Higher National Unit Specification

General information

Unit title: Sustainable Resource Recovery and Pollution Control (SCQF level 8)

Unit code: J4S2 35

Superclass: QC

Publication date: August 2020

Source: Scottish Qualifications Authority

Version: 01

Unit purpose

This unit is designed to extend the learners’ knowledge and understanding of current principles and practice of recovery of waste as a resource, and environmental pollution issues. The unit comprises an in-depth study of a wide spectrum of waste management systems and strategies to recover resources and value. It also introduces learners to common sources of pollution, their characteristics and impacts, and the current principles and techniques to control, monitor and model pollutant movement and concentrations, and finally review options to mitigate the effects of pollution.

Outcomes

On successful completion of the unit the learner will be able to:

1. Evaluate the operation of three waste management systems and the waste streams they can effectively address to support resource recovery.
2. Explain how current policy on waste management for recovery of resources 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 Higher National Unit credit at Scottish Credit and Qualifications Framework (SCQF) level 8: (8 SCQF credit points at SCQF level 8)
Higher National Unit Specification: General information (cont)

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Recommended entry to the unit

Access to this unit is at the discretion of the centre. However, it is recommended that learners have some prior knowledge of waste management for resource recovery and pollution control. This may be demonstrated by possession of the HN Unit Pollution Management and Resource Recovery (F2EE 34) or an equivalent unit of study at SCQF level 6 or 7.

Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the support notes for this unit specification.

There is no automatic certification of Core Skills or Core Skill components in this unit.

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.

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.
Higher National Unit Specification: Statement of standards

Unit title: Sustainable Resource Recovery and Pollution Control (SCQF level 8)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

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. Learners 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 to support resource recovery.

Knowledge and/or skills

♦ Waste management and resources efficiency hierarchy
♦ Waste management systems for waste minimisation and resource recovery
♦ Characteristics of individual waste streams
♦ Waste collection systems and the recyclate market

Outcome 2

Explain how current policy on waste management for recovery of resources is implemented in Scotland.

Knowledge and/or skills

♦ International agreements
♦ European Union directives
♦ National strategies, polices and plans
♦ Local authority duties and plans

Outcome 3

Appraise common methods for the treatment and control of pollution.

Knowledge and/or skills

♦ Identify common sources of environmental pollution
♦ Pollution control hierarchy
♦ International, EU, and National Pollution Policy
♦ Treatment, control and monitoring methods for pollution
♦ Source — pathway— receptor model
Outcomes 4

Explain methods for modelling the movement of pollutants in the environment.

Knowledge and/or skills

- Introduction to environmental modelling
- Air pollution modelling
- Water pollution modelling
- Soil pollution modelling

Evidence requirements for this unit

Learners will need to provide evidence to demonstrate their knowledge and/or skills across all outcomes by showing that they can:

Outcome 1

- Evaluate, in terms of their operation and effectiveness and the waste streams they address, three common waste management systems.
- Identify the environmentally undesirable characteristics and impacts of two waste streams.
- Appraise two waste collection systems with regards operating costs, value of resources recovered, policy drivers and public participation.

Outcome 2

- Explain, with particular reference to recycling and landfill diversion targets, how International Agreements and UK policy on waste management is implemented in Scotland making reference to:
  - Circular economy and resource recovery
  - Scottish waste management strategy
  - Regional waste strategy
  - Responsibility of local authorities for waste
  - Voluntary agreements

Outcome 3

- Describe, in terms of their environmental effect, three 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.
Higher National Unit Specification: Statement of standards (cont)

Unit title: Sustainable Resource Recovery and Pollution Control (SCQF level 8)

Outcome 4:

♦ Explain the benefits of pollution modelling.
♦ 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.
Higher National Unit Support Notes

Unit title: Sustainable Resource Recovery and Pollution Control (SCQF level 8)

Unit support notes are offered as guidance and are not mandatory.

While the exact time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this unit

This unit is primarily intended for learners who may take up employment in environmental management or related areas.

The Kyoto Protocol and Rio Conference would be discussed to explain the evolution of policy to limit the emission of greenhouse gases to the atmosphere. The main legislative drivers for change in waste management are the reduction of methane emissions, an important greenhouse gas, from landfills containing high volumes of biodegradable material and a move towards a circular economy with resource recovery at its core. The targets and time constraints in current policy should be taught, and learner understanding of the need and content assessed. Learners should also reflect on Zero Waste rather than Zero to Landfill, and review principles such as the Polluter Pays Principle, the Proximity Principle, Producer Responsibility and Duty of Care.

There are a variety of waste management systems carried out at both private and Local Authority waste treatment plants. Learners would discuss landfill, composting, incineration, anaerobic digestion and advanced incineration methods, 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 and resource recovery from waste should be considered together with barriers to effective management of waste for the recovery of resources such as behavioural change.

The resource efficiency hierarchy with a view to resource recovery is still an important concept, and the effectiveness of incineration with energy recovery should 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 with regards resource recovery and value.
Higher National Unit Support Notes (cont)

Unit title: Sustainable Resource Recovery and Pollution Control (SCQF level 8)

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 could 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 10s 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. Learners 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, ie Darcy’s Law). This would be kept at a low level, with the learners 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.

Guidance on approaches to delivery of this unit

This unit is likely to form part of a group award designed to provide learners with knowledge and understanding for employment within environmental management.

This unit could be delivered as a series of learning sessions addressing various aspects of waste management and pollution control. Learners should be encouraged to make links between resource recovery from waste issues, social attitudes, and the need for behavioural change. Waste management for resource recovery has been driven by European Union Directives, which are a reflection on the importance that sustainable development now holds in EU and UK policy. The Environment Bill provisions detail on UK targets and actions related to waste management and resource efficiency introducing focus on for instance Producer Responsibility, separation of waste for treatment and provides guidance on collection requirements.

Learners 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. Learners could be given individual areas to research and present to the rest of the class as the unit progresses, or could undertake a practical session designed to demonstrate decomposition rates and ideal conditions.
Higher National Unit Support Notes (cont)

Unit title: Sustainable Resource Recovery and Pollution Control (SCQF level 8)

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 learners 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.

This Unit could be delivered by distance-learning. The use of a virtual-learning environment (VLE) is highlighted, with on-line lectures and activities; the employment of video and audio clips, social-media and other online tools is encouraged. Learners should be encouraged to use the Internet as a research tool in addition to traditional library based resources. Independent study should be encouraged by using learner-centred, resource based methodologies.

Guidance on approaches to assessment of this unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

This unit introduces learners to a range of issues and concepts, to provide knowledge and understanding of the relevance of resource recovery from waste and pollution control methods and monitoring. Learners will be expected to develop a holistic approach in their knowledge and understanding. Written and/or recorded oral evidence is required from Learners to demonstrate this. Assessment will be completed under open-book conditions.

Each outcome could be assessed by an individual extended response question of approximately 600 words or equivalent. Alternatively, structured questions could address each of the evidence requirements for all outcomes in one assessment of approximately 2,500 words or equivalent.
Higher National Unit Support Notes (cont)

Unit title: Sustainable Resource Recovery and Pollution Control (SCQF level 8)

Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the evidence requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA’s qualifications is available at www.sqa.org.uk/e-assessment.

Opportunities for developing Core and other essential skills

As learners have to study national policy and guidance documents, apply guidelines to the case study, 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.

There are opportunities to develop the Core Skills of Communication at SCQF level 6 by requiring learners to respond by means of Oral and Written communications. The Core Skill of Working with Others at SCQF level 6 will be developed during this unit as learners are encouraged to co-operate with each other as they work towards a shared view of effective resource recovery and pollution control methods.
History of changes to unit

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Unit template: June 2017
General information for learners

Unit title: Sustainable Resource Recovery and Pollution Control (SCQF level 8)

This section will help you decide whether this is the unit for you by explaining what the unit is about, what you should know or be able to do before you start, what you will need to do during the unit and opportunities for further learning and employment.

This unit is designed to extend your knowledge and understanding of sustainable waste management principles and practice for zero waste and a move towards resource recovery, together with pollution issues and control methods. 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. 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 and economic problem for now and the future. The industry is rapidly 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 UK and Scottish Directives, and this reflects the importance that sustainable development now holds in UK policy.

Although access to this Unit is at the discretion of the centre, this unit is intended to be presented to learners who have already studied the unit F2EE 34 Pollution Management and Resource Recovery 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.

Your performance through this unit will be assessed by asking you to answer extended response questions by open-book assessment.