. Monitoring may be reduced thereafter.

Monitoring at WEN6 will cease once this location has been removed by quarrying.

Monitoring reporting will be undertaken as per the conditions of the Environmental Permit.

## **2.6 Noise monitoring**

Noise monitoring and provision of a noise management plan are requirements of the Site's planning permission (see ERA; ESI report reference 66250R3).

It is considered that noise is adequately controlled by planning and is not considered necessary to consider further here.

### **3 REFERENCES**

**EA, 2003.** Guidance on monitoring of landfill leachate, groundwater and surface water – Landfill technical guidance note 02 (LFTGN02). Environment Agency, February 2003.

**EA, 2004.** Guidance on the management of landfill gas, landfill technical guidance note 03 (LFTGN03). Environment Agency, September 2004.

**ESI, 2017.** Wennington Quarry Water Management Plan. ESI Report 61594TN3, August 2017.

# APPENDICES

# APPENDIX A

## **Surface Water Monitoring Procedure**

## **Monitoring Equipment**

Appropriate sample bottles, bailer/sampling devise, cool box.

## **Pre-Sampling Procedures**

### **Two weeks (or more) prior to sampling:**

1. Check with the laboratory in advance to ensure it will be able to cope with the number of samples and the determinands required on the appointed day. Commercial laboratories may require less notice than in-house facilities but it is recommended that the laboratory is contacted at least two weeks before the sampling round is due.
2. NOTE: Analysis must be carried out by laboratories holding UKAS accreditation for the procedures that are to be employed. Proof of UKAS accreditation together with details of the analytical techniques must be obtained for each laboratory used and filed in the Working Plan.
3. Check the amount of sample required, whether any special fixatives are necessary and what type of sampling container(s) should be used and that suitable sampling containers are available or there is still time for the laboratory to supply them.
4. Check the determinands to be analysed, how many samples are required and which locations are to be sampled. Contact the analyst and agree a date for the delivery of samples, advise the laboratory how many samples and what determinands will be required and request sample bottles if necessary. Allow for QA samples if necessary, see below.

### **The day before or immediately prior to sampling.**

Before proceeding on a monitoring round a number of preliminary checks should be made by monitoring personnel to ensure that they:

- Have all their necessary protective equipment (including gloves).
- Have any cuts on the hands or forearms covered with waterproof plasters and the equipment should include a spare pack of waterproof plasters.
- Have all the necessary sampling equipment and that it is clean and in good working order (bailer, cool box etc.).
- Have their notebook or data recording device.
- Have at least 2 waterproof marker pens (i.e. 1 plus a spare).
- Have the means to gain access to the monitoring points that require sampling (e.g. keys, spanners, screwdrivers etc.).
- Have a sufficient number of clean sample containers (with any necessary preservatives) and labels available (N.B. allow for at least one spare container).

## **Sampling Procedure**

Ensure that any sample taken is representative of the water flowing within the watercourse.

Ensure that the sample is not contaminated by the sampling procedure.

A safe system of work should be observed; personnel must wear protective clothing and not smoke in the vicinity of the monitoring point.

For sampling:

- Check the monitoring location and reference number and write this in the notebook (or data recorder).
- Note anything unusual about the monitoring location.
- Note the level of water flowing within the channel.
- Provided that the sample bottle does not contain any fixative chemicals, rinse sample bottle twice with water from the watercourse and discard water. **If the sample bottle contains fixative do not rinse.**
- Use a bailer to slowly fill bottle with the water sample until water overflows from the bottle unless the bottle contains fixative chemicals in which case ensure that none of the fixative is lost. Take care to cause the minimum of agitation and aeration during sampling.
- Seal so that it is airtight (i.e. there is no airspace). This procedure ensures that the minimum amount of air is allowed in contact with the sample.
- Label the sample bottle with the following information, Date, Time, Site, Location, and/or Sampling Point Number.
- Note anything unusual about the sample e.g. its odour, colour, presence of foreign bodies, etc.

### **Sample Storage and Delivery**

A cool box(s) should be used for the immediate storage of samples taken during a sampling round and for transportation to the laboratory.

If samples cannot be delivered to the laboratory on the day of collection they should be stored overnight in a refrigerator and delivered the following day in a cool box or refrigerated vehicle.

Complete, sign and date a chain of custody record to accompany the sample to the laboratory.

Provide the analyst with a written order that details which determinands are to be tested for and any pre-analysis preparation that is required (e.g. filtering of the sample), ensuring that it is clear that the standard procedures for The Company contract are to be followed.

Before leaving site, make a note in the Site Diary to record the date of the sampling round and the date the samples were delivered to the laboratory.

On handing over samples ensure that the person receiving completes the chain of custody record and obtain a signed copy.

When the results are received from the laboratory, ensure that the chain of custody is intact confirm the date in the Site Diary and in the notebook.

### **Analysis Results**

The analysis results will be entered onto The Company environmental database. The original certificates of analysis will be placed on file at The Company's Area Office with a copy being sent to site for filing in the Landfill Manager's office (during the operational life of the site).



# APPENDIX B

## Groundwater Monitoring Procedure

## **Monitoring Equipment**

- Dip meter;
- Appropriate sample bottles with any necessary preservatives;
- Labels and waterproof markers;
- Flexible hose;
- Graduated bucket;
- Notebook or data recording device;
- Equipment for accessing boreholes (e.g. keys, spanners, screwdrivers, etc);
- Gloves and other relevant PPE;
- Spare waterproof plasters.

## **Pre-Sampling Procedures**

### **Two weeks (or more) prior to sampling:**

1. Check with the laboratory in advance to ensure it will be able to cope with the number of samples and the determinands required on the appointed day. Commercial laboratories may require less notice than in-house facilities; but it is recommended that the laboratory is contacted at least two weeks before the sampling round is due.

**NOTE:** Analysis must be carried out by laboratories holding UKAS accreditation for the procedures that are to be employed. Proof of UKAS accreditation together with details of the analytical techniques must be obtained for each laboratory used and filed in the Working Plan.

2. Check the amount of sample required, whether any special fixatives are necessary and what type of sampling container(s) should be used and that suitable sampling containers are available or there is still time for the laboratory to supply them.
3. Check that required bottles have been ordered and delivered to agreed location.

### **The day before or immediately prior to sampling:**

Before proceeding on a monitoring round a number of preliminary checks should be made by monitoring personnel to ensure that they:

1. Have all their necessary protective equipment (including gloves).
2. Have any cuts on the hands or forearms covered with waterproof plasters and the equipment should include a spare pack of waterproof plasters.
3. Have all the necessary sampling equipment and that it is clean and in good working order (bailer, dipper, portable Waterra pump, graduated bucket, cool box etc.).
4. Have their notebook or data recording device.
5. Have at least 2 waterproof marker pens (i.e. 1 plus a spare).
6. Have the means to gain access to the monitoring points that require sampling (e.g. keys, spanners, screwdrivers etc.).
7. Have a sufficient number of clean sample containers (with any necessary preservatives) and labels available (N.B. allow for at least one spare container).
8. Have a measuring container for gauging the volume of groundwater removed during purging of the boreholes.
9. Have details of the depths and diameters of the monitoring wells so that purging volumes can be calculated.

## **Groundwater Monitoring and Sampling Procedure**

### **General**

Ensure that any sample taken is representative of the groundwater in the ground.

Ensure that sufficient time is allowed for sampling each monitoring point to enable fresh groundwater to be taken.

Ensure that the sample is not contaminated by the sampling procedure.

A safe system of work should be observed; personnel must wear protective clothing and not smoke in the vicinity of the monitoring point.

### **Groundwater Level Monitoring Procedure**

1. Check the monitoring location and reference number and write this in the notebook (or data recorder).
2. Note anything unusual about the monitoring location e.g. damage.
3. Lower the dip-meter probe until the buzzer sounds.
4. Raise the probe slowly until the buzzer stops.
5. Lower the probe slightly until the buzzer just begins to sound.
6. Read the level of groundwater below the datum point from the tape and note the depth.

### **Groundwater Sampling Procedure**

1. Check the monitoring location and reference number and write this in the notebook (or data recorder).
2. Note anything unusual about the monitoring location, e.g. damage.
3. Measure the level of groundwater in the monitoring well using dip meter.
4. Note depth in notebook and calculate approximate depth of water column within the well.
5. Calculate the volume of groundwater within the well.
6. Pump out three times the standing volume of groundwater and discard.
7. Provided that the sample bottle does not contain fixative chemicals, rinse sample bottle twice with groundwater from latter part of purging operation and rinse outer part of sampling tube. Discard groundwater. **If the sample bottle contains fixative do not rinse.**
8. Re-insert the rinsed tube to the base of the bottle and fill bottle with the water sample. Continue to pump water into the bottle once full so that excess sample overflows from the bottle. Ensure that the equivalent of several bottle-volumes of water are passed through the bottle, unless the bottle contains fixative chemicals in which case ensure that none of the fixative is lost.
9. Carefully withdraw the sample tube whilst still pumping so that the bottle is completely full.
10. Seal so that it is airtight (i.e. there is no airspace). This procedure ensures that the minimum amount of air is allowed in contact with the sample.
11. Label the sample bottle with the following information, Date, Time, Site, Contents, Location and/or Sampling Point Number.
12. Note anything unusual about the sample e.g. its odour, colour, presence of foreign bodies etc.

### **Sample Storage and Delivery**

Complete, sign and date a chain of custody record to accompany the sample to the laboratory.

Provide the analyst with a written order that details which determinands are to be tested for and any pre-analysis preparation that is required (e.g. filtering of the sample), ensuring that it is clear that the standard procedures for The Company contract are to be followed.

Before leaving site, make a note in the Site diary to record the date of the sampling round and the date the samples were delivered to the laboratory.

On handing over samples ensure that the person receiving completes the chain of custody record and retain a signed copy.

### **Analysis Results**

The analysis results will be entered onto The Company environmental database. The original certificates of analysis will be placed on file at The Company's Area Office.

# APPENDIX C

## Notification Form

Part A

Permit Number	
Name of operator	
Location of Facility	
Time and date of the detection	

**(a) Notification requirements for any malfunction, breakdown or failure of equipment or techniques, accident, or emission of a substance not controlled by an emission limit which has caused, is causing or may cause significant pollution**

<b>To be notified within 24 hours of detection</b>	
Date and time of the event	
Reference or description of the location of the event	
Description of where any release into the environment took place	
Substances(s) potentially released	
Best estimate of the quantity or rate of release of substances	
Measures taken, or intended to be taken, to stop any emission	
Description of the failure or accident.	

**(b) Notification requirements for the breach of a limit**

<b>To be notified within 24 hours of detection unless otherwise specified below</b>	
Emission point reference/ source	
Parameter(s)	
Limit	
Measured value and uncertainty	
Date and time of monitoring	
Measures taken, or intended to be taken, to stop the emission	

**Time periods for notification following detection of a breach of a limit**

Parameter	Notification period

<b>(c) Notification requirements for the detection of any significant adverse environmental effect</b>	
<b>To be notified within 24 hours of detection</b>	
Description of where the effect on the environment was detected	
Substances(s) detected	
Concentrations of substances detected	
Date of monitoring/sampling	

Part B - to be submitted as soon as practicable

Any more accurate information on the matters for notification under Part A.	
Measures taken, or intended to be taken, to prevent a recurrence of the incident	
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission	
The dates of any unauthorised emissions from the facility in the preceding 24 months.	

<b>Name*</b>	
<b>Post</b>	
<b>Signature</b>	
<b>Date</b>	

\* authorised to sign on behalf of the operator