Higher National Unit specification

General information for centres

Unit title: Waste Management and Pollution Control

Unit code: F55S 35

Unit purpose: This Unit is designed to extend the candidates' knowledge and understanding of waste management principles and practice, and pollution issues. The Unit comprises an in-depth study of a wide spectrum of waste management systems and strategies. It also introduces candidates to pollution control principles and common sources of pollution, their characteristics and impacts, and techniques to control and mitigate the effects of pollution.

On completion of the Unit the candidate should be able to:

1 Evaluate the operation of three waste management systems and the waste streams they can effectively address.
2 Explain how European Union policy on waste management is implemented in Scotland.
3 Appraise common methods for the treatment and control of pollution.
4 Explain methods for modelling the movement of pollutants in the environment.

Credit points and level: 1 HN credit at SCQF level 8: (8 SCQF credit points at SCQF level 8*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Recommended prior knowledge and skills: Access to this Unit is at the discretion of the centre. However, it is recommended that candidates have some prior knowledge of waste management and pollution control. This may be demonstrated by possession of the HN Unit *Pollution and Waste Management: An Introduction* (F2EE 34) or an equivalent Unit of study at SCQF level 6 or 7.

Core Skills: There are opportunities to develop the component Critical Thinking of the Core Skill of *Problem Solving,* and the Core Skills of *Working with Others* and *Communication,* all at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

General information for centres (cont)

Assessment: All Outcomes for this Unit could be assessed by means of an extended response report in which candidates provide evidence that they have an understanding of the waste management and pollution control systems, policy and procedure. Ideally the assessment process could be integrated as far as possible into delivery of the Unit. The report may concentrate on one of these areas provided it covers the full range of environmental impacts.

Higher National Unit specification: statement of standards

Unit title: Waste Management and Pollution Control

Unit code: F55S 35

The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Evaluate the operation of three waste management systems and the waste streams they can effectively address

Knowledge and/or Skills

- Waste management hierarchy
- Waste management systems
- Characteristics of individual waste streams
- Waste collection systems

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- evaluate, in terms of their operation and effectiveness and the waste streams they address, three common waste management systems
- identify the environmentally undesirable characteristics of two waste streams
- appraise two waste collection systems, in terms of relative operating costs and environmental effectiveness

Assessment Guidelines

This Outcome could be assessed by extended response questions. Alternatively all Outcomes may be assessed using one instrument of assessment. See further information under Assessment Guidelines for Outcome 4.

Higher National Unit specification: statement of standards (cont)

Unit title: Waste Management and Pollution Control

Outcome 2

Explain how European Union policy on waste management is implemented in Scotland

Knowledge and/or Skills

- European Union Waste Management Policy
- Scottish Waste Management Strategy
- Regional waste strategy
- Duties of local authorities

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- explain, with particular reference to recycling and landfill diversion targets, how European Union policy on waste management is implemented in Scotland making reference to:
  - the Scottish Waste Management Strategy
  - regional waste strategy
  - the responsibility of local authorities for waste

Assessment Guidelines

This Outcome may be assessed by extended response questions. Alternatively, all Outcomes may be assessed using one instrument of assessment. See further information under Assessment Guidelines for Outcome 4.

Outcome 3

Appraise common methods for the treatment and control of pollution

Knowledge and/or Skills

- Common sources of pollution
- Treatment and control systems for pollution

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- describe, in terms of their environmental effect, four common sources of pollution, to include one source of air pollution, one source of water pollution and one source of soil pollution
- appraise an effective treatment or control system for each of three specific pollutants

This is an open-book assessment.

Higher National Unit specification: statement of standards (cont)

Unit title: Waste Management and Pollution Control

Assessment Guidelines

This Outcome could be assessed by extended response questions. Alternatively, all Outcomes may be assessed using one instrument of assessment. See further information under Assessment Guidelines for Outcome 4.

Outcome 4

Explain methods for modelling the movement of pollutants in the environment

Knowledge and/or Skills

- Air pollution models
- Water pollution models
- Soil pollution models

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- explain a method for modelling the dispersion of air pollution
- explain a method for modelling the movement of water pollution
- explain a method for modelling soil pollution that uses either diffusion or hydraulic conductivity

Assessment Guidelines

This Outcome may be assessed by extended response questions. Alternatively the assessment of all Outcomes may be combined and evidence presented in the form of a report. Structured questions could address each of the Evidence Requirements for all Outcomes. The assessment could be introduced to candidates at the start of the delivery of the Unit, allowing candidates sufficient time to research each topic as it is taught, with the assessment process integrated as far as possible with Unit delivery.

Administrative Information

Unit code: F55S 35

Unit title: Waste Management and Pollution Control

Superclass category: QC

Original date of publication: August 2008

Version: 01

History of changes:

Version	Description of change	Date

Source: SQA

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre for further details, telephone 0845 279 1000.

Higher National Unit specification: support notes

Unit title: Waste Management and Pollution Control

Guidance on the content and context for this Unit

This Unit is primarily intended for candidates who may take up employment in a waste management or related area.

The Rio Conference would be discussed to explain the evolution of policy to limit the emission of greenhouse gases to the atmosphere. The main legislative driver for change in waste management is the reduction of methane emissions, an important greenhouse gas, from landfills containing high volumes of biodegradable material. The targets and time constraints in the directive should be taught and candidate understanding of the need and content assessed.

There are a variety of waste management systems carried out at both private and Local Authority waste treatment plants. Candidates would discuss landfill, composting, incineration, anaerobic digestion and pyrolisis and be made aware that all these methods can make an important contribution to an integrated waste management strategy. The features of various waste collection schemes and how they limit or enhance the effectiveness of specific waste treatment would be considered.

The waste management hierarchy is still an important concept but the effectiveness of incineration with energy recovery would be considered as an attractive option for some areas of the country. A number of physical sorting techniques can be employed in waste treatment facilities such as air flotation, attrition in trommels, magnetic separation, density separation etc and their descriptions and effective use could be discussed in lectures.

Waste management and energy efficiency can be portrayed as important pollution control methods, as can a number of more immediate systems. Land spreading of wastes, UV treatment, sedimentation, flocculation, aeration, bacteriological treatment, impoundment, dilution, filtration and a number of other techniques are regularly used to treat pollutants. The point of use of the techniques varies according to the pollutant. Some processes use a collection of treatments such as you would find in a sewage treatment plant which would act as an excellent visit to illustrate pollution control in practice. Common sources of pollution which can be illustrated are farm wastes, human wastes, animal carcasses, oil, chemicals, soil, dust, phosphate, nitrate, heavy metals, smoke, carbon dioxide, viruses and bacteriological agents, PM 10’s and a variety of others. Transport mechanisms can include water, air, soil, vermin or insect, accidental or intentional. Impacts can include eutrophication, global warming, toxic or chronic effects to flora or fauna, land contamination leading to poor aeration and methane production, sedimentation in gravel beds in streams and a variety of other effects including aesthetic problems.

The modelling of pollutants and how they spread through different mediums is important both as a planning and general tool in pollution control. Techniques can predict the dispersal of pollutants and make an estimate of the concentration at various locations. Candidates would be given a broad understanding of models for pollutants in air (Gaussian plume), water (Streeter Phelps) and soil (various pollutant transfer models for organic and inorganic chemicals). This would be kept at a low level, with the candidates being made aware of the main variables in these models, why they are important and the limitations of modelling techniques, but not expected to use the equations.

Higher National Unit specification: support notes (cont)

Unit title: Waste Management and Pollution Control

Guidance on the delivery and assessment of this Unit

This Unit is likely to form part of a Group Award designed to provide candidates with knowledge and understanding for employment within a waste management or related environment.

This Unit could be delivered as a series of learning sessions addressing various aspects of waste management and pollution control. Candidates should be encouraged to make links between waste issues and social attitudes and the need for behavioural change. Waste management is being driven by European Union Directives, which are a reflection on the importance that sustainable development now holds in EU policy.

Candidates should be given out a wide ranging assessment containing particular questions to allow them to demonstrate their understanding and knowledge of the various aspects of the Unit. Candidates could be given individual areas to research and present to the rest of the class as the Unit progresses.

Waste management should be looked on as a major contributor to pollution control, as should manufacturing efficiency, energy efficiency and resource efficiency. The impact of consumer activity on the waste stream and reliance on heavily packaged goods should be considered. Resource use is an ever important issue in contemporary society and discussion of the implications of over exploitation of materials and energy sources should be encouraged. The contrast between renewable and non-renewable resources should be explained.

If at all possible photographic evidence to illustrate technology and pollution issues should be provided if it is not possible to arrange at least one visit to treatment facility. A sewerage works allows the candidates to witness a number of techniques and also gives them some indication of the physical scale of these facilities. A composting site, waste transfer station or incinerator site would also be extremely useful as examples.

Opportunities for developing Core Skills

As candidates have to study national policy and guidance documents and apply guidelines to the case study and present essential ideas/information and supporting detail in a logical and effective order, opportunities arise to develop Critical Thinking of the Core Skill *Problem Solving* at SCQF level 6.

If candidates complete written work for each Outcome they will have an opportunity to develop the general skill ‘Produce well structured written communication on complex topics’ of the Core Skill *Communication* at SCQF level 6.

Group presentations and discussion could be used during Unit delivery to allow candidates to work in groups to produce formative course work.

Higher National Unit specification: support notes (cont)

Unit title: Waste Management and Pollution Control

Open learning

Parts of this Unit are suited to delivery by distance/open learning as some underpinning knowledge could be conveyed using a VLE platform and blended learning techniques. However, due to the benefits of on-site visits and group/lecturer interaction, it is advisable that time is built into the delivery to allow candidates to benefit from this type of activity.

Candidates with disabilities and/or additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* **(www.sqa.org.uk)**.

General information for candidates

Unit title: Waste Management and Pollution Control

This Unit is designed to extend your knowledge and understanding of waste management principles and practice, and pollution issues. The Unit comprises an in-depth study of a wide spectrum of waste management systems and equipment, and society's approach to dealing with waste issues. You will also be introduced to pollution control principles and common sources of pollution, their characteristics and impacts and techniques to control and mitigate the effects of pollution.

The production of waste, how it is collected and what happens to it afterwards is an important social problem for now and the future. The industry is growing both in importance and size. As techniques move away from traditional reliance on landfill employment opportunities in waste management are increasing. Pollution is also a major issue and this Unit will inform you about the avoidance, isolation and mitigation methods that can be employed to prevent and mitigate the escape of pollutants into the environment and reduce any negative effects.

You will be encouraged to make links between waste issues and social attitudes and the need for behavioural change. Waste management is being driven by European Union Directives, and this reflects the importance that sustainable development now holds in EU policy.

Although access to this Unit is at the discretion of the centre, this Unit is intended to be presented to candidates who have already studied the Unit: *Pollution and Waste Management: an Introduction* (F2EE 34) or an equivalent Unit of study.

There are opportunities to develop the Core Skills of Critical Thinking, *Working with Others* and *Communication*, all at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.