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General Sector Guidance

Integrated Pollution Prevention and Control (IPPC)

SEPA
scottish environment protection agency

ENVIRONMENT AND HERITAGE SERVICE

ENVIRONMENT AGENCY

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Table 0.1: Record of changes

Version	Date	Change	Template Version
Consultation	May 2000		
1	1 Aug 2000	Initial version for use availbel on the website only, little changed from consultation version	
2	8 April 2001	Revisions throughout to take into account the consultation comments and also restyling for publication	
Issue 1	June 2002	Initial Issue	V1

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Executive summary

This guidance has been produced by the Environment Agency for England and Wales with the Scottish Environment Protection Agency (SEPA) and the Northern Ireland Environment and Heritage Service (EHS). Together these are referred to as "the Regulator" throughout this document. Its publication follows consultation with industry, government departments and non-governmental organisations.

What is IPPC

Integrated Pollution Prevention and Control (IPPC) is a regulatory system that employs an integrated approach to control the environmental impacts of certain industrial activities. It involves determining the appropriate controls for industry to protect the environment through a single Permitting process. To gain a Permit, Operators will have to show that they have systematically developed proposals to apply the Best Available Techniques (BAT) and meet certain other requirements, taking account of relevant local factors.

This Guidance and the BREF

This UK Guidance for delivering the PPC (IPPC) Regulations in this sector is based on the BAT Reference document BREF (see Ref. 1) produced by the European Commission. The BREF is the result of an exchange of information between member states and industry. The quality, comprehensiveness and usefulness of the BREF is acknowledged. This guidance is designed to complement the BREF and is cross-referenced to it throughout. It takes into account the information contained in the BREF and lays down the indicative standards and expectations in the UK (England and Wales, Scotland and Northern Ireland). The reader is advised to have access to the BREF.

This UK General Sector Guidance is to be used when there is no **sector specific IPPC guidance**. It is a supplemental note for use with existing Integrated Pollution Control (IPC), or waste, or other guidance, and deals with issues included in IPPC which may not have been covered in the previous regulatory regimes, such as accidents, energy, noise, site restoration etc. It lays down some general standards and expectations in the UK (England and Wales, Scotland and Northern Ireland) for the techniques and standards that need to be addressed to satisfy the Regulations.

The aims of this Guidance

The aims of this Guidance are to:

- provide a clear structure and methodology for Operators to follow to ensure they address all aspects of the PPC Regulations and other relevant Regulations
- minimise the effort by both Operator and Regulator in the permitting of an installation by expressing the BAT techniques as clear indicative standards
- improve the consistency of applications by ensuring that all relevant issues are addressed
- increase the transparency and consistency of regulation by having a structure in which the Operator's response to each issue, and any departures from the standards, can be seen clearly and which enables applications to be compared

To assist Operators in making applications, separate, horizontal guidance is available on a range of topics such as waste minimisation, monitoring, calculating stack heights and so on. Most of this guidance is available free through the Environment Agency, SEPA or EHS (Northern Ireland) websites (see **References**).

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1 Introduction

1.1 Understanding IPPC

IPPC and the Regulations

Integrated Pollution Prevention and Control (IPPC) is a regulatory system that employs an integrated approach to control the environmental impacts of certain industrial activities. It involves determining the appropriate controls for industry to protect the environment through a single permitting process. To gain a Permit, Operators will have to show that they have systematically developed proposals to apply the Best Available Techniques (BAT) and meet certain other requirements, taking account of relevant local factors.

The essence of BAT is that the selection of techniques to protect the environment should achieve an appropriate balance between the environmental benefits and the costs incurred by Operators.

IPPC operates under the Pollution Prevention and Control Regulations, (see **The Pollution Prevention and Control Regulations** and **Appendix 2**). These Regulations have been made under the Pollution Prevention and Control (PPC) Act 1999 and implement the EC Directive 96/61 on IPPC. Further information on the overall system of IPPC, together with Government policy and more detailed advice on the interpretation of the Regulations, can be found in the Department of the Environment, Food and Rural Affairs (DEFRA) document **IPPC: A Practical Guide**.

Installation based, NOT national emission limits Indicative BAT Standards

The BAT approach of IPPC differs from regulatory approaches based on fixed national emission limits (except where General Binding Rules or standard Permits are issued). The legal instrument that ultimately defines BAT is the Permit, and this can only be issued at the installation level.

Indicative BAT standards (essentially for BAT, but also covering other aspects) are laid out in national guidance (such as this) and should be applied unless there is strong justification for another course of action. BAT includes both the technical components of the installation given in Section 2 and the benchmark levels identified in Section 3. Departures from those standards, in either direction, can be justified at the local level taking into account the technical characteristics of the installation concerned, its geographical location and the local environmental conditions. If there are any applicable mandatory EU emission limits, these must be met, although BAT may go further.

BAT and EQS

The BAT approach also differs from, but complements, regulatory approaches based on Environmental Quality Standards (EQS). Essentially, BAT requires measures to be taken to prevent or, where this is not practicable, to reduce emissions. That is, if emissions can be reduced further, or prevented altogether, at reasonable cost, then this should be done irrespective of whether any environmental quality standards are already being met. It requires us not to consider the environment as a recipient of pollutants and waste, which can be filled up to a given level, but to do all that is practicable to minimise the impact of industrial activities. The process considers what can be reasonably achieved within the installation first (covered by Sections 2 and 3 of this Guidance) and only then checks to ensure that the local environmental conditions are secure (see **Section 4** on page 54 of this Guidance and **IPPC Environmental Assessments for BAT**). So the BAT approach is a more precautionary one, which may go beyond the requirements of Environmental Quality Standards.

Conversely, it is possible that the application of BAT may lead to a situation in which an EQS is still threatened. The Regulations therefore allow for expenditure beyond BAT where necessary. This situation should arise very rarely assuming that the EQS is soundly based on an assessment of harm.

The BAT assessment, which balances cost against benefit (or prevention of harm) should, in most cases, have come to the same conclusion about the expenditure which is appropriate to protect the environment.

Advice on the relationship of environmental quality standards and other standards and obligations is given in **IPPC: A Practical Guide** and in Section 3.

Assessing BAT at the sector level

The assessment of BAT takes place at a number of levels. At the European level, the EC issues a BAT reference document (BREF) for each sector. The BREF is the result of an exchange of information which member states should take into account when determining BAT, but which gives them flexibility in its application. The UK Sector Guidance Note for that sector takes into account the information contained in the BREF and lays down the indicative standards and expectations in the UK. At this national level, techniques that are considered to be BAT should represent an appropriate balance of costs and benefits for a typical, well-performing installation in that sector and be affordable without making the sector as a whole uncompetitive, either within Europe or world-wide. The UK Sector Guidance Note is for use where IPPC UK Sector guidance is not yet available.

Assessing BAT at the installation level

When assessing which sectoral, indicative BAT standards apply at the installation level, departures may be justified in either direction as described above. The most appropriate technique may depend on local factors and, where the answer is not self-evident, a local assessment of the costs and benefits of the available options may be needed. Individual company profitability is not considered. Further information on this can be found in **IPPC: A Practical Guide** and **IPPC Part A(1) Installations: Guide for Applicants**.

Costs may only be taken into account at the local level where:

- the local technical characteristics or environmental conditions can be shown to be different from those assumed in the national/European assessment of BAT described in this guidance; in such cases a local cost benefit assessment may be appropriate
- where the BAT cost/benefit balance of an improvement only becomes favourable when the relevant item of plant is due for renewal/renovation. In effect, these are cases where BAT for the sector can be expressed in terms of local investment cycles
- a number of expensive improvements are needed. Then a phasing programme may be appropriate as long as it is not so drawn out that it appears to be rewarding a poorly performing installation, (see **IPPC Environmental Assessments for BAT** for more details).

Innovation

The Regulators encourage the development and introduction of innovative techniques that meet the BAT criteria. They are looking for continuous improvement in the overall environmental performance of the process as a part of progressive sustainable development. This Sector Guidance Note describes the indicative standards at the time of writing. However, Operators should keep up-to-date with the relevant BATs. This note may not be cited in an attempt to delay introducing improved techniques. The technical characteristics of a particular installation may also allow for opportunities not foreseen in the Guidance; as BAT is determined at the installation level, except in the case of General Binding Rules (GBRs), it is valid to consider these even where they go beyond the indicative standards.

New installations

The indicative requirements apply to both new and existing activities, but it will be more difficult to justify departures from them in the case of new installations. For new activities the indicative requirements should normally be in place before operations start. In some cases, such as where an audit of ongoing operations is required, this is not possible and indicative upgrading timescales are given for such cases.

Existing installation standards

For upgrading timescales for existing plant, see **Section 1.4.2** on page 5.

1.2 Making an application

You may make a satisfactory application by:

- addressing the issues in Sections 2 and 3 of this guidance
- assessing your environmental impact described in Section 4 and in **IPPC Environmental Assessments for BAT**
- demonstrating that what you propose is BAT for your installation

In practice, some Applicants produce far more information that we need and do not focus on the areas that are important. This can lead to extensive requests for further information.

If you are not reading this from the CD you should be aware that CDs are being progressively made available which will steer you through these steps. The tools and advice on the CD define much more closely the level of detail required in the application and make the process of calculating impact assessment much simpler.

For existing IPC and waste Applicants your previous applications will provide much of the information for your IPPC application. Where you refer to information supplied with your previous application you will need to send us fresh copies. However, you will see from the advice given on the CDs that in many cases we prefer that documents are maintained on site rather than supplied with the application. This is particularly true for management system information.

For further advice see the **IPPC Part A(1) Installations: Guide for Applicants**.

1.3 Installations covered

This Note, in conjuction with the relevant sector guidance from the earlier regulatory regimes, i.e. from IPC or from Waste Management Licensing, covers installations, described in Part A (Part A(1) in England and Wales) of Schedule 1 to the PPC Regulations (see **Ref 3**) for which no sector-specific IPC guidance has been produced.

Advice on the extent of the physical site which is contained within the installation is given in **IPPC Part A(1) Installations: Guide for Applicants**. Operators are advised to discuss this with the Regulator before preparing their application.

Where associated activities are carried out in conjunction with the main activities and are not covered in this guidance note (for example combustion activities), reference should be made to:

- other relevant IPPC Guidance Notes and,
- where appropriate, the Secretary of State's Guidance for Local Authority Air Pollution Control. (NB In Northern Ireland this guidance is produced by the Department of the Environment.

1.4 Timescales

1.4.1 Permit review periods

Permits are likely to be reviewed as follows:

- for individual activities not previously subject to regulation under IPC or Waste Management Licensing, a review should be carried out within four years of the issue of the IPPC Permit
- for individual activities previously subject to regulation under IPC or Waste Management Licensing, a review should be carried out within six years of the issue of the IPPC Permit

So activities/installations not currently in IPC or Waste Management Licensing will be initially reviewed within four years and thereafter within six years.

An exception to this is where discharges of List I or List II substances have been permitted, or where there is disposal or tipping for the purposes of disposal of any matter that might lead to an indirect discharge of any substance on List I or II. In such cases the review must be carried out within four years.

This period will be kept under review and, if any of the above factors change significantly, may be shortened or extended.

1.4.2 Upgrading timescales for existing plant

Existing installation timescales

For an existing activity, a less strict proposal (or an extended timescale) may be acceptable, for example, where the activity already operates to a standard that is very close to an indicative requirement. Equally, local environmental impacts may require action to be taken more quickly than the indicative timescales given in this Guidance. Furthermore, where IPC upgrading programmes are already in place, it is not expected that the indicative timescales given in this Guidance would extend to these.

Upgrading timescales will be set in the improvement programme of the Permit, along the following lines. Improvements fall into a number of categories:

- The many good-practice requirements in Section 2, such as management systems, waste, water and energy audits, bunding, good housekeeping measures to prevent fugitive or accidental emissions, energy baseline measures, waste-handling facilities, monitoring equipment, or installation of some secondary techniques. Also, longer-term studies required for control, environmental impacts and the like – at the latest within 3 years of the issue of the Permit.
- The larger, usually more capital-intensive improvements such as abatement equipment.
- All improvements should be carried out at the earliest opportunity and to a programme approved by the Regulator. Any longer timescales will need to be justified by the Operator

The Applicant should include a proposed timetable covering all improvements

1.5 Key issues

See existing sector guidance.

1.6 Summary of releases

See existing sector guidance.

1.7 Technical overview

See existing sector guidance.

1.8 Economics

See existing sector guidance, noting that some earlier sector guidance for IPC and waste may not have contained economic or cost information.

2 Techniques for pollution control

This section summarises, in the outlined BAT boxes: the indicative BAT requirements (i.e., what is BAT in most circumstances) against which the application will be judged.

At the top of each BAT box is the issue which is being addressed. These reflect the requirements or information laid down in the Regulations.

Although referred to as BAT, the requirements also cover the other requirements of the PPC Regulations and those of other Regulations such as the Waste Management Licensing Regulations (see Appendix 2 for equivalent legislation in Scotland and Northern Ireland) and the Groundwater Regulations insofar as they are relevant to an IPPC Permit).

For further information on the status of the Indicative BAT standards, see **Guidance for applicants**.

In responding to the requirements the Operator should keep the following general principles in mind.

- There should be evidence in the application you have considered the possibility of preventing the release of harmful substances by substituting materials or processes (see **Section 2.2.1** on page 27), preventing releases of water altogether (see **Section 2.2.2** on page 29), or by preventing waste emissions by reuse or recovery.
- Where that is not practicable you should reduce emissions that may cause harm.

All of the requirements identified in the BAT boxes should be identified in the application. Where information is not available, the reason should be explained and discussed with the Regulator before finalising the application. The Regulator may require, by formal notice, information that is missing.

The Regulations require Applicants to describe the proposed installation activities and the proposed techniques and measures to prevent and reduce waste arisings and emissions of substances and heat (including during periods of start-up or shut-down, momentary stoppage, leak or malfunction).

2.1 In-process controls

See existing sector guidance.

As part of the Application the Operator should:

- Provide adequate process descriptions of the activities and the abatement and control equipment for all of the activities such that the Regulator can understand the process in sufficient detail to assess the Operator's proposals and, in particular, to assess opportunities for further improvements. This should include:
  - process flow sheet diagrams (schematics)
  - a summary of emissions to air, water and land including waste
  - diagrams of the main plant items where they have environmental relevance; for example, landfill liner design, incinerator furnace design, abatement plant design and the like
  - details of any chemical reactions and their reaction kinetics/energy balance
  - control system philosophy and how the control system incorporates environmental monitoring information
  - annual production, mass and energy balance information
  - venting and emergency relief provisions
  - summary of extant operating and maintenance procedures
  - a description of how protection is provided during abnormal operating conditions such as momentary stoppages, start-up and shut-down for as long as is necessary to ensure compliance with release limits in Permits
  - additionally, for some applications it may be appropriate to supply piping and instrumentation diagrams for systems containing potentially polluting substances
- If there is uncertainty, the degree of detail required should be established in pre-application discussions.
- Describe the current or proposed position for all of the indicative BAT requirements for each subsection of 2.1, any requirements in the existing Sector Guidance or any others pertinent to the installation.
- Identify shortfalls in the above information that the Operator believes require longer–term studies to establish.
- Demonstrate that the proposals are BAT by confirming compliance with the indicative requirements, by justifying departures (as described in Section 1.2 and in the A1 Guide for Applicants) or alternative measures.

In assessing the integrated impacts of proposals and balancing the impacts of different techniques, it should be noted that energy should be taken into account whether or not there is a Climate Change Levy Agreement in place (see **Section 2.7.3** on page 32).

2.2 Emissions control

2.2.1 Point source emissions to air

The nature and source of the emissions expected from each activity will be found in the existing sector guidance. They are summarised in previous sections and will be confirmed in detail in the Operator's response to the emissions inventory.

Cross-sectoral guidance on abatement techniques for point–source emissions to air can be found in **Ref 9** and in the existing sector guidance.

With the Application the Operator should supply the general application requirements in Section 2.1 for in process controls and in addition:

- Describe measures taken to increase the reliability with which the required control and abatement performance is delivered (for instance, there may be a lime–feed system to abate acid gases, but they are notorious for blocking – what measures ensure reliability? Dioxins are measured only occasionally – what techniques ensure that they are controlled all the time?).
- Where Volatile Organic Compounds (VOCs) are released, the identification of the main chemical constituents of the emissions and assessment of the fate of these chemicals in the environment. These steps will be carried out in response to Sections 3.1 and 4.1, but need to be understood here in order to demonstrate that the controls are adequate.

Indicative BAT requirements for point emissions to air	
1	The Operator should complete any detailed studies required into abatement or control options as an improvement condition.
2	The application of BAT should ensure that there are no visible persistent plumes except for condensed water vapour.
3	Plumes of condensed water vapour, such as from large cooling towers can cause loss of light. Plumes, particularly from low level cooling towers, that come down to ground level can contain biocides or organisms which could be harmful and can cause poor visibility and icing of roads. Such plumes should not be permitted. In some cases the use of air cooled condensers or hybrid towers may be BAT, in other cases it may be possible to reduce load or shut down under weather conditions which are likely to lead to such problems. Plume modelling of new plant should be carried out for large installations to demonstrate that the proposals will not lead to unacceptable impacts. See the "Cooling Systems" BREF for further information.
4	Releases from wet scrubbers can cause similar problems. In addition, condensation or adsorption of environmentally harmful substances by the condensing water, combined with the less buoyant plume, may lead to inadequate dispersion of the pollutants. Under conditions where the plume always re-evaporates (becomes wispy and then clear) this may not be harmful. Where this is not the case or where there are particular local sensitivities, the gas stream should be reheated to avoid condensation in the vicinity of the vent. Ideally this should employ waste heat where available. Where there is no available waste heat and dispersion of the pollutants can be shown to be adequate the applicant may be able to demonstrate that the BAT criteria have nonetheless been met.
5	For all other techniques, see the existing sector guidance.

2.2.2 Point source emissions to surface water and sewer

The nature and source of the emissions expected from each activity will be found in the existing sector, unmarked in previous sections and will be confirmed in detail in the Operator's response to the emissions inventory.

Indicative BAT requirements for the control of effluent treatment (Sheet 1 of 2)

1 The primary consideration should be to prevent releases of harmful substances to the aquatic environment, whether releases are direct or via a sewage treatment works.

2 The following general principles should be applied in sequence to control emissions to water:
- water use should be minimised and wastewater reused or recycled (see **Section 2.4.2** on page 70)
- contamination risk of process or surface water should be minimised (see **Section 2.2.5** on page 60)
- wherever possible, closed loop cooling systems should be used and procedures in place to ensure blow down is minimised
- where any potentially harmful materials are used measures should be taken to prevent them entering the water circuit

3 Consideration should be given to the use of filtration/osmosis or other techniques. such techniques allow the water to be cleaned to the above level for release or, preferably, be returned to the process. Particular consideration should be given to the fate of the concentrated residues of such techniques. These can often be returned to furnaces, evaporated, solidified, sent for incineration etc. that tankering of such residues off site as waste, simply transfers the problem to another place unless they are sent to a facility with the genuine ability to recycle the materials.

4 If the wastewater is all readily biodegradable or contains only materials which are naturally occurring in much larger quantities in the receiving water the Operator can offer justification as to why filtration/osmosis or other techniques are not appropriate.

5 Where prevention is not possible, the emissions benchmarks given in **Section 3** on page 46, are achievable.

6 Where effluent is treated off-site at a sewage treatment works, the above factors apply in particular demonstrating that:
- the treatment provided at the sewage treatment works is as good as would be achieved if the emission was treated on-site, based on reduction of load (not concentration) of each substance to the receiving water (using the **IPPC Environmental Assessments for BAT** software tool will assist in making this assessment).
- whether action plans are appropriate in the event of sewer bypass, (via storm/emergency overflows or at intermediate sewage pumping stations) to prevent direct discharge of the waste waters during these periods, e.g. knowing when bypass is occurring, rescheduling activities such as cleaning or even shutting down when bypass is occurring.
- a suitable monitoring programme is in place for emissions to sewer. This may be that specified by the sewerage undertaker to protect the treatment plant, or it may be more extensive if further controls are required to minimise the load released.

Indicative BAT requirements for the control of effluent treatment (Sheet 2 of 2)

7 The Operator should maintain an understanding of the main chemical constituents of the treated effluent (including the make-up of the COD) and assessment of the fate of these chemicals in the environment.

8 All emissions should be controlled, as a minimum, to avoid a breach of water quality standards (see **Section 3.2** on page 48 and **Section 4.1** on page 54), but noting that where BAT can deliver further reduction at reasonable cost it should do so (see **Section 1.1** on page 1). Calculations and/or modelling to demonstrate this will be carried out in response to Section 4.1.

9 Where there are harmful substances or levels of residual toxicity, identify the causes of the toxicity and the techniques proposed to reduce the potential impacts.

10 Consider whether the effluent flow is sufficient to fall within the requirements of the Urban Waste Water Treatment Directive.

2.2.3 Point source emissions to groundwater

Groundwater protection legislation

The Groundwater Regulations for the UK came into force on 1 April 1999. An IPPC Permit will be subject to the following requirements under these Regulations.

i. It shall not be granted at all if it would permit the *direct discharge* of a List I substance (Regulation 4(1)) except in limited circumstances – see note 1, below.

ii. If the Permit allows the disposal of a List I substance or any other activity that might lead to an *indirect discharge* (see note 2, below) of a List I substance then *prior investigation* (as defined in Regulation 7) is required and the Permit shall not be granted if this reveals that indirect discharges of List I substances would occur; in any event, conditions to secure the prevention of such discharges must be imposed (Regulation 4(2) and (3)).

iii. In the case of List II substances, Permits allowing direct discharges or possible indirect discharges, cannot be granted unless there has been a prior investigation and conditions must be imposed to prevent groundwater pollution (Regulation 5).

iv. The Regulations contain further detailed provisions covering *surveillance* of groundwater (Regulation 8); conditions required when direct discharges are permitted (Regulation 9); when indirect discharges are permitted (Regulation 10); and review periods and compliance (Regulation 11).

The principles, powers and responsibilities for groundwater protection in England and Wales, together with the Agency's policies on this, are outlined in the Environment Agency's document **Policy and Practice for the Protection of Groundwater**. This outlines the concepts of vulnerability and risk and the likely acceptability from the Agency's viewpoint of certain activities within groundwater protection zones. These are categorised as:

A Prior investigation of the potential effect on groundwater of on-site disposal activities discharges to groundwater. Such investigations will vary from case to case, but the Regulator is likely to require a map of the proposed disposal area; a description of the underlying geology, hydrogeology and soil type, including the depth of saturated zone and quality of groundwater

the proximity of the site to any surface waters and abstraction points, and the relationship between ground and surface waters; the composition and volume of waste to be disposed of; and the rate of planned disposal.

The Environment Agency has produced a series of maps of England and Wales, which provide a guide to potential groundwater vunerability. Source Protection Zones are intended to aid protection by defining annular zones around each major potable source, including springs, boreholes and wells, based on travel times.

B Surveillance - This will also vary from case to case, but will include monitoring of groundwater quality and ensuring the necessary precautions to prevent groundwater pollution are being undertaken.

Note 1 The Regulations state that, subject to certain conditions, the discharges of List I substances to groundwater may be authorised if the groundwater is "permanently unsuitable for other uses". Advice must be sought from the Regulator where this is being considered as a justification for such discharges.

Note 2 List I and List II refer to the list in the Groundwater Regulations and should not be confused with the similar lists in the Dangerous Substances Directive

Indicative BAT requirements for point source emissions to groundwater
Identify if there may be a discharge of any List I or List II substances and if any are identified, explain how the requirements of the Groundwater Regulations 1998 have been addressed.

1 In general, there should be no permitted releases to groundwater of either a direct or indirect nature.

2 If such releases are to continue the requirements of the Regulations, as summarised above, must be complied with.

List I

1.-(1) Subject to the sub paragraph below, a substance is in List I if it belongs to one of the following families or groups of substances:

(a) organohalogen compounds and substances that may form such compounds in the aquatic environment

(b) organotin compounds

(c) substances that possess carcinogenic, mutagenic or teratogenic properties in or via the aquatic environment (including substances that have those properties that would otherwise be in List II)

(d) mercury and its compounds

(e) cadmium and its compounds

(f) mineral oils and hydrocarbons

(g) cyanides.

1.-(2) A substance is not in List I if it has been determined by the Regulator to be inappropriate to List I on the basis of a low risk of toxicity, persistence and bioaccumulation.

List II

2.-(1) A substance is in List II if it could have a harmful effect on groundwater and it belongs to one of these families or groups of substances:

(a) the following metalloids and metals and their compounds:

zinc	tin	copper
barium	nickel	beryllium
chromium	boron	lead
uranium	selenium	vanadium
arsenic	cobalt	antimony
thallium	molybdenum	tellurium
titanium	silver	

(b) biocides and their derivatives not appearing in List I

(c) substances that have a harmful effect on the taste or odour of groundwater, and compounds liable to cause the formation of such substances in such water and to render it unfit for human consumption

(d) toxic or persistent organic compounds of silicon, and substances that may cause the formation of such compounds in water, excluding those which are biologically harmless or are rapidly converted in water into harmless substances

(e) inorganic compounds of phosphorus and elemental phosphorus

(f) fluorides

(g) ammonia and nitrates.

2.-(2) A substance is also in List 2 if:

(a) it belongs to one of the families or groups of substances set out in paragraph 1(1) above

(b) it has been determined by the Regulator to be inappropriate to List I under paragraph 1(2); and

(c) it has been determined by the Regulator to be in inappropriate to List II having regard to toxicity, persistence and bioaccumulation.

3.-(1) The Secretary of State or Scottish Ministers may review any decision of the Regulator in relation to the exercise of its powers under the paragraphs above.

3.-(2) The Secretary of State or Scottish Minister shall notify the Regulator of his decision following a review under List 1 sub paragraph 1 above and it shall be the duty of the Regulator to give effect to that decision.

4.- The Regulator shall from time to time publish a summary of the effect of its determinations under this Schedule in such manner as it considers appropriate and shall make copies of any such summary available to the public free of charge.

2.2.4 Control of fugitive emissions to air

On many installations fugitive, or diffuse, emissions may be more significant than point-source emissions. Details will be found in the appropriate sector guidnace. Common examples of the sources of fugitive emissions are:

- open vessels (for example, the effluent treatment plant)
- storage areas (for example bays, stockpiles, lagoons and the like)
- the loading and unloading of transport containers

- transferring material from one vessel to another (for example, furnace, ladle, reactors, silos)
- conveyor systems
- pipework and ductwork systems (for example, pumps, valves, flanges, catchpots, drains, inspection hatches and so on)
- poor building containment and extraction
- potential for bypass of abatement equipment (to air or water)
- accidental loss of containment from failed plant and equipment

As part of the Application the Operator will have identified and, where possible quantified, significant fugitive emissions to air from all relevant sources, estimating the proportion of total emissions that are attributable to fugitive releases for each substance. Where there are opportunities for reductions, the Permit may require the updated inventory of fugitive emissions to be submitted.

Indicative BAT requirements for fugitive emissions to air

1 **Dust** - The following general techniques should be employed where appropriate:

- Covering of skips and vessels
- Avoidance of outdoor or uncovered stockpiles (where possible)
- Where unavoidable, use of sprays, binders, stockpile management techniques, windbreaks and so on
- Regular wheel and road cleaning (avoiding transfer of pollution to water and wind blow)
- Closed conveyors, pneumatic or screw conveying (noting the higher energy needs), minimising drops. Filters on the conveyors to clean the transport air prior to release
- Regular housekeeping
- Enclosed silos (for storage of bulk powder materials) vented to fabric filters with the collected material returned to the silo or recycled to the furnace
- Enclosed containers or sealed bags used for smaller quantities of fine materials
- Areas of the process where dust is likely to be generated (for example, bag opening, fabric filter dust disposal and the like) should be provided with extraction which vents to suitable abatement.
- Batch plants – building design should minimise the movement of accumulated dust (for example minimum number of openings, use of dust curtains and seals). All measures should be fully functional and be properly maintained as part of a regular maintenance schedule.

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2.2.5 Fugitive emissions to surface water, sewer and groundwater

As part of the Application the Operator will have identified and, where possible quantified, significant fugitive emissions to water from all relevant sources, estimating the proportion of total emissions that is attributable to fugitive releases for each substance. Where there are opportunities for reductions, the Permit may require regular updated inventory of fugitive emissions to be submitted.

Indicative BAT requirements for fugitive emissions to water (Sheet 1 of 2)

1 With regard to **subsurface structure**, the Operator should:

- establish and record the routing of all installation drains and subsurface pipework
- identify all subsurface sumps and storage vessels
- engineer systems to minimise leakages from pipes and ensure swift detection if they do occur, particularly where hazardous (i.e. listed) substances are involved
- provide, in particular, secondary containment and/or leakage detection for such subsurface pipework, sumps and storage vessels
- establish an inspection and maintenance programme for all subsurface structures, e.g. pressure tests, leak tests, material thickness checks or CCTV

2 For **surfacing**, the Operator should:

- describe the design and condition of the surfacing of all operational areas *(Relevant information may include as appropriate: capacities; thicknesses; falls; material; permeability; strength/reinforcement; resistance to chemical attack; inspection and maintenance procedures; and quality assurance procedures.)*
- have an inspection and maintenance programme of impervious surfaces and containment kerbs
- justify where operational areas have not been equipped with:
  - an impervious surface
  - spill containment kerbs
  - sealed construction joints
  - connection to a sealed drainage system

3 All tanks containing liquids whose spillage could be harmful to the environment should be bunded. For further information on bund sizing and design, see the **Releases to water references**. Bunds should:

- be impermeable and resistant to the stored materials
- have no outlet (that is, no drains or taps) and drain to a blind collection point
- have pipework routed within bunded areas with no penetration of contained surfaces
- be designed to catch leaks from tanks or fittings
- have a capacity greater than 110 percent of the largest tank or 25 percent of the total tankage
- be subject to regular visual inspection and any contents pumped out or otherwise removed under manual control after checking for contamination
- where not frequently inspected, be fitted with a high-level probe and an alarm as appropriate

Indicative BAT requirements for fugitive emissions to water (Sheet 2 of 2)

- have fill points within the bund where possible or otherwise provide adequate containment
- have a routine programmed inspection of bunds (normally visual, but extending to water testing where structural integrity is in doubt)

4 All sumps shoud:
- be impermeable and resistant to stored materials
- be subject to regular visual insection and any contents pumped out or otherwise removed after checking for contamination
- where not frequently inspected, be fitted with a high level probe and alarm as appropriate
- have a routine programmed enspection (normally visual but extending to water testing where mineral integrity is in doubt

5 Storage areas and containers should be designed and operated to minimise the risk of releases to the environment. In particular:
- Storage areas should be located away from watercourses and sensitive boundaries, for example, adjacent to areas of public use, and should be protected against vandalism.
- Storage areas should be clearly marked and signed plus containers should be clearly labelled.
- The maximum storage capacity of storage areas should be stated and not exceeded. The maximum storage period for containers should be specified.
- Appropriate storage facilities should be provided for special requirements such as for substances that are flammable, sensitive to heat or light and the like; also incompatible waste types should be kept separate.
- Containers should be stored with lids, caps and valves secured and in place. This also applies to emptied containers.
- Storage containers, drums and the like should be regularly inspected.
- Procedures should be in place to deal with damaged or leaking containers.

2.2.6 Odour

The level of detail supplied should be in keeping with the risk of causing odour-related annoyance at sensitive receptors.

Where an installation poses no risk of odour-related environmental impact because the activities undertaken are inherently non-odorous, this should be justified and no further information relating to odour need normally be supplied.

Where odour could be a problem, the Operator will be required in the Application to supply the information as indicated below:

- Information relating to sensitive receptors, in particular the type of receptor, location relative to the odour sources and an assessment of the impact of odorous emissions on the receptors. Where detailed information is required the Operator may be able to secure an agreement to supply this as part of an Improvement Programme.
- An overview of any complaints received, what they relate to (source/operation) and remedial action taken.
- The types and source of odorous substances used or generated, intentional and fugitive (unintentional) release points and monitoring undertaken.

- Actions taken to prevent or minimise
  – A description of the actions taken to prevent and/or minimise odour annoyance for each odour source.
  – A demonstration that the indicative BAT requirements are being complied with.
  – Identification of any circumstances or conditions which might compromise the ability to prevent or minimise odour annoyance, and a description of the actions that will be taken to minimise the impact.

There may be a requirement placed upon the Operator to provide some or all of this information in the form of an odour management statement. See the **Odour management statement** for a typical log book.

Indicative BAT requirements for odour control

1 The requirements for odour control will be installation-specific and depend on the sources and nature of the potential odour. In general:

2 Where odour can be contained, for example within buildings, the Operator should maintain the containment and manage the operations to prevent its release at all times.

3 Where odour releases are expected to be acknowledged in the Permit, (i.e. contained and treated prior to discharge or discharged for atmospheric dispersion):
- For existing installations, the releases should be modelled to demonstrate the odour impact at sensitive receptors. The target should be to minimise the frequency of exposure to ground level concentrations that are likely to cause annoyance.
- For new installations, or for significant changes, the releases should be modelled and it is expected that the Operator will achieve the highest level of protection that is achievable with BAT from the outset.
- Where there is no history of odour problems then modelling may not be required although it should be remembered that there can still be an underlying level of annoyance without complaints being made.
- Where, despite all reasonable steps in the design of the plant, extreme weather or other incidents are liable, in the view of the Regulator, to increase the odour impact at receptors, the Operator should take appropriate and timely action, as agreed with the Regulator, to prevent further annoyance (these agreed actions will be defined either in the Permit or in an odour management statement).

4 Where odour generating activities take place in the open, (or potentially odorous materials are stored outside) a high level of management control and use of best practice will be expected.

5 Where an installation releases odours but has a low environmental impact by virtue of its remoteness from sensitive receptors, it is expected that the Operator will work towards achieving the standards described in this Note, but the timescales allowed to achieve this might be adjusted according to the perceived risk.

2.3 Management

Within IPPC, an effective system of management is a key technique for ensuring that all appropriate pollution prevention and control techniques are delivered reliably and on an integrated basis.

The Regulators strongly support the operation of environmental management systems (EMSs). An Operator with such a system will find it easier to complete not only this section but also the technical/ regulatory requirements in the following sections

The Regulators recommend either certification to the ISO 14001 standard or registration under EMAS (EC Eco Management and Audit Scheme) (OJ L114, 24/04/01). Both certification and registration provide independent verification that the EMS conforms to an assessable standard. EMAS now incorporates ISO 14001 as the specification for the EMS element. We believe that EMAS has a number of benefits over ISO14001 including a greater focus on environmental performance; a greater emphasis on legal compliance; and a public environmental statement. For further details about ISO 14001 and EMAS contact British Standards Institute (BSI) and the Institute of Environmental Management and Assessment (IEMA) respectively.

An effective EMS will help the Operator to maintain compliance with regulatory requirements and to manage other significant environmental impacts. This section identifies only those EMS requirements that are not specifically covered elsewhere in other sections of the document. It should not, therefore, be taken to describe all of the elements of an effective environmental management system. While the requirements below are considered to be BAT for IPPC, they are the same techniques as required in a formal EMS and are also capable of delivering wider environmental benefits. However, it is information on their applicability to IPPC which is primarily required in this application.

Indicative BAT requirements for management techniques (Sheet 1 of 3)

Operations and maintenance

1 Effective operational and maintenance systems should be employed on all aspects of the process whose failure could impact on the environment, in particular there should be:
- documented procedures to control operations that may have an adverse impact on the environment
- a defined procedure for identifying, reviewing and prioritising items of plant for which a preventative maintenance regime is appropriate
- documented procedures for monitoring emissions or impacts
- a preventative maintenance programme covering all plant, whose failure could lead to impact on the environment, including regular inspection of major ‘non productive’ items such as tanks, pipework, retaining walls, bunds ducts and filters

2 The maintenance system should include auditing of performance against requirements arising from the above and reporting the result of audits to top management.

Competence and training

3 Training systems, covering the following items, should be in place for all relevant staff which cover
- awareness of the regulatory implications of the Permit for the activity and their work activities;
- awareness of all potential environmental effects from operation under normal and abnormal circumstances
- awareness of the need to report deviation from the Permit
- prevention of accidental emissions and action to be taken when accidental emissions occur

Indicative BAT requirements for management techniques (Sheet 2 of 3)

4 The skills and competencies necessary for key posts should be documented and records of training needs and training received for these post maintained.

5 The key posts should include contractors and those purchasing equipment and materials;

6 The potential environmental risks posed by the work of contractors should be assessed and instructions provided to contractors about protecting the environment while working on site.

7 Where industry standards or codes of practice for training exist (e.g. WAMITAB) they should be complied with.

Accidents/incidents/non conformance

8 There should be an accident plan as described in **Section 2.8** on page 84 which:
- identifies the likelihood and consequence of accidents
- identifies actions to prevent accidents and mitigate any consequences

9 There should be written procedures for handling, investigating, communicating and reporting actual or potential non-compliance with operating procedures or emission limits.

10 There should be written procedures for handling, investigating, communicating and reporting environmental complaints and implementation of appropriate actions.

11 There should be written procedures for investigating incidents, (and near misses) including identifying suitable corrective action and following up

Organisation

12 The following are indicators of good performance which will impact on Agency resources, but upon which we will not normally insist as Permit conditions

13 The company should preferably adopt an environmental policy and programme which:
- includes a commitment to continual improvement and prevention of pollution
- includes a commitment to comply with relevant legislation, and with other requirements to which the organisation subscribes
- identifies, sets, monitors and reviews environmental objectives and key performance indicators independently of the Permit

14 The company should preferably have procedures which incorporate environmental issues into the following areas (as supported by demonstrable evidence e.g. written procedures):
- the control of process change on the installation
- design and review of new facilities (including provision for their decommissioning), engineering and other capital projects
- capital approval
- purchasing policy

15 The company should preferably have audits, at least annually, to check that all activities are being carried out in conformity with the above requirements. These should preferably be independent.

16 The company should preferably report annually on environmental performance, objectives and targets, and future planned improvements. This should preferably be a public environmental statement.

Indicative BAT requirements for management techniques (Sheet 3 of 3)
17 The company should preferably have a registered or certified EMAS/ISO 14001 system (by an accredited certification body)
18 The company should preferably have a clear, logical and recorded system for keeping records of: • Policies • roles and responsibilities • targets • procedures • results of audits • results of reviews

2.4 Raw Materials

This section covers the use of raw materials and water and the techniques for both minimising their use and minimising their impact by selection. (The choice of fuels is covered under **Section 2.7.3** on page 84, Energy).

As a general principle, the Operator will need to demonstrate the measures taken to:

- reduce the use of chemicals and other materials (**Section 2.4.2** on page 72)
- substitute less harmful materials, or those which can be more readily abated and when abated lead to substances that are more readily dealt with
- understand the fate of by-products and contaminants and their environmental impact (**Section 2.4.2** on page 72)

2.4.1 Raw materials selection

This section looks at the selection and substitution of raw materials and **Section 2.4.2** on page 70 describes the techniques to minimise their use.

It should be recognised that the process of selecting raw materials can present an opportunity to control emissions at source. In this regard it is suggested that Operators closely examine the range of possible raw material options available to them.

The Application requires the Operator to supply a list of the materials used, which have the potential for significant environmental impact, including:

- the chemical composition of the materials where relevant
- the quantities used
- the fate of the material (i.e. approximate percentages to each media and to the product)
- environmental impact where known (for example. degradability, bioaccumulation potential, toxicity to relevant species)
- any reasonably practicable alternative raw materials that may have a lower environmental impact including, but not limited to any alternatives described in the BAT requirements below (the substitution principle)
- and to justify (for example, on the basis of impact on product quality) the continued use of any substance for which there is a less hazardous alternative to show that the proposed raw materials are therefore BAT.

2.4.2 Waste minimisation audit (minimising the use of raw materials)

The options for waste recovery and recycling are covered in **Section 2.6** on page 76. Waste avoidance/minimisation, and the use of clean technologies, is a theme which runs throughout **Section 2.1** on page 34 and **Section 2.2** on page 50. This section deals with the systematic approach to look for other opportunities.

Waste minimisation can be defined simply as: “a systematic approach to the reduction of waste at source, by understanding and changing processes and activities to prevent and reduce waste”.

A variety of techniques can be classified under the term waste minimisation, from basic housekeeping through statistical measurement to applying of clean technologies.

In the context of waste minimisation and this Guidance, waste relates to the inefficient use of raw materials and other substances at an installation. A consequence of waste minimisation will be the reduction of gaseous, liquid and solid emissions.

Key operational features of waste minimisation will be:

- the ongoing identification and implementation of waste prevention opportunities
- the active participation and commitment of staff at all levels including, for example staff suggestion schemes
- monitoring of materials’ usage and reporting against key performance measures

For the primary inputs to waste activities e.g. incineration, the requirements of this section may have been met “upstream” of the installation. However, there may still be arisings that are relevant.

See the **Waste minimisation support references** for detailed information, guides and case studies on waste minimisation techniques.

Indicative BAT requirements for waste minimisation audits
Identify the raw and auxiliary materials, other substances and water that they propose to use.

1 The Operator should carry out a waste minimisation audit at least every 4 years. If an audit has not been carried out in the 2 years prior to submission of the application and the details made known at the time of the application, then the first audit shall take place within 2 years of the issue of the Permit. The methodology used and an action plan for reducing the use of raw materials should be submitted to the Regulator within 2 months of completion of the audit. The audit should be carried out as follows:

The Operator should analyse the use of raw materials, assess the opportunities for reductions and provide an action plan for improvements using the following three essential steps

- process mapping
- materials mass balance
- action plan

The use and fate of raw materials and other materials, including reactants, intermediates, by-products, solvents and other support materials, such as inerting agents, fuels, catalysts and abatement agents, should be mapped onto a process flow diagram (see the **Waste minimisation support references**). This should be achieved by using data from the raw materials inventory and other company data as appropriate. Data should be incorporated for each principal stage of the operation in order to construct a mass balance for the installation.

2 Using this information, opportunities for improved efficiency, changes in process and waste reduction should be generated and assessed. An action plan should then be prepared for implementing improvements to a timescale approved by the Regulator.

2.4.3 Water use

Reasons for reducing water use

Water use should be minimised within the BAT criteria for the prevention or reduction of emissions and be commensurate with the prudent use of water as a natural resource.

Reducing water use may be a valid environmental (or economic) aim in itself, perhaps because of local supply constraints. Also, from the point of view of reducing polluting emissions, any water passing through an industrial process is degraded by the addition of pollutants, and there are distinct benefits to be gained from reducing the water used. These include:

- reducing the size of (a new) treatment plant, thereby supporting the cost benefit BAT justification of better treatment
- cost savings where water is purchased or disposed of to another party
- associated benefits within the process such as reduced energy requirements for heating and pumping, and reduced dissolution of pollutants into the water leading to reduced sludge generation in the effluent treatment plant

The use of a simple mass balance for water use may help to reveal where reductions can be made.

Advice on cost-effective measures for minimising water can be found in the **Water efficiency references:**.

Indicative BAT requirements for minimisation of water use (Sheet 1 of 2)
Identify the raw and auxiliary materials, other substances and *water* that they propose to use.

1 The Operator should carry out a regular review of water use (water efficiency audit) at least every 4 years. If an audit has not been carried out in the 2 years prior to submission of the application and the details made known at the time of the application, then the first audit shall take place within 2 years of the issue of the Permit. The methodology used and an action plan for reducing the use of raw materials should be submitted to the Regulator within 2 months of completion of the audit.
- The Operator should produce flow diagrams and water mass balances for the activities.
- Water-efficiency objectives should be established by comparison with the benchmarks above. In justifying any departures from these, or where benchmarks are not appropriate, the techniques described below should be taken into account. The constraints on reducing water use beyond a certain level should be identified by each Operator, as this is usually installation-specific.
- Water pinch techniques should be used in the more complex situations, particularly on chemical plant, to identify the opportunities for maximising reuse and minimising use of water (see the **Water efficiency references:**).

2 Using this information, opportunities for reducing water use should be generated and assessed. An action plan should then be prepared implementing improvements to a timescale approved by the Regulator.

3 The following general principles should be applied in sequence to reduce emissions to water:
- water-efficient techniques should be used at source where possible
- water should be recycled within the process from which it issues, by treating it first if necessary. Where this is not practicable, it should be recycled to another part of the process that has a lower water-quality requirement
- in particular, uncontaminated roof and surface water, which cannot be used, should not be mixed with contaminated water until the latter has been treated in the effluent treatment system and after final monitoring

4 Measures should be implemented to minimise contamination risk of process or surface water (see **Section 2.2.5** on page 61).

5 To identify the scope for substituting water from recycled sources, the water-quality requirements associated with each use should be identified. Less contaminated water streams, such as cooling waters, should be kept separate where there is scope for reuse, possibly after some form of treatment.

6 Ultimately wastewater will need some form of treatment (see **Section 2.2.2** on page 54). However in many applications, the best conventional effluent treatment produces a good water quality that may be usable in the process directly or when mixed with fresh water. While treated effluent quality can vary, it can be recycled selectively, when the quality is adequate, reverting to discharge when the quality falls below that which the system can tolerate. The Operator should identify where treated water from the effluent treatment plant could be used and justify where it is not.

7 In particular, the cost of membrane technology continues to reduce. They can be applied to individual process streams or to the final effluent from the effluent treatment plant. Ultimately, they could completely replace the ETP plant, leading to greatly reduced effluent volume. There remains, however, a concentrated effluent stream but, where this is sufficiently small, and particularly where waste heat is available for further treatment by evaporation a zero effluent system could be produced. Where appropriate, the Operator should assess the costs and benefits of providing such treatment.

Indicative BAT requirements for minimisation of water use (Sheet 2 of 2)
Identify the raw and auxiliary materials, other substances and *water* that they propose to use.

8 Water used in cleaning and washing down should be minimised by:
- vacuuming, scraping or mopping in preference to hosing down
- evaluating the scope for reusing wash water
- trigger controls on all hoses, hand lances and washing equipment

9 Fresh water consumption should be directly measured and recorded regularly - ideally on a daily basis.

2.5 Waste handling

The nature and source of the emissions expected from each activity will be found in the existing sector, unmarked in previous sections and will be confirmed in detail in the Operator's response to the emissions inventory.

Indicative BAT requirements for waste handling
Characterise and quantify each waste stream and d3escribe the proposed measures for waste management, storage and handling.

1 A system should be maintained to record the quantity, nature, origin and, where relevant, the destination, frequency of collection, mode of transport and treatment method of any waste that is disposed of or recovered.

2 Wherever practicable, waste should be segregated and the disposal route identified. This should be as close to the point of production as possible.

3 Records should be maintained of any waste sent off-site (Duty of Care).

4 All appropriate steps to prevent emissions (for example, liquids, dust, VOCs and odour) from storage or handling should be taken (see **Section 2.2.4** on page 60, **Section 2.2.5** on page 61 and **Section 2.2.6** on page 63).

2.6 Waste recovery or disposal

The Regulations require the Regulator, in setting Permit conditions, to take account of certain general principles, including that the installation in question should be operated in such a way that "waste production is avoided in accordance with Council Directive 75/442/EEC on waste; and where waste is produced it is recovered, or where this is technically or economically impossible it is disposed of, while avoiding or reducing the impact on the environment". The objectives of the National Waste Strategies should also be considered. Waste avoidance (minimisation) is covered throughout **Section 2.1** on page 8 and **Section 2.2** on page 9. and by the specific requirement for a waste minimisation audit in **Section 2.4.2** on page 22.

To meet this requirement, the Regulator needs Operators to provide the information in point 2 below.

Indicative BAT requirements for waste recovery or disposal
Describe how each waste stream is proposed or disposed of. If you propose any disposal, explain why recovery is technically and economically impossible and describe the measures planned to avoid or reduce any impact on the environment.

1	Waste should be recovered, unless it is technically or economically impossible to do so.
2	Where waste must be disposed of, unless agreed with the Regulator to be inappropriate, the Operator should provide a detailed assessment identifying the best environmental options for waste disposal. For existing activities, this may be carried out as an improvement condition to a timescale to be approved by the Regulator.
3	Waste batch materials arising from materials handling and storage should be recycled to the process whenever possible. Waste from this source should be minimised using the techniques laid down in **Section 2.2.4** on page 13.
4	Dust collected from waste gas streams should be recycled to the process whenever practicable.
5	Dust deposited in the regenerators during a furnace campaign should be disposed of to an appropriately licensed site at the end of the campaign.
6	Melt not converted to product - whenever possible should be cooled and shattered in water and the resulting cullet used as raw material (exceptions: continuous filament glass fibre production where waste material (from process interruption) is fibrous; and drain glass).
7	Waste material from stone wool processes should be briquetted, or other means of dust control, and recycled.
8	Waste product – procedures to minimise waste generated from out of specification material, edge trims and so on should be implemented.

2.7 Energy

BAT for energy efficiency under the PPC Regulations will be satisfied provided the Operator meets the following conditions:

either

- the Operator meets the basic energy requirements in Section 2.7.1 and Section 2.7.2 below and is a participant to a Climate Change Agreement (CCA) or a Direct Participant Agreement (DPA) within the Emissions Trading Scheme.

or

- the Operator meets the basic energy requirements in Section 2.7.1 and Section 2.7.2 below and the further sector-specific energy requirements in Section 2.7.3 below.

Note that even where a Climate Change Agreement or Direct Participant Agreement is in place, this does not preclude the consideration of energy efficiency (including those identified in Section 2.7.3) as part of an integrated assessment of BAT where they impact on other emissions, e.g. where:

- the choice of fuel impacts upon emissions other than carbon, e.g. sulphur in fuel
- the minimisation of waste by waste-to-energy does not maximise energy efficiency, e.g. by Combined Heat and Power (CHP)
- the most energy-intensive abatement leads to the greatest reduction in other emissions

Further guidance is given in the guidance note **H2 Energy efficiency for IPPC**.

2.7.1 Basic energy requirements (1)

The requirements of this section are basic, low cost, energy standards that apply whether or not a CCA or DPA is in force for the installation.

Indicative BAT requirements for basic energy requirements (1):
Provide a breakdown of the energy consumption and generation by source and the associated environmenta emissions.

1 The Operator should provide annually the energy consumption information, shown in the table below, in terms of delivered energy and also, in the case of electricity, converted to primary energy consumption. For the public electricity supply, a conversion factor of 2.6 should be used. Where applicable, the use of factors derived from on-site heat and/or power generation, or from direct (non-grid) suppliers should be used. In the latter cases, the Operator should provide details of such factors. Where energy is exported from the installation, the Operator should also provide this information. In the application this information should be submitted in the inventory in the H1 software tool and should also supplement this with energy flow information (such as "Sankey" diagrams or energy balances) showing how the energy is used throughout the process.

2 The Operator should provide the following Specific Energy Consumption (SEC) information. Define and calculate the SEC of the activity (or activities) based on primary energy consumption for the products or raw material inputs that most closely match the main purpose or production capacity of the installation. Provide a comparison of SEC against any relevant benchmarks available for the sector.

3 The Operator should provide associated environmental emissions. This is dealt with in the Operator's response to the emissions inventory using the H1 software tool.

Table 2.1: Example breakdown of delivered and primary energy consumption

Energy source	Energy consumption		
	Delivered, MWh	Primary, MWh	% of total
Electricity*			
Gas			
Oil			
Other (Operator to specify)			

* specify source.

* specify source.

2.7.2 Basic energy requirements (2)

The requirements of this section are basic, low-cost, energy standards that apply whether or not a CCA or DPA is in force for the installation.

Indicative BAT requirements for basic energy requirements (2)
Describe the proposed measures for improvement of energy efficiency.

1 **Operating, maintenance and housekeeping measures** should be in place in the following areas. Indicative checklists of appropriate measures are provided in Appendix 2 of the guidance note **H2 Energy efficiency for IPPC**, where relevant:

- air conditioning, process refrigeration and cooling systems (leaks, seals, temperature control, evaporator/condenser maintenance)
- operation of motors and drives
- compressed gas systems (leaks, procedures for use)
- steam distribution systems (leaks, traps, insulation)
- space heating and hot-water systems
- lubrication to avoid high-friction losses
- boiler maintenance, e.g. optimising excess air
- other maintenance relevant to the activities within the installation

2 **Basic, low cost, physical techniques** should be in place to avoid gross inefficiencies. These should include insulation, containment methods, (such as seals and self-closing doors), and avoidance of unnecessary discharge of heated water or air (e.g. by fitting simple control systems such as timers and sensors).

3 **Energy-efficient building services** should be in place to deliver the requirements of the Building Services section of the guidance note **H2 Energy efficiency for IPPC**. For energy-intensive industries these issues may be of minor impact and should not distract effort from the major energy issues. They should nonetheless find a place in the programme, particularly where they constitute more than 5 percent of the total energy consumption.

4 **Energy management techniques** should be in place, according to the requirements of Section 2.3 noting, in particular, the need for monitoring of energy flows and targeting of areas for reductions.

5 **An energy efficiency plan** should be provided that:

- identifies all techniques relevant to the installation, including those listed above and in Section 2.7.3, that are applicable to the installation
- estimates the CO_2 savings that would be achieved by each measure over its lifetime
- and, in the case where the activities are NOT covered by a CCA or DPA; provides information on the equivalent annual costs of implementation of the technique, the costs per tonne of CO_2 saved and the priority for implementation. A procedure is given in the Energy Efficiency Guidance Note.

6 An example format of the energy efficiency plan is shown in **Table 2.2**.

Table 2.2: Example format for energy efficiency plan

ALL APPLICANTS			ONLY APPLICANTS WITHOUT CCA		
Energy efficiency measure	CO2 savings (tonnes)		Equivalent Annual Cost (EAC) £k	EAC/CO2 saved £/tonne	Date for implementation
	Annual	lifetime			

Refer to Energy Efficiency Guidance Note for appraisal methodology. Where other appraisal methodologies have been used, state the method, and provide evidence that appropriate discount rates, asset life and expenditure (£/t) criteria have been employed.

The energy efficiency plan is required to ensure that the Operator has considered all relevant techniques. However, where a CCA or DPA is in place the Regulator will only enforce implementation of those measures in categories 1-3 above.

2.7.3 Further energy-efficiency requirements

Where there is no CCA or DPA in place, the operator should demonstrate the degree to which the further energy-efficiency measures identified in the implementation plan, including those below, have been taken into consideration and justify where they have not.

Indicative BAT requirements for further energy efficiency
Climate Change Agreement for Trading Agreement.

1 The following techniques should be implemented where they are judged to be BAT based on a cost/ benefit appraisal according to the methodology provided in Appendix 4 of the guidance note **H2 Energy efficiency for IPPC**.

Energy-efficiency techniques

Energy–efficiency techniques

1 Within IPPC it is valid to consider both the emission of direct (heat and emissions from on-site generation) and indirect (emissions from a remote power station) pollution when considering options for energy efficiency. The techniques will be largely sector-specific, and further information will be found in both the existing sector guidance and in the IPPC Energy Efficiency Guidance Note (Reference 13), but the following may be applicable in many sectors:

- heat recovery from different parts of the processes;
- high–efficiency dewatering techniques to minimise drying energy;
- minimisation of water use and closed circulating water systems;
- good insulation;
- Cont.
- plant layout to reduce pumping distances;
- phase optimisation of electronic control motors;
- using spent cooling water (which is raised in temperature) in order to recover the heat;
- optimised efficiency measures for combustion plant such as air/feedwater preheating, excess air and the like;
- continuous processing instead of batch processes.

Energy supply techniques

2 The following techniques should be considered:

- use of Combined Heat and Power (CHP)
- recovery of energy from waste
- use of less polluting fuels

3 The Operator should provide justification that the proposed or current situation represents BAT, irrespective of whether a CCA or Trading Agreement is in place, where there are other BAT considerations involved, such as:

- the choice of fuel impacts upon emissions other than carbon, for example, sulphur in fuel
- where the potential minimisation of waste emissions by recovery of energy from waste conflicts with energy efficiency requirements

4 Where there is an on-site combustion plant other guidance is also relevant. For plants greater than 50MW, Operators should consult the IPC guidance on power generation (reference IPC S2 1.01 Combustion Processes: Large boilers and furnaces 50MW(th) and over and supplement IPC S3 1.01 Combustion Processes). Operators of plant of 20-50MW should consult the Local Authority Air Pollution Control guidance. On IPPC installations this guidance will be generally applicable to plant under 20MW also. For incineration plant S2.5.01 Waste Incineration should be consulted (available from the **EA website**).

2.8 Accidents

This section covers accidents and their consequences. It is not limited to major accidents but includes spills and abnormal operation.

Some installations will also be subject to the Control of Major Accident Hazards Regulations 1999 (COMAH) (see **Appendix 2** for equivalent legislation in Scotland and Northern Ireland). IPPC and COMAH sometimes overlap and some systems and information for both regimes may be interchangeable.

The COMAH regime applies to major hazards. For accidents covered by COMAH, refer to any reports already held by the Regulator. However, the accident provisions under IPPC may fall beneath the threshold for major accident classification under COMAH, so Operators also need to consider smaller accidents and abnormal operation as well. Guidance (see the **COMAH guides**), prepared in support of the COMAH Regulations may also help IPPC Operators (whether or not they are covered by the COMAH regime), in considering ways to reduce the risks and consequences of accidents.

General management requirements are covered in Section 2.1. For accident management, there are three particular components:

- identification of the hazards posed by the installation/activity
- assessment of the risks (hazard x probability) of accidents and their possible consequences
- implementation of measures to reduce the risks of accidents, and contingency plans for any accidents that do occur

Indicative BAT requirements for accidents and abnormal operations (Sheet 1 of 3) Describe your documented system that you propose to be used to identify, assess and minimise the environmental risks and hazards of accidents and their consequences.	
1	A structured accident management plan should be submitted to the Regulator that should:
2	Identify the hazards to the environment posed by the installation. Particular areas to consider may include, but should not be limited to, the following: • transfer of substances (for example, loading or unloading from or to vessels) • overfilling of vessels • failure of plant and/or equipment (for example, over-pressure of vessels and pipework, blocked drains) • failure of containment (such as bund and/or overfilling of drainage sumps) • failure to contain firewaters • making the wrong connections in drains or other systems • preventing incompatible substances coming into contact • unwanted reactions and/or runaway reactions • emission of an effluent before adequate checking of its composition has taken place • steam main issues • vandalism

Indicative BAT requirements for accidents and abnormal operations (Sheet 2 of 3)
Describe your documented system that you propose to be used to identify, assess and minimise the environmental risks and hazards of accidents and their consequences.

3 **assesses the risks**. Having identified the hazards, the process of assessing the risks should address six basic questions:

- how likely are they to occur? (source frequency)
- what gets out and how much? (risk evaluation of the event)
- where does it end up? (predictions for the emission – what are the pathways and receptors?)
- what are the consequences? (consequence assessment – the effects on the receptors)
- what are the overall risks? (determination of the overall risk and its significance to the environment)
- what can prevent or reduce the risk? (risk management – measures to prevent accidents and/or reduce their environmental consequences)

4 The depth and type of assessment will depend on the characteristics of the installation and its location. The main factors to take into account are:

- the scale and nature of the accident hazard presented by the installation and the activities
- the risks to areas of population and the environment (receptors)
- the nature of the installation and complexity of the activities and the relative difficulty in deciding and justifying the adequacy of the risk-control techniques

5 **identify the techniques necessary to reduce the risks.** The following techniques are relevant to most installations:

- an inventory should be maintained of substances, present or likely to be present, which could have environmental consequences if they escape. Do not forget that many apparently innocuous substances can be environmentally damaging if they escape (for example, a tanker of milk spilled into a watercourse could destroy its ecosystem). The Permit will require the Regulator to be notified of any changes to the inventory
- procedures should be in place for checking raw materials and wastes to ensure compatibility with other substances with which they may accidentally come into contact
- adequate storage arrangements for raw materials, products and wastes should be provided
- to ensure that control is maintained in emergency situations, consideration should be given to process design alarms, trips and other control aspects, for example, automatic systems based on microprocessor control and passing valve control, tank level readings such as ultrasonic gauges, high-level warnings and process interlocks and process parameters
- preventative techniques, such as suitable barriers to prevent damage to equipment from the movement of vehicles, should be included as appropriate
- appropriate containment should be provided, for example, bunds and catchpots, building containment
- techniques and procedures should be implemented to prevent overfilling of storage tanks (liquid or powder), for example, level measurement, independent high-level alarms, high-level cut-off, and batch metering
- where the installation is situated in a floodplain, consideration should be given to techniques which will minimise the risk that flooding may either cause a pollution incident or make one worse
- installation security systems to prevent unauthorised access should be provided as appropriate and should include maintenance arrangements where necessary
- there should be an installation log/diary to record all incidents, near-misses, changes to procedures, abnormal events and findings of maintenance inspections

Indicative BAT requirements for accidents and abnormal operations (Sheet 3 of 3)
Describe your documented system that you propose to be used to identify, assess and minimise the environmental risks and hazards of accidents and their consequences.

- procedures should be established to identify, respond to and learn from such incidents
- roles and responsibilities of personnel involved in accident management identified
- clear guidance should be available on how each accident scenario should be managed, for example, containment or dispersion, to extinguish fires or let them burn
- procedures should be in place to avoid incidents occurring as a result of poor communication among operations staff during shift changes and maintenance or other engineering work
- safe shutdown procedures should be in place
- communication routes should be established with relevant authorities and emergency services both before and in the event of an accident. Post-accident procedures should include the assessment of harm caused and steps needed to redress this
- appropriate control techniques should be in place to limit the consequences of an accident, such as oil spillage equipment, isolation of drains, alerting of relevant authorities and evacuation procedures
- personnel training requirements should be identified and provided
- the systems for the prevention of fugitive emissions are generally relevant (**Section 2.2.4** on page 60 and **Section 2.2.5** on page 61) and in addition, for drainage systems:
  - procedures should be in place to ensure that the composition of the contents of a bund sump, or sump connected to a drainage system, are checked before treatment or disposal
  - drainage sumps should be equipped with a high-level alarm or sensor with automatic pump to storage (not to discharge)
  - there should be a system in place to ensure that sump levels are kept to a minimum at all times
  - high-level alarms and the like should not be routinely used as the primary method of level control
- adequate redundancy or standby plant should be provided with maintenance and testing to the same standards as the main plant
- process waters, site drainage waters, emergency firewater, chemically contaminated waters and spillages of chemicals should, where appropriate, be contained and, where necessary, routed to the effluent system, with provision to contain surges and storm-water flows, and treated before emission to controlled waters or sewer. Sufficient storage should be provided to ensure that this could be achieved. There should also be spill contingency procedures to minimise the risk of accidental emission of raw materials, products and waste materials and to prevent their entry into water. Any emergency firewater collection system should also take account of the additional firewater flows or fire-fighting foams. Emergency storage lagoons may be needed to prevent contaminated firewater reaching controlled waters (see the **Releases to water references**)
- consideration should be given to the possibility of containment or abatement for accidental emissions from vents and safety relief valves/bursting discs. Where this may be inadvisable on safety grounds, attention should be focused on reducing the probability of the emission

2.9 Noise

The level of detail supplied should be in keeping with the risk of causing noise-related annoyance at sensitive receptors.

Where an installation poses no risk of noise-related environmental impact because the activities undertaken are inherently quiet, this should be justified and no further information relating to noise need normally be supplied. It should, however, be remembered that there can still be an underlying level of annoyance without complaints being made.

Where noise issues are likely to be relevant, the Operator will be required, in the Application, to provide information on the following: (for more details see **H3 Part 1 Noise**)

- the main sources of noise and vibration that will fall within the IPPC installation and also on Infrequent sources of noise and vibration
- the nearest noise-sensitive sites
- conditions/limits imposed under other regimes
- the local noise environment
- any environmental noise measurement surveys, modelling or any other noise measurements
- any specific local issues and proposals for improvements.

Within this section “noise” should be taken to refer to “noise and/or vibration” as appropriate, detectable beyond the site boundary.

The PPC Regulations require installations to be operated in such a way that “all the appropriate preventative measures are taken against pollution, in particular through the application of BAT”. The definition of pollution includes “emissions that may be harmful to human health or the quality of the environment, cause offence to human senses or impair or interfere with amenities and other legitimate uses of the environment”. BAT is therefore likely to be similar, in practice, to the requirements of the statutory nuisance legislation, which requires the use of “best practicable means” to prevent or minimise noise nuisance. It is understood that raw material handling can generate noise where glass is being recycled or broken up. It is suggested that consideration be given to the use of sonic booths or sound proofing to control the generation of noise where such activities are being carried out.

In the case of noise, “offence to any human senses” can normally be judged by the likelihood of complaints, but in some cases it may be possible to reduce noise emissions still further at reasonable costs, and this may exceptionally therefore be BAT for noise emissions.

For advice on how noise and/or vibration related limits and conditions will be determined see **Assessment and Control of Environmental Noise and Vibration from Industrial Activities**,

Noise arises from a range of activities including: fans, motors, material handling; vehicle movements, engineering activities, and compressed air systems. In general, any problems are readily dealt with by good design and where necessary, noise abatement techniques. Certain pollution control techniques can also require noise control, which can add to the overall cost of the technique.

Indicative BAT requirements for monitoring
Describe the proposed measures for monitoring emissions, including any environmental monitoring, and the frequency, measurement methodology and evaluation procedure proposed.

1 The Operator should employ basic good practice measures for the control of noise, including adequate maintenance of any parts of plant or equipment whose deterioration may give rise to increases in noise (for example, maintenance of bearings, air handling plant, the building fabric as well as specific noise attenuation measures associated with plant, equipment or machinery).

2 The Operator should also employ such other noise control techniques to ensure that the noise from the installation does not give rise to reasonable cause for annoyance, in the view of the Regulator and, in particular, should justify where either Rating Levels ($L_{Aeq,T}$) from the installation exceed the numerical value of the Background Sound Level ($L_{A90,T}$).

3 Further justification will be required should the resulting field rating level ($L_{AR,TR}$) exceed 50 DB by day and a facade rating level exceed 45 DB by night, with day being defined as 07:00 to 23:00 and night 23:00 to 07:00.

4 In some circumstances "creeping background" may be an issue. Where this has been identified in pre application discussions or in previous discussions with the local authority, the Operator should employ such noise control techniques as are considered appropriate to minimise problems to an acceptable level within the BAT criteria.

5 Noise surveys, measurement, investigation (which can involve detailed assessment of sound power levels for individual items of plant) or modelling may be necessary for either new or existing installations depending upon the potential for noise problems. Operators may have a noise management plan as part of their management system.

2.10 Monitoring

This section describes monitoring and reporting requirements for emissions to all environmental media. Guidance is provided for selecting the appropriate monitoring methodologies, frequency of monitoring, compliance-assessment criteria and environmental monitoring.

Indicative BAT requirements for monitoring (Sheet 1 of 5)
Describe the proposed measures for monitoring emissions, including any environmental monitoring, and the frequency, measurement methodology and evaluation procedure proposed.

Emissions monitoring

1 The following monitoring parameters and frequency are normally appropriate in this sector. Generally, monitoring should be undertaken during commissioning, start-up, normal operation and shut-down unless the Regulator agrees that it would be inappropriate to do so.

2 Continuous monitoring (or at least sampling in the case of water) and recording are likely to be required under the following circumstances:
- Where the potential environmental impact is significant or the concentration of substance varies widely.
- Where a substance is abated continuous monitoring of the substance is required to show the performance of the abatement plant. For example continuous monitoring of dust is needed after a fabric filter to show the effectiveness of the filter and indicate when maintenance is needed, or sampling BOD from an effluent treatment plant.
- Where other control measures are required to achieve satisfactory levels of emission (e.g. material selection).

3 Where effective surrogates are available, they may be used to minimise monitoring costs.

4 Where monitoring shows that substances are not emitted in significant quantities, it may be possible to reduce monitoring frequency.

5 For analysis techniques and compliance criteria see **Appendix 1**.

Monitoring and reporting of emissions to water and sewer

6 The Operator should also have a fuller analysis carried out covering a broad spectrum of substances to establish that all relevant substances have been taken into account when setting the release limits. This should cover the substances listed in Schedule 5 of the Regulations unless it is agreed with the Regulator that they are not applicable. The need to repeat such a test will depend upon the potential variability in the process and, for example, the potential for contamination of raw materials. Where there is such potential, tests may be appropriate.

7 Any substances found to be of concern, or any other individual substances to which the local environment may be susceptible and upon which the operations may impact, should also be monitored more regularly. This would particularly apply to the common pesticides and heavy metals. Using composite samples is the technique most likely to be appropriate where the concentration does not vary excessively.

8 In some sectors there may be releases of substances that are more difficult to measure and whose capacity for harm is uncertain, particularly when combined with other substances. "Whole effluent toxicity" monitoring techniques can therefore be appropriate to provide direct measurements of harm, for example, direct toxicity assessment. See **Section 2.2.2** on page 54.

Monitoring and reporting of emissions to air

Indicative BAT requirements for monitoring (Sheet 2 of 5)
Describe the proposed measures for monitoring emissions, including any environmental monitoring, and the frequency, measurement methodology and evaluation procedure proposed.

9 There are a wide variety of possible releases to air, and specific information may be found in the existing sector guidance. In general:

- Continuous monitoring would be expected where the releases are significant and where it is needed to maintain good control.
- Gas flow should be measured, or otherwise determined, to relate concentrations to mass releases.
- To relate measurements to reference conditions, the following will need to be determined and recorded:
  - Temperature and pressure.
  - Oxygen, where the emissions are the result of a combustion process.
  - Water vapour content, where the emissions are the result of a combustion process or any other wet gas stream. It would not be needed where the water vapour content is unable to exceed 3% v/v or where the measuring technique measures the other pollutants without removing the water.

10 Where appropriate, periodic visual and olfactory assessment of releases should be undertaken to ensure that all final releases to air should be essentially colourless, free from persistent trailing mist or fume and free from droplets.

Monitoring and reporting of waste emissions

11 For waste emissions, the following should be monitored and recorded:

- the physical and chemical composition of the waste
- its hazard characteristics
- handling precautions and substances with which it cannot be mixed
- where waste is disposed of directly to land, for example, sludge spreading or an on-site landfill, a programme of monitoring should be established that takes into account the materials, potential contaminants and potential pathways from the land to groundwater surface water or the food chain

Environmental monitoring (beyond the installation)

12 The Operator should consider the need for environmental monitoring to assess the effects of emissions to controlled water, groundwater, air or land, or emissions of noise or odour.

13 Environmental monitoring may be required, for example, when:

- there are vulnerable receptors
- the emissions are a significant contributor to an Environmental Quality Standard (EQS) that may be at risk

Indicative BAT requirements for monitoring (Sheet 3 of 5)
Describe the proposed measures for monitoring emissions, including any environmental monitoring, and the frequency, measurement methodology and evaluation procedure proposed.

- the Operator is looking for departures from standards based on lack of effect on the environment;
- to validate modelling work.

14 The need should be considered for:

- groundwater, where it should be designed to characterise both quality and flow and take into account short- and long-term variations in both. Monitoring will need to take place both up-gradient and down-gradient of the site
- surface water, where consideration will be needed for sampling, analysis and reporting for upstream and downstream quality of the controlled water
- air, including odour
- land contamination, including vegetation, and agricultural products
- assessment of health impacts
- noise

15 Where environmental monitoring is needed, the following should be considered in drawing up proposals:

- determinands to be monitored, standard reference methods, sampling protocols
- monitoring strategy, selection of monitoring points, optimisation of monitoring approach
- determination of background levels contributed by other sources
- uncertainty for the employed methodologies and the resultant overall uncertainty of measurement
- quality assurance (QA) and quality control (QC) protocols, equipment calibration and maintenance, sample storage and chain of custody/audit trail
- reporting procedures, data storage, interpretation and review of results, reporting format for the provision of information for the Regulation

16 Guidance on air quality monitoring strategies and methodologies can be found in **Monitoring Guidance**, for noise.

Monitoring of process variables

17 Some process variables may affect the environment and these should be identified and monitored as appropriate. Examples might be:

- raw materials monitoring for contaminants where contaminants are likely and there is inadequate supplier information (see **Section 2.4.1** on page 21)
- plant efficiency where it has an environmental relevance
- abatement equipment performance (e.g. bag filter pressure drop)
- energy consumption across the plant and at individual points-of-use in accordance with the energy plan. Frequency – normally continuous and recorded
- fresh water use across the activities and at individual points-of-use should be monitored as part of the water-efficiency plan (see **Section 2.4.3** on page 23). Frequency – continuous and recorded

Indicative BAT requirements for monitoring (Sheet 4 of 5)
Describe the proposed measures for monitoring emissions, including any environmental monitoring, and the frequency, measurement methodology and evaluation procedure proposed.

Monitoring standards (Standard Reference Methods)

Equipment standards

18 The Environment Agency has introduced its Monitoring Certification Scheme (MCERTS) to improve the quality of monitoring data and to ensure that the instrumentation and methodologies employed for monitoring are fit for purpose. Performance standards have been published for continuous emissions monitoring systems (CEMs), ambient air quality monitoring systems (CAMs) , chemical testing of soils and manual stack emissions monitoring. Other MCERTS standards are under development to cover portable emissions monitoring equipment, water monitoring instrumentation, data acquisition and Operators' own arrangements, such as installation, calibration and maintenance of monitoring equipment, position of sampling ports and provision of safe access for manual stack monitoring.

19 As far as possible, Operators should ensure their monitoring arrangements comply with the requirements of MCERTS where available, for example using certified instruments and equipment, and using a stack testing organisation accredited to MCERTS standards. Where the monitoring arrangements are not in accordance with MCERTS requirements, the Operator should provide justification and describe the monitoring provisions in detail. See **MCERTS approved equipment** for a listing of MCERTS equipment.

20 The following should be described in the application, indicating which monitoring provisions comply with MCERTS requirements or where other arrangements have been made:

- monitoring methods and procedures (selection of Standard Reference Methods)
- justification for continuous monitoring or spot sampling
- reference conditions and averaging periods
- measurement uncertainty of the proposed methods and the resultant overall uncertainty
- criteria for the assessment of non-compliance with Permit limits and details of monitoring strategy aimed at demonstration of compliance
- reporting procedures and data storage of monitoring results, record keeping and reporting intervals for the provision of information to the Regulator
- procedures for monitoring during start-up and shut-down and abnormal process conditions
- drift correction calibration intervals and methods
- the accreditation held by samplers and laboratories or details of the people used and the training/competencies

Sampling and analysis standards

21 The analytical methods given in **Appendix 1** should be used. In the event of other substances needing to be monitored, standards should be used in the following order of priority:

- Comité Européen de Normalisation (CEN)
- British Standards Institution (BSI)
- International Standardisation Organisation (ISO)
- United States Environmental Protection Agency (US EPA)
- American Society for Testing and Materials (ASTM)
- Deustches Institut für Normung (DIN)
- Verein Deustcher Ingenieure (VDI)
- Association Française de Normalisation (AFNOR)

Indicative BAT requirements for monitoring (Sheet 5 of 5)
Describe the proposed measures for monitoring emissions, including any environmental monitoring, and the frequency, measurement methodology and evaluation procedure proposed.

22 Further guidance on standards for monitoring gaseous releases relevant to IPC/IPPC is given in the **Monitoring Guidance**. A series of updated Guidance Notes covering this subject is being prepared. This guidance specifies manual methods of sampling and analysis that will also be suitable for calibration of continuous emission monitoring instruments. Further guidance relevant to water and waste is available from the publications of the Standing Committee of Analysts.

23 If in doubt the Operator should consult the Regulator.

Monitoring timescales

24 The Operator should complete any detailed studies required into monitoring needs as an improvement condition to a timescale to be agreed with the Regulator.

25 For existing activities, the above techniques should be programmed for implementation within the same timescale.

Table 2.3: Monitoring of process elements released to controlled waters should include at least:

Parameter	Monitoring frequency
Flow rate	Continuous and integrated daily flow rate
pH	Continuous
Temperature	Continuous
COD/BOD	Flow weighted sample or composite samples, weekly analysis, reported as flow weighted monthly averages
Turbidity	Continuous
Oil	Weekly analysis

in the Table indicates the parameters considered a priority for continuous monitoring.

2.11 Closure

The PPC Regulations require an Applicant to submit a site report, describing the condition of the site, as part of the application. Guidance on this is in Annex C of the Guide for Applicants (see **IPPC Part A(1) Installations: Guide for Applicants**) or Guidance for SEPA Staff On Land and Groundwater Considerations for PPC Part A Installations (Scotland) (see **PPC Part A Installtions: Guide for Applicants (Scotland)**).

Indicative BAT requirements for closure
Describe the proposed measures, upon definitive cessation of activities, to avoid any pollution risk and return the site of operation to a satisfactory state (including where appropriate, measures relating to the design and construction oft he installation.

1 **Operations during the IPPC Permit**
Operations during the life of the IPPC Permit should not lead to any deterioration of the site if the requirements of the other sections of this and the specific-sector notes are adhered to. Should any instances arise which have, or might have, impacted on the state of the site, the Operator should record them along with any further investigation or ameliorating work carried out. This will ensure that there is a coherent record of the state of the site throughout the period of the IPPC Permit. This is as important for the protection of the Operator as it is for the protection of the environment. Any changes to this record should be submitted to the Regulator.

2 **Steps to be taken at the design-and-build stage of the activities**
Care should be taken at the design stage to minimise risks during decommissioning. For existing installations, where potential problems are identified, a programme of improvements should be put in place to a timescale agreed with the Regulator. Designs should ensure that:

- underground tanks and pipework are avoided where possible (unless protected by secondary containment or a suitable monitoring programme)
- there is provision for the draining and clean-out of vessels and pipework prior to dismantling
- lagoons and landfills are designed with a view to their eventual clean-up or surrender
- insulation is provided that is readily dismantled without dust or hazard
- materials used are recyclable (having regard for operational or other environmental objectives)

3 **The site-closure plan**
A site closure plan should be maintained to demonstrate that, in its current state, the installation can be decommissioned to avoid any pollution risk and return the site of operation to a satisfactory state. The plan should be kept updated as material changes occur. Common sense should be used in the level of detail, since the circumstances at closure will affect the final plans. However, even at an early stage, the closure plan should include:

- either the removal or the flushing out of pipelines and vessels where appropriate and their complete emptying of any potentially harmful contents
- plans of all underground pipes and vessels
- the method and resource necessary for the clearing of lagoons
- the method of ensuring that any on-site landfills can meet the equivalent of surrender conditions
- the removal of asbestos or other potentially harmful materials unless agreed that it is reasonable to leave such liabilities to future owners
- methods of dismantling buildings and other structures, see **Ref 1** which gives guidance on the protection of surface and groundwater at construction and demolition-sites
- testing of the soil to ascertain the degree of any pollution caused by the activities and the need for any remediation to return the site to a satisfactory state as defined by the initial site report

4 For existing activities, the Operator should complete any detailed studies (see Application item Error! Reference source not found. above), and submit the site-closure plan as an improvement condition to a timescale to be agreed with the Regulator but in any case within the timescale given in **Section 1.1** on page 1 (Note that radioactive sources are not covered by this legislation, but decommissioning plans should be co-ordinated with responsibilities under the Radioactive Substances Act 1993.)

2.12 Installation issues

In some cases it is possible that actions that benefit the environmental performance of the overall installation will increase the emissions from one Permit-holder's activities. For example, taking treated effluent as a raw water supply will probably slightly increase emissions from that activity, but could dramatically cut the total emissions from the whole installation.

Where you are not the only Operator of the installation, describe the proposed techniques and measures (including those to be taken jointly by yourself and other Operators) for ensuring the satisfactory operation of the whole installation

Indicative BAT requirements for installation wide issues
Where you are not the only Operator of the installation, describe the proposed techniques and measures (including those to be taken by yourself and other Operators) for ensuring the satisfactory operation of the whole installation.

1 The Operator should consider possibilities for minimising environmental impact to the environment as a whole, by operating together with other Permit holders. Possibilities include:
- Communication procedures between the various Permit-holders; in particular those needed to ensure that the risk of environmental incidents is minimised.
- Benefiting from the economies of scale to justify the installation of a CHP plant.
- The combining of combustible wastes to justify a combined waste-to-energy/CHP plant.
- The waste from one activity being a possible feedstock for another.
- The treated effluent from one activity being of adequate quality to be the raw water feed for another activity.
- The combining of effluent to justify a combined or upgraded effluent-treatment plant.
- The avoidance of accidents from one activity that may have a detrimental knock-on effect on the neighbouring activity.
- Land contamination from one activity affecting another – or the possibility that one Operator owns the land on which the other is situated.

3 Emission benchmarks

3.1 Emissions inventory

The Regulations require the Applicant to describe the nature, quantities and sources of foreseeable emissions into each medium. This will be done by completing the inventory of emission and consumption in the H1 software tool. The information required is as follows.

Provide a table of significant emissions of substances (except noise, vibration, odour and heat which are covered in their respective sections) that will result from the proposals and should include, preferably in order of significance:

- substance (where the substance is a mixture, for example, VOCs or COD, separate identification of the main constituents or inclusion of an improvement proposal to identify them)
- source, including height, location and efflux velocity
- media to which it is released
- any relevant EQS or other obligations
- benchmark
- proposed emissions normal/max expressed, as appropriate for:
  - mass/unit time
  - concentration
  - annual mass emissions
- statistical basis (average, percentile etc.)
- notes covering the Operators confidence in his ability to meet the benchmark values
- if intermittent, the appropriate frequencies
- plant loads at which the data is applicable
- whether measured or calculated (the method of calculation should be provided)

The response should clearly state whether the emissions are current emission rates or those planned following improvements, and should cover emissions under both normal and abnormal conditions for:

- point-source emissions to surface water, groundwater and sewer
- waste emissions
- point-source emissions to air
- significant fugitive emissions to all media, identifying the proportion of each substance released that is due to fugitives rather than point-source releases
- abnormal emissions from emergency relief vents, flares and the like
- indirect and direct emission of carbon dioxide associated with energy consumed or generated

Emissions of carbon dioxide associated with energy use should be broken down by energy type and, in the case of electricity, by source, for example, public supply, direct supply or on-site generation. Where energy is generated on-site, or from a direct (non-public) supplier, the Operator should specify and use the appropriate factor. Standard factors for carbon dioxide emissions are provided in the guidance note **H2 Energy efficiency for IPPC**.

Where VOCs are released, the main chemical constituents of the emissions should be identified.

For waste, emissions relate to any wastes removed from the installation, or disposed of at the installation under the conditions of the Permit, for example, landfill. Each waste should have its composition determined and the amounts expressed in appropriate terms such as cubic metres or tonnes per month. This requirement applies equally to unavoidable by-products such as mill scale and scrap metal.

A suitable table on which to record this information is provided in the electronic version of this Guidance Note.

Indicative BAT requirements for emission benchmarks
Describe the nature, quantities and sources of foreseeable emissions into each medium (which will result from the techniques proposed in Section 2).

1	The Operator should compare the emissions with the benchmark values given in the remainder of this Section.
2	Where the benchmarks are not met, the Operator should revisit the responses made in Section 2 as appropriate and make proposals for improvements or justify not doing so as part of the BAT assessment.

3.2 Emission benchmarks

Introduction to emission benchmarks

Guidance is given below on release concentrations or mass release rates achievable for key substances using the best combination of techniques. These BAT-based benchmarks are not mandatory release limits and reference should be made to Section 1 and the Guide for Applicants regarding their use.

3.2.1 Emissions to air associated with the use of BAT

The emissions quoted below are daily averages based upon continuous monitoring during the period of operation. See **Section 3.2.6** on page 106 for the standard conditions that should be applied. Care should always be taken to convert benchmark and proposed releases to the same reference conditions for comparison. To convert measured values to reference conditions, see the **Monitoring Guidance** for more information. The benchmarks given do not take sampling, analytical errors, or uncertainties into account. These will be considered when setting an ELV for a Permit.

Limits in Permits may be set for mean or median values over long or short periods. The periods and limits selected should reflect:

- the manner in which the emission may impact upon the environment
- likely variations which will arise during operation within BAT
- possible failure modes and their consequences
- the capabilities of the monitoring and testing system employed

Where emissions are expressed in terms of concentrations and where continuous monitors are employed, it is recommended that limits are defined such that:

- not more than one calendar monthly average during any rolling twelve month period shall exceed the benchmark value by more than 10%
- not more than one half hour period during any rolling 24 hour period shall exceed the benchmark value by more than 50% (for the purpose of this limit half hourly periods commence on the hour and the half hour)

Where spot tests are employed:

- the half hour limit above shall be applied over the period of the test
- the mean of three consecutive tests taken during a calendar year shall not exceed the benchmark value by more than 10%

3.2.2 Emissions to water associated with the use of BAT

Wastewater treatment systems can maximise the removal of metals using sedimentation and possibly filtration. The reagents used for precipitation may be hydroxide, sulphide or a combination of both, depending on the mix of metals present. It is also practicable in many cases to re-use treated water.

Where automatic sampling systems are employed, limits may be defined such that:

- not more than 5% of samples shall exceed the benchmark value

Where spot samples are taken:

- no spot sample shall exceed the benchmark value by more than 50%

Table 3.1: Examples of emissions to water associated with the use of BAT

Substance	Benchmark release concentration, mg/litre
Total hydrocarbon oil	5 mg/litre
Suspended solids	20 mg/litre
Dissolved iron	10 mg/litre
Total chromium	0.2 mg/litre (0.5mg/litre where stainless steel is processed).
Dissolved Nickel	0.2 mg/litre (0.5mg/litre where stainless steel is processed).
Zinc	2 mg/litre

3.2.3 Standards and obligations

In addition to meeting the requirements of BAT, there are other national and international standards and obligations that must either be safeguarded through the IPPC Permit or, at least, taken into account in setting Permit conditions. This is particularly the case for any EC based EQSs.

EC-based EQ standards

IPPC: A Practical Guide explains how these should be taken into account and contains an annex listing the relevant standards. (See **Appendix 2** for equivalent legislation in Scotland and Northern Ireland). They can be summarised as follows.

Air quality

- Statutory Instrument 1989 No 317, Clean Air, The Air Quality Standards Regulations 1989 gives limit values in air for nitrogen dioxide (any emission from the process should not result in a breach of this standard beyond the site boundary), sulphur dioxide and suspended particulates.
- Environmental Protection, The Air Quality Regulations 1997.
- Statutory Instrument 2000 No.928, Air Quality (England) Regulations 2000 gives air quality objectives to be achieved by:
  – 2005 for nitrogen dioxide
  – 2004 for SO2 and PM10
  – 2003 for CO, 1,3 butadiene and benzene
  – in two stages for lead by 2004 and 2008 respectively

Water quality

- Directive 76/464/EEC on Pollution Caused by Dangerous Substances Discharged to Water contains two lists of substances. List I relates to the most dangerous, and standards are set out in various daughter Directives. List II substances must also be controlled. Annual mean concentration limits for receiving waters for List I substances can be found in SI 1989/2286 and SI 1992/337 the Surface Water (Dangerous Substances Classification) Regulations. Values for List II substances are contained in SI 1997/2560 and SI 1998/389. Daughter Directives cover EQS values for mercury, cadmium, hexachlorocyclohexane, DDT, carbon tetrachloride, pentachlorophenol, aldrin, dieldrin, endrin, isodrin, hexachlorobenzene, hexachlorobutadiene, chloroform,1,2-dichloroethane, trichloroethane, perchloroethane and trichlorobenzene.
- Other waters with specific uses have water-quality concentration limits for certain substances. These are covered by the following Regulations:
  – SI 1991/1597 Bathing Waters (Classification) Regulations
  – SI 1992/1331 and Direction 1997 Surface Waters (Fishlife) (Classification) Regulations
  – SI 1997/1332 Surface Waters (Shellfish) (Classification) Regulations
  – SI 1996/3001 The Surface Waters (Abstraction and Drinking Water) (Classification) Regulations

Future likely changes include:

- Some air-quality and water-quality standards may be replaced by new ones in the near future.
- The Solvents Directive on the limitation of emissions of VOCs due to the use of organic solvents in certain activities and installations.

Other standards and obligations

Those most frequently applicable to most sectors are:

- Hazardous Waste Incineration Directive
- Waste Incineration Directive.
- Large Combustion Plant Directive.
- Reducing Emissions of VOCs and Levels of Ground Level Ozone: a UK Strategy (published by the Department of the Environment in October 1993. It sets out how the Government expects to meet its obligations under the UNECE VOCs Protocol to reduce its emissions by 30% (based on 1988 levels) by 1999, including the reductions projected for the major industrial sectors).
- Water Quality Objectives – assigned water quality objectives to inland rivers and water courses (ref. Surface (Rivers Ecosystem) Classification).
- The UNECE convention on long-range transboundary air pollution (negotiations are now underway which could lead to a requirement further to reduce emissions of NO_x and VOCs. A requirement to further reduce SO_2 emissions from all sources has been agreed. The second Sulphur protocol (Oslo, 1994) obliges the UK to reduce SO_2 emissions by 80% (based on 1980 levels) by 2010).
- The Montreal Protocol.
- The Habitats Directive (see **Section 4.3** on page 120).
- Sulphur Content of Certain Liquid Fuels Directive 1999/32/EC (from 1 January 2003, the sulphur content of heavy fuel oil must not exceed 1% except when it is burnt in plants fitted with SO_2 abatement equipment. Sulphur levels in gas oil must not exceed 0.2% from 1 July 2000, and 0.1% from the start of 2008.)

3.2.4 Units for benchmarks and setting limits in permits

Releases can be expressed in terms of:

- **"concentration"** (for example mg/l or mg/m^3), which is a useful day-to-day measure of the effectiveness of any abatement plant and is usually measurable and enforceable The total flow must be measured/controlled as well
- **"specific mass release"** (for example, kg/ product or input or other appropriate parameter), which is a measure of the overall environmental performance of the plant (including the abatement plant) compared with similar plants elsewhere
- **"absolute mass release"** (for example, kg/hr, t/yr), which relates directly to environmental impact

When endeavouring to reduce the environmental impact of an installation, its performance against each of these levels should be considered, as appropriate to the circumstances, in assessing where improvements can best be made.

When setting limits in Permits, the most appropriate measure will depend on the purpose of the limit. It may also be appropriate to use surrogate parameters, which reflect optimum environmental performance of plant as the routine measurement, supported by less frequent check-analyses on the final concentration. Examples of surrogate measures would be the continuous measurement of conductivity (after ion-exchange treatment) or total carbon (before a guard-column in activated carbon treatment) to indicate when regeneration or replacement is required.

The emission level figures given in this chapter are based on average figures, not on maximum, short-term peak values, which could be expected to be higher. The emission levels given are based on a typical averaging period of not less than 30 minutes and not greater than 24 hours.

3.2.5 Statistical basis for benchmarks and limits in permits

Conditions in Permits can be set with percentile, mean or median values over annual, monthly or daily periods, which reflect probable variation in performance. In addition, absolute maxima can be set.

Where there are known failure modes, which will occur even when applying BAT, limits in Permits may be specifically disapplied, but with commensurate requirements to notify the Regulator and to take specific remedial action.

For water: UK benchmarks or limits are most frequently 95 percentile concentrations or absolute concentrations, (with flow limited on a daily average or maximum basis).

For air: benchmarks or limits are most frequently expressed as daily averages or, typically 95 percent of hourly averages.

3.2.6 Reference conditions for releases to air

The reference conditions of substances in releases to air from point-sources are:

- temperature 0 °C (273K)
- pressure 101.3 kPa
- no correction for water vapour or oxygen

To convert measured values to reference conditions, see the **Monitoring Guidance** for more information.

4 Impact

4.1 Impact assessment

The Operator should assess that the emissions resulting from the proposals for the activities/installation will provide a high level of protection for the environment as a whole, in particular having regard to EQS etc, revisiting the techniques in Section 2 as necessary. The use of **IPPC Environmental Assessments for BAT**, and the **IPPC Environmental Assessments for BAT software tool**, and the other tools on the Application CD, will lead the Applicant through the process.

The depth to which the impact assessment should go should be discussed with the Regulator. For some low risk sites the requirements may be reduced.

Indicative BAT requirements for impact assessment
Provide an assessment of the potential significant environmental effects (including trans-boundary effects) of the foreseeable emissions.

1 Provide a description, including maps as appropriate, of the receiving environment to identify the receptors of pollution. The extent of the area may cover the local, national and international (for example, transboundary effects) environment as appropriate.

2 Identify important receptors, which may include: areas of human population including noise or odour-sensitive areas, flora and fauna (that is, Habitat Directive sites, special areas of conservation, Sites of Special Scientific Interest (SSSI or in Northern Ireland ASSI) or other sensitive areas), soil, water, that is groundwater (water below the surface of the ground in the saturation zone and in direct contact with the ground and subsoil) and watercourses (for example, ditches, streams, brooks, rivers), air, including the upper atmosphere, landscape, material assets and the cultural heritage.

3 Identify the pathways by which the receptors will be exposed (where not self-evident).

4 Carry out an assessment of the potential impact of the total emissions from the activities on these receptors. **IPPC Environmental Assessments for BAT** provides a systematic method for doing this and will also identify where modelling needs to be carried out, to air or water, to improve the understanding of the dispersion of the emissions. The assessment will include comparison (see **IPPC: A Practical Guide**) with:
- community EQS levels
- other statutory obligations
- non-statutory obligations
- environmental action levels (EALs) and the other environmental and regulatory parameters defined in **IPPC Environmental Assessments for BAT**

5 In particular it will be necessary to demonstrate that an appropriate assessment of vent and chimney heights has been made to ensure that there is adequate dispersion of the minimised emission(s) to avoid exceeding local ground-level pollution thresholds and limit national and transboundary pollution impacts, based on the most sensitive receptor, be it human health, soil or terrestrial ecosystems.

6 Where appropriate, the Operator should also recognise the chimney or vent as an emergency emission point and understand the likely behaviour. Process upsets or equipment failure giving rise to abnormally high emission levels over short periods should be assessed. Even if the Applicant can demonstrate a very low probability of occurrence, the height of the chimney or vent should nevertheless be set to avoid any significant risk to health. The impact of fugitive emissions can also be assessed in many cases.

7 Consider whether the responses to Sections 2 and 3 and this assessment adequately demonstrate that the necessary measures have been taken against pollution, in particular by the application of BAT, and that no significant pollution will be caused. Where there is uncertainty about this, the measures in Section 2 should be revisited as appropriate to make further improvements.

8 Where the same pollutants are being emitted by more than one permitted activity on the installation, the Operator should assess the impact both with and without the neighbouring emissions.

4.2 Waste Management Licensing Regulations

Indicative BAT requirements for waste management licensing regulations
Explain how the information provided in other parts of the application also demonstrates that the requirements of the relevant objectives of the Waste Management Licensing Regulations 1994 have been addressed, or provide additional information in this respect.

1 In relation to activities involving the disposal or recovery of waste, the Regulators are required to exercise their functions for the purpose of achieving the relevant objectives as set out in Schedule 4 of the Waste Management Licensing Regulations 1994. (For the equivalent Regulations in Scotland and Northern Ireland, see **Appendix 2**.)

2 The relevant objectives, contained in paragraph 4, Schedule 4 of the Waste Management Licensing Regulations 1994 (SI 1994/1056 as amended) are extensive, but will only require attention for activities that involve the recovery or disposal of waste. Paragraph 4 (1) is as follows:

- ensuring the waste is recovered or disposed of without endangering human health and without using process or methods which could harm the environment and in particular without:
  - risk to water, air, soil, plants or animals or
  - causing nuisance through noise or odours or
  - adversely affecting the countryside or places of special interest
- implementing, as far as material, any plan made under the plan-making provisions

3 The application of BAT is likely to already address risks to water, air, soil, plants or animals, odour nuisance and some aspects of effects on the countryside. It will, however, be necessary for the Operator briefly to consider each of these objectives individually and provide a comment on how they are being addressed by your proposals. It is also necessary to ensure that any places of special concern that could be affected, such as SSSIs, are identified and commented upon although, again, these may have been addressed in your assessment for BAT, in which case a cross-reference may suffice.

4 Operators should identify any development plans made by the local planning authority, including any waste local plan, and comment on the extent to which the proposals accord with the contents of any such plan (see **Section 2.6** on page 76).

4.3 The Habitats Regulations

Indicative BAT requirements for the habitats regulations
Provide an assessment of whether the installation is likely to have a significant effect on a European site in the UK and, if it is, provide an assessment of the implications of the installation for that site, for the purpose of the Conservation (Natural Habitats etc.) Regulations 1994 (SI 1994/2716)

1 An application for an IPPC Permit will be regarded as a new plan or project for the purposes of the Habitats Regulations (for the equivalent Regulations in Scotland and Northern Ireland see **Appendix 2**). Therefore, Operators should provide an initial assessment of whether the installation is likely to have a significant effect on any European site in the UK (either alone or in combination with other relevant plans or projects) and, if so, an initial assessment of the implications of the installation for any such site. The application of BAT is likely to have gone some way towards addressing the potential impact of the installation on European sites and putting into place techniques to avoid any significant effects. The Operator should provide a description of how the BAT assessment has specifically taken these matters into account, bearing in mind the conservation objectives of any such site.

2 European sites are defined in Regulation 10 of the Habitats Regulations to include Special Areas of Conservation (SACs); sites of community importance (sites that have been selected as candidate SACs by member states and adopted by the European Commission, but which are not yet formally classified); and Special Protection Areas (SPAs). It is also Government policy (set out in PPG 9 on nature conservation) that potential SPAs and candidate SACs should be considered to be European sites for the purposes of Regulation 10.

3 Information on the location of European sites and their conservation objectives is available from:

- English Nature (01733 455000), **http://www.english-nature.org.uk**
- Countryside Council for Wales (01248 385620), **http://www.ccw.gov.uk**
- Scottish Natural Heritage (0131 447 4784), **http://www.snh.org.uk**
- Joint Nature Conservation Committee (01733 866852), **http://www.jncc.gov.uk**
- Environment and Heritage Service, Northern Ireland, **http://www.ehsni.gov.uk**

4 The Regulator will need to consider the Operator's initial assessment. If it concludes that the installation is likely to have a significant effect on a European site, then the Regulator will need to carry out an “appropriate assessment” of the implications of the installation in view of that site's conservation objectives. The Regulations impose a duty on the Regulator to carry out these assessments, so it cannot rely on the Operator's initial assessments. Therefore the Regulator must be provided with any relevant information upon which the Operator’s assessment is based.

5 Note that in many cases the impact of the Habitats Regulations will have been considered at the planning application stage, in which case the Regulator should be advised of the details.

References

For a full list of available Technical Guidance see Appendix A of the Guide for Applicants or visit the Environment Agency Website **http://www.environment-agency.gov.uk**. Many of the references below are being made available free of charge for viewing or download on the Website. The same information can also be accessed via the SEPA web site **http://www.sepa.org.uk**, or the NIEHS web site **www.ehsni.gov.uk**. Most titles will also be available in hard copy from The Stationery Office (TSO). Some existing titles are not yet available on the Website but can be obtained from TSO.

Ref 1 *IPPC Reference Document on Best Available Techniques* European Commission **http://eippcb.jrc.es**

Ref 2 *The Pollution Prevention and Control Act (1999)* (**www.hmso.gov.uk**).

Ref 3 *The Pollution Prevention and Control Regulations* (SI 2000 No. 1973) (**www.hmso.gov.uk**).

Ref 4 *IPPC: A Practical Guide* (for England and Wales) (or equivalents in Scotland and Northern Ireland) **www.defra.gov.uk/environment/ppc/ippcguide/index.htm**

Ref 5 Guidance for applicants

• *IPPC Part A(1) Installations: Guide for (Applicants England and Wales)* (includes Preparation of a Site Report in a Permit Application) (**EA website**).

• *PPC Part A Installations: Guide for Applicants (Scotland)* (Guidance for SEPA staff on land and groundwater considerations) **Guidance for SEPA staff on land and groundwater considerations**

Ref 6 Assessment methodologies:

• *E1 BPEO Assessment Methodology for IPC*

• *IPPC Environmental Assessments for BAT* (in preparation as H1)

Ref 7 Waste minimisation support references

• *Environment Agency web site*. Waste minimisation information accessible via: **www.environment-agency.gov.uk/subjects/waste/131528**

• *Waste Minimisation – an environmental good practice guide for industry* (helps industry to minimise waste and achieve national environmental goals). Available free to companies who intend to undertake a waste reduction programme (tel: 0345 33 77 00)

• *Profiting from Pollution Prevention – 3Es methodology* (emissions, efficiency, economics). Video and A4 guide aimed at process industries. Available from Environment Agency, North East region (tel: 0113 244 0191, ask for Regional PIR)

• *Waste Minimisation Interactive Tools (WIMIT)*. Produced in association with Envirowise and the BOC Foundation (a software tool designed for small and medium businesses.). Available free from The Environmental Helpline (tel: 0800 585794)

• *ENVIROWISE*. A joint DTI/DEFRA programme, with over 200 separate case studies, good practice guides, leaflets, flyers, software tools and videos covering 12 industry sectors, packaging, solvents and the generic areas of waste minimisation and cleaner technology. ENVIROWISE is accessible via a FREE and confidential helpline (tel: 0800 585794) or via the web site **www.envirowise.gov.uk**

• *Increased Profit Through Improved Materials Additions*: Management/Technical Guide, ENVIROWISE, GG194/195

• *Waste Management Information Bureau*. The UK's national referral centre for help on the full range of waste management issues. It produces a database called Waste Info, which is available for on-line searching and on CD-ROM. Short enquiries are free (tel: 01235 463162)

• *Waste Minimisation* – Institution of Chemical Engineers Training Package E07. Basic course which contains guide, video, slides, OHPs etc. (tel: 01788 578214)

• *BIO-WISE - profiting through industrial biotechnology.* A DTI programme providing free advice and information about how biotechnology can be used within manufacturing industry. Case studies, guides website and Helpline 0800 432100. **dti.gov.uk/biowise** (leather guide GG237 and case study 11

Ref 8 Water efficiency references:

• *Simple measures restrict water costs*, ENVIROWISE, GC22

• *Effluent costs eliminated by water treatment*,ENVIROWISE, GC24

• *Saving money through waste minimisation*: Reducing water use, ENVIROWISE, GG26

• *ENVIROWISE Helpline* 0800 585794

• *Optimum use of water for industry and agriculture dependent on direct abstraction: Best practice manual*. R&D technical report W157, Environment Agency (1998), WRc Dissemination Centre, Swindon (tel: 01793 865012)

• *Cost-effective Water Saving Devices and Practices* ENVIROWISE GG067

• *Water and Cost Savings from Improved Process Control* ENVIROWISE GC110

• *Tracking Water Use to Cut Costs* ENVIROWISE GG152

Ref 9 Releases to air references:

• BREF on Waste Water and Waste Gas Treatment.

• A1 Guidance on effective flaring in the gas, petroleum etc. industries, 1993, ISBN 0-11-752916-8

• A2 Pollution abatement technology for the reduction of solvent vapour emissions, 1994, £5.00, 0-11-752925-7

• A3 Pollution abatement technology for particulate and trace gas removal, 1994, £5.00, 0-11-752983-4

• Part B PG1/3 Boilers and Furnaces 20-50 MW net thermal input (ISBN 0-11-753146-4-7)

• Part B PG1/4 Gas Turbines 20-50 MW net thermal input (ISBN 0-11-753147-2

Ref 10 Releases to water references

• BREF on Waste Water and Waste Gas Treatment

• *A4 Effluent Treatment Techniques*, TGN A4, Environment Agency, ISBN 0-11-310127-9 (**EA website**)

• *Pollution Prevention Guidance Note – Above-ground oil storage tanks*, PPG 2, Environment Agency, gives information on tanks and bunding which have general relevance beyond just oil (**EA website**)

• *Construction of bunds for oil storage tanks*, Mason, P. A, Amies, H. J, Sangarapillai, G. Rose, Construction Industry Research and Information Association (CIRIA), Report 163, 1997, CIRIA, 6 Storey's Gate, Westminster, London SW1P 3AU. Abbreviated versions are also available for masonry and concrete bunds (www.ciria.org.uk on-line purchase)

• *Policy and Practice for the Protection of Groundwater* (PPPG) (**EA website**)

• *Choosing Cost-effective Pollution Control* ENVIROWISE GG109

• *Cost-effective Separation Technologies for Minimising Wastes and Effluents* ENVIROWISE GG037

• *Cost-effective Membrane Technologies for Minimising: Wastes and Effluents* ENVIROWISE GG044

Ref 11 Waste references

• *Investigation of the criteria for, and guidance on, the landspreading of industrial wastes* – final report to the DEFRA, the Environment Agency and MAFF, May 1998

• *Agency guidance on the exemption 7 activity* (proposed)

Ref 12 Energy references:

• *H2 Energy efficiency for IPPC* (working version available on the website should be used until the final version is published)

Ref 13 COMAH guides

• *A Guide to the Control of Major Accident Hazards Regulations 1999*, Health and Safety Executive (HSE) Books L111, 1999, ISBN 0 07176 1604 5

• *Preparing Safety Reports: Control of Major Accident Hazards Regulations 1999*, HSE Books HS(G)190, 1999

• *Emergency Planning for Major Accidents: Control of Major Accident Hazards Regulations 1999*, HSE Books HS(G)191, 1999

• *Guidance on the Environmental Risk Assessment Aspects of COMAH Safety Reports*, Environment Agency, 1999 (**EA website**)

• *Guidance on the Interpretation of Major Accidents to the Environment for the Purposes of the COMAH Regulations*, DEFRA, 1999, ISBN 753501 X, available from the Stationery Office

Ref 14 Monitoring Guidance

• *MCERTS approved equipment* link via **http://www.environment-agency.gov.uk/business/mcerts**

• *M1 Sampling facility requirements for the monitoring of particulates in gaseous releases to atmosphere*, March 1993, £5.00, ISBN 0-11-752777-7

• *M3 Standards for IPC Monitoring Part 1: Standards, organisations and the measurement infrastructure*, August 1995, £11.00, ISBN 0-11-753133-2

• *M4 Standards for IPC Monitoring Part 2: Standards in support of IPC Monitoring*, revised 1998

• *Direct Toxicity Assessment for Effluent Control* Technical Guidance (2000), UKWIR 00/TX/02/07

Ref 15 Noise references:

• *H3 Horizontal Guidance for Noise Part 1*Regulation and Permitting

• *H3 Horizontal Guidance for Noise Part 2* Assessment and Control

Ref 16 Closure references

• *Working at Construction and Demolition-sites* (PPG 6) (**EA website**)

Ref 17 Directives

• *Hazardous waste incineration Directive* (1994/67/EC)

• *Waste incineration Directive* (2000/76/EC)

• *Large Combustion Plant Directives* (1988/609/EEC)

• *Habitiats Directive* (92/43/EC)

Ref 18 Dispersion

• *Dispersion Methodology Guide* D1 (**EA website** - summary only)

Ref 19 Fire Fighting

• *BS 5908: Code of Practice for Fire Precautions in the Chemical and Allied Industries*

• *Pollution prevention measures for the control of spillages and fire-fighting run-off*, PPG 18, Environment Agency Pollution Prevention Guidance Note, gives information on sizing firewater containment systems (**EA website**)

Ref 20 Volatile Organic Compounds

• *The Categorisation of Volatile Organic Compounds*, DOE Research Report No DOE/HMIP/RR/95/009 (**EA website**)

Abbreviations

BAT	Best Available Techniques – see IPPC A Practical Guide or the Regulations for further definition
BAT Criteria	The criteria to be taken into account when assessing BAT, given in Schedule 2 of the PPC Regulations
BOD	Biological Oxygen Demand
BREF	BAT Reference Document
CEM	Continuous Emissions Monitoring
CHP	Combined heat and power plant
COD	Chemical Oxygen Demand
ELV	Emission Limit Value
EMS	Environmental Management System
ETP	Effluent treatment plant
ITEQ	International Toxicity Equivalents
MCERTS	Monitoring Certification Scheme
NIEHS	Northern Ireland Environment and Heritage Service
SAC	Special Areas of Conservation
SECp	Specific Energy consumption
SEPA	Scottish Environment Protection Agency
SPA	Special Protection Area
TSS	Suspended solids
TOC	Total Organic Carbon
VOC	Volatile organic compounds

Appendix 1: Some common monitoring and sampling methods

Table 4.1: Measurement methods for common substances to water

Determinand	Method	Detection limit Uncertainty	Valid for range mg/l	Standard
Suspended solids	Filtration through glass fibre filters	1 mg/l 20%	10-40	ISO 11929:1997, EN872 - Determination of suspended solids
COD	Oxidation with di-chromate	12 mg/l 20%	50-400	ISO 6060: 1989, Water Quality - Determination of chemical oxygen demand
BOD5	Seeding with micro-organisms and measurement of oxygen content	2 mg/l 20%	5-30	ISO 5815: 1989, Water Quality Determination of BOD after 5 days, dilution and seeding method EN 1899 (BOD 2 Parts)
AOX	Adsorption on activated carbon and combustion	-- 20%	0.4 - 1.0	ISO 9562: 1998, EN1485 - Determination of adsorbable organically bound halogens.
Tot P				BS 6068: Section 2.28 1997, Determination of phosphorus –ammonium molybdate spectrometric method
Tot N				BS 6068: Section 2.62 1998, Determination of nitrogen Part 1 Method using oxidative digestion with peroxydisulphate, BS EN ISO 11905
pH				SCA The measurement of electric conductivity and the determination of pH, ISBN 0117514284
Turbidity				SCA Colour and turbidity of waters 1981, ISBN 0117519553 EN 27027:1999
Flow rate	Mechanical ultrasonic or electromagnetic gauges			SCA Estimation of Flow and Load, ISBN 011752364X
Temperature				
TOC				SCA The Instrumental Determination of Total Organic Carbon and Related Determinants 1995, ISNB 0117529796 EN 1484:1997
Fatty acids				Determination of Volatile Fatty Acids in Sewage Sludge 1979, ISBN 0117514624
Metals				BS 6068: Section 2.60 1998, Determination of 33 elements by inductively coupled plasma atomic emission spectroscopy
Chlorine				BS6068: Section 2.27 1990, Method for the determination of total chlorine: iodometric titration method
Chloroform Bromoform				BS 6068: Section 2.58, Determination of highly volatile halogenetaed hydrocarbons – Gas chromatographic methods
Dispersants Surfactants Anionic Cationic Non-ionic				SCA Analysis of Surfactants in Waters, Wastewaters and Sludges, ISBN 01176058 EN 903:1993 (Used for anionic surfactants)

Table 4.1: Measurement methods for common substances to water

Determinand	Method	Detection limit Uncertainty	Valid for range mg/l	Standard
Pentachloro-Phenol				BS5666 Part 6 1983, Wood preservative and treated timber quantitative analysis of wood preservatives containing pentachlorophenol EN 12673:1997 (used for chlorophenol and polychlorinated phenols)
Formaldehyde				SCA The determination of formaldehyde, other volatile aldehydes and alcohols in water
Phosphates and nitrates				BS 6068: Section 2.53 1997, Determination of dissolved ions by liquid chromatography
Sulphites and sulphates				BS 6068: Section 2.53 1997, Determination of dissolved ions by liquid chromatography
Ammonia				BS 6068: Section 2.11 1987, Method for the determination of ammonium: automated spectrometric method
Grease and oils	IR absorption	0.06 mg/kg		SCA The determination of hydrocarbon oils in waters by solvent extraction IR absorption and gravimetry, ISBN 011751 7283

Table 4.2: Measurement methods for air emissions

Determinand	Method	Averaging time Detection limit Uncertainty	Compliance criterion	Standard
Formaldehyde	Impingement in 2,4 dinitro-phenyl-Hydrazine HPLC	1 hour 1 mg/m^3 30%	Two samples taken. Each result below limit after subtraction of measurement uncertainty	NIOSH
Ammonia	Ion Chromatography	1 hour 0.5mg/m^3 25%		US EPA Method 26
VOCs speciated	Adsorption Thermal Desorption GCMS	1 hour 0.1 mg/m3 30%		BS EN 1076: Workplace atmospheres. Pumped sorbent tubes for the determination of gases and vapours. Requirements and test methods.
Chloroform	Absorption on activated carbon solvent extraction. GC analysis	1 hour 1 mg/m^3 20%		MDHS 28 Chlorinated hydrocarbon solvent vapours in air (modified)
Oxides of sulphur	UV fluoresence automatic analyser	1 hour 1 ppm 10%	95% of hourly averages over a year below specified limit	ISO 7935 (BS6069 Section 4.4) Stationary source emissions -determination of mass concentrations of sulphur dioxide CEN Standard in preparation
	Wet sampling train Ion chromatography	1 hour 1 mg/m^3 25%	Two samples taken. Each result below limit after subtraction of measurement uncertainty	ISO 7934 (BS6069 Section 4.1) Method for the determination of the mass concentration of sulphur dioxide-hydrogen peroxide/barium perchlorate method

Measurement uncertainty is defined as total expanded uncertainty at 95% confidence limit calculated in accordance with the Guide to the Expression of Uncertainty in Measurement, ISBN 92-67-10188-9, 1st Ed., Geneva, Switzerland, ISO 1993.

See also Monitoring Guidance **Monitoring Guidance**

Appendix 2: Equivalent legislation in Scotland & Northern Ireland

The legislation referred to in the text is that for England. The following are the equivalents for Scotland, Wales and Northern Ireland.

Table 4.3: Equivalent legislation

England	Wales	Scotland	Northern Ireland
PPC Regulations (England and Wales) 2000	As England	PPC (Scotland) Regulations 2000, SI 200/323	To be prepared
SI:1994 1056: Waste Management Licensing Regulations	As England	As England	No NI equivalent
The Water Resources Act 1991	As England	COPA 1974 (S30A-30E equiv to Part III WRA91): Natural Heritage (Scotland) Act 1991 (Part II equiv to Part I WRA91)	The Water (NI) Order 1999
SI 1989 No.317: Clean Air, The Air Quality Standards Regulations 1989 SI 1995 No. 3146: The Air Quality Standards (Amendments) Regulations 1995	As England	As England	SR 1990 No.145: The Air Quality Standards Regulations (Northern Ireland) 1990 SR1996 No.23: The Air Quality Standards (Amendments) Regulations (Northern Ireland) 1996
SI 2000 No.928: The Air Quality (England) Regulations 2000	SI 2000 No.1940 (W.138): The Air Quality (Wales) Regulations 2000	SSI 2000/97: The Air Quality (Scotland) Regulations	No NI equivalent
SI 2001 No.2315: The Air Quality Limit Values Regulations 2001	SI 2001 No.2683 (W.224): The Air Quality Limit Values (Wales) Regulations 2001	SSI 2001 No.224: The Air Quality Limit Values (Scotland) Regulations 2001	SI 2002 No.94: The Air Quality Limit Values (Northern Ireland) Regulations 2002
SI 1989 No 2286 and 1998 No 389: The Surface Water (Dangerous Substances Classification) Regulations. (Values for List II substances are contained in SI 1997/2560 and SI 1998/389)	As England	SI 1990/126: Surface Water (Dangerous Substances) (Classification) (Scotland) Regulations	Surface Waters (Dangerous Substances) (Classification) Regulations 1998. Statutory Rules of Northern Ireland 1998 No 397
SI 1991 No.1597: Bathing Waters (Classification) Regulations 1991	As England	SI 1991 No.1609: Bathing Waters (Classification) (Scotland) Regulations 1991	The Quality of Bathing Water Regulations (NI) 1993
SI 1997 No.1331: The Surface Waters (Fishlife) (Classification) Regulations 1997	As England	SI 1997 No.2471 (S.163): The Surface Waters (Fishlife) (Classification) (Scotland) Regulations 1997	The Surface Water (Fishlife) (Classification) Regulations (NI) 1997
SI 1997 No.1332: The Surface Waters (Shellfish) (Classification) Regulations 1997	As England	SI 1997 No.2470 (S.162): The Surface Waters (Shellfish) (Classification) (Scotland) Regulations 1997	The Surface Water (Shellfish) (Classification) Regulations (NI) 1997
SI 1994 No.2716: The Conservation (Natural Habitats, etc) Regulations	As England	As England	Conservation (Natural Habitats etc) Regulations (Northern Ireland) 1995

Table 4.3: Equivalent legislation

England	Wales	Scotland	Northern Ireland
SI 1999 No.743: Control of Major Accident Hazards Regulations (COMAH) 1999	As England	As England	SR 2000 No.93: Control of Major Accident Hazards Regulations (Northern Ireland) 2000
SI 1998 No.2746: The Groundwater Regulations 1998	As England	As England	SR 1998 No.401. The Groundwater Regulations (Northern IrelandI) 1998

Appendix 3: List of changes

Table 4.4: List of Changes

Change	Reason	Author	Author-ised By	Date