

# Unit 17: Pollution Control and Management

<b>Unit code:</b>	<b>T/602/5989</b>
<b>QCF Level 3:</b>	<b>BTEC National</b>
<b>Credit value:</b>	<b>10</b>
<b>Guided learning hours:</b>	<b>60</b>

## ● Aim and purpose

This unit enables learners to develop a knowledge and understanding of air, noise, land and water pollution control and management. The unit also develops learners' understanding of the environmental impact of pollution. Learners will also investigate how pollution control and management can be applied in practice.

## ● Unit introduction

Pollution is one of the major threats facing the world's environment today. Understanding the causes of pollution and how human activities and waste products can seriously affect the natural balance of the environment is vital to the study of sustainable development. The focus of this unit is on the nature and causes of different types of pollution and their effects on the resources of air, water and land, and how their impacts can be controlled and mitigated by effective environmental management.

All living things are affected by pollution as they depend on air to breathe, water to drink and land to live on. Pollution normally brings to mind hazardous waste materials, sewage, pesticides, effluent, oil spills and landfill leachate, but pollution also includes excess concentrations of gases, eg carbon dioxide (CO<sub>2</sub>), chlorofluorocarbons (CFCs), waste energy or intrusive noise.

Pollution from industrial processes, emissions and exhaust fumes produce poor air quality that can cause smog, lung disease and respiratory problems. The recent growth in carbon dioxide levels in the atmosphere, its link to global warming and possible climate change is an area of topical debate.

The control of water pollution has become increasingly stringent as the effects on wildlife, food chains, groundwater, rivers, lakes and streams become more serious. The planning and protection of water resources to safeguard water supplies is a growing sector in the UK.

Land contaminated by industrial, mining and domestic waste, litter, agricultural chemicals and fertilisers is also an important issue. All over the UK, there are many sites contaminated by previous usage associated with industrial and agricultural processes, where waste products present a hazard to the environment. There is increasing pressure today to reuse previously developed and contaminated land.

This unit introduces learners to the nature of the environment and natural systems that are affected by pollution. The main types of pollution of land, air and water will be investigated and their impacts considered. Using a specific example of a development site, learners will assess ways to prevent, control and manage the effects of different forms of pollution. Learners will also develop an understanding of the relevant current legislation in the UK and the roles of the national and local statutory bodies responsible for pollution control and regulation.

On completion of the unit, learners will have knowledge of the main types and causes of pollution affecting the UK. They will be aware of the different environmental issues relating to pollution and have an understanding of the need to control and manage pollution effectively. The unit, being an integral part of the BTEC Level 3 Nationals in Environmental Sustainability (QCF) qualifications, will provide learners with the knowledge, skills and understanding to consider following a career in pollution and environmental management within the private or public sectors.

## ● Learning outcomes

**On completion of this unit a learner should:**

- 1 Understand the nature of the environment and the natural systems that are affected by pollution
- 2 Know the common sources of water and land pollution in the UK
- 3 Know the main causes and effects of air and noise pollution in the UK
- 4 Be able to investigate the environmental impact of a specific development in relation to water pollution
- 5 Understand current legislation relevant to water pollution, air pollution and contaminated land.

# Unit content

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## 1 Understand the nature of the environment and the natural systems that are affected by pollution

*Nature of the environment:* structure of the Earth eg core, mantle, crust; layered atmosphere eg troposphere, stratosphere, mesosphere, ionosphere; ozone layer; composition of air eg nitrogen, oxygen, noble gases, carbon dioxide, water vapour; effects of solar energy in the atmosphere, on land and water; absorption and scattering of radiation, reflection and albedo of surface; air and ocean currents; greenhouse effect; biogeochemical cycles (carbon, nitrogen, hydrological)

*Effects of human activities on the environment:* effects eg pollution, natural resource depletion, deforestation; importance to the environment of maintaining the Earth's natural balance

*Impacts of pollution:* definition of pollution eg waste materials and waste energy caused by human activities affecting the natural balance of the environment; impacts of pollution on natural processes; main types of pollution eg air, land, water and noise pollution; impacts of pollution on water resources and food resources; effects of human activity on carbon dioxide levels; increases in emissions and greenhouse gases eg sulfur dioxide, methane, CFCs; global warming and climate change; influence of weather patterns and climate on pollution eg temperature inversions, smog, acid rain; contamination of land and water

## 2 Know the common sources of water and land pollution in the UK

*Water pollution:* sources eg agriculture, industry, domestic sewage, oil spillages, landfill tip leachate, forestry

*Types of water pollution:* surface water pollution eg chemical spills; ground water pollution eg pesticide runoff, leaching; oxygen depleting pollution eg sewage, excess nutrient build-up, eutrophication; nutrient pollution eg excess fertiliser, nitrates and phosphates, waste water; microbiological pollution eg human and animal waste; suspended matter pollution eg agricultural runoff, industrial waste, siltation, insoluble pollutants; chemical pollution eg detergents, solvents, pesticides, metals, petroleum-based products

*Water quality management:* monitoring; sources of information on point and diffuse pollution; data sources eg historical records, river water sampling, sewage works discharge records; water quality measurement (chemical, physical and biological); chemical analysis; biological oxygen demand (BOD); indicator species eg blood worms for polluted water; responsibilities of the Environment Agency in monitoring and regulation

*Contamination of land:* sources of land pollution eg domestic and industrial waste, industrial processes, mining, heavy metal contamination, hazardous waste, radioactive waste, dumping and fly-tipping, litter, biodegradable and non-biodegradable materials, plastics

*Effects and control of contaminated land:* sterilised land; poisonous substances in plants and animals in food chain eg phytotoxic and zootoxic compounds; restricted use of land eg no development; health hazards eg radioactive waste-related cancers; planning controls eg Environmental Impact Assessments, planning conditions on new development; regulation, licensing and monitoring eg hazardous waste regulations, contaminated land registers; site controls eg Environment Agency monitoring, sampling, site capping, alternative methods of waste disposal; nuclear waste disposal eg underground silos, solidifying in glass/concrete; pollution effects of litter and non-biodegradable substances; statutory controls on litter and dumping; reduced plastic packaging; education

*Agricultural pollution management:* targeted use of pesticides to prevent non-specific killing of plants and animals; control of the use of specific insecticides; fertiliser spreading restrictions to prevent nitrates in ground water and runoff; nitrate vulnerable zones, better agricultural practices eg waste management plans for manure, dirty water, silage effluent, organic and inorganic waste, anaerobic digestion, composting of biodegradable waste

### 3 Know the main causes and effects of air and noise pollution in the UK

*Air pollution:* causes of air pollution eg release of poisonous gases into the air by burning fuels, industrial emissions, vehicle exhausts, change in balance of greenhouse gases, methane, carbon dioxide (CO<sub>2</sub>); types of air pollution eg particulates, soot and smoke, carbon dioxide, carbon monoxide, sulfur dioxide, nitrogen oxides, lead compounds, chlorofluorocarbons (CFCs)

*Effects of air pollution:* effects eg poor air quality, smog, health issues, respiratory diseases; acid rain and consequent effects on natural and built environment eg dying forests, acidified lakes, fish kills, erosion of stonework and monuments; greenhouse effect eg impacts of CFCs, CO<sub>2</sub>, links to climate change

*Methods of controlling air pollution:* legislation, regulation and monitoring; controlling emissions; limiting CFCs; reducing usage of fossil fuels, alternative fuels; more efficient engines, catalytic converters, unleaded petrol, research into new, less harmful chemicals, education and behaviour change

*Noise pollution:* causes of noise pollution eg vehicular traffic, aircraft, industrial; noise monitoring; tranquillity mapping; air traffic control zones eg flight path controls, new engine design

*Methods of controlling noise pollution:* regulation, recording and monitoring of noise nuisance by local authorities; noise abatement measures eg noise bunding, planting, road surfacing use of sound insulation and sound deadening materials; sensitive design and layout of buildings

### 4 Be able to investigate the environmental impact of a specific development in relation to water pollution

*Site selection:* investigation of development site options eg factories, industrial sites, fish farms, intensive livestock units, domestic waste sites; assessment of potential pollution problems eg different polluting effluents, discharges, leachates, leaks and runoff

*Background research:* sources eg internet search, historical records, map search, planning history; existing licences and compliance documentation; planning site investigation eg permission for site access, soil and water sampling; risk assessments; health and safety guidelines

*Investigation of environmental impact:* effect of discharges and effluents on land and in watercourses; detection and measurement of organic and inorganic pollutants eg visual methods, physiochemical analyses, use of biotic indices; data analysis eg calculations of population sizes, frequency of pollution events; methods of preventing pollutants affecting water resource eg good planning, suitable design of effluent control systems intercepting ditches and pipes; methods used to reduce immediate environmental damage eg use of absorbent mats, booms

*Environmental assessment:* use of Environmental Impact Assessment techniques; presenting results in an environmental statement; making conclusions and recommendations eg reports, presentations, action and implementation plans, monitoring reports

## 5 Understand current legislation relevant to water pollution, air pollution and contaminated land

*Relevant legislation:* current legislation eg Environment Act 1995, The Water Act 2003, Contaminated Land legislation in Part 11A Environmental Protection Act 1990, Control of Pollution Act (1974), Control of Pollution (Oil Storage) (England) Regulations 2001, Clean Air Acts, Radioactive Contaminated Land Regulations 2006,7,8, Environmental Permitting (England and Wales) Regulations 2010, Environmental Damage (Prevention and Remediation) Regulations 2009, Town and Country Planning Acts, Environmental Impact Assessments, European Environmental Directives and Regulations

*Roles of government departments and other agencies in regulation:* eg Environment Agency, Department for Environment, Farming and Rural Affairs (Defra), Department of Energy and Climate Change (DECC), local planning authorities, environmental health departments, legislative methods used to protect water catchments, water abstraction and discharge licences, nitrate sensitive areas, planning controls, Environmental Impact Assessment regulations and monitoring, waste licensing

## Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
<b>P1</b> discuss human and natural factors that affect the composition of the air [IE1, 2, 4, 6]	<b>M1</b> review the effects of pollution on different environmental cycles	<b>D1</b> evaluate the importance of man on the balance of greenhouse gases, including the link to global warming and climate change
<b>P2</b> discuss the major environmental impacts of pollution [CT1, 2, 5]		
<b>P3</b> describe how the main types of water pollution occur in the UK	<b>M2</b> discuss the different effects of water pollution and their management	
<b>P4</b> describe the main ways in which land can become contaminated in the UK	<b>M3</b> discuss the problems of effective control and regulation of contaminated land	
<b>P5</b> describe how the main causes of air pollution occur in the UK	<b>M4</b> explain the different consequences of air pollution on the natural and built environment	<b>D2</b> discuss the need for stricter controls on water and air pollution in the UK
<b>P6</b> describe the main sources and effects of noise pollution	<b>M5</b> discuss different solutions to reduce the impact of noise pollution	
<b>P7</b> collect relevant information from a development site with the potential to cause water pollution [TW1, 2; RL1, 5]	<b>M6</b> analyse the results of a site investigation, suggesting improvements to pollution management	<b>D3</b> present an Environmental Impact Assessment, recommending ways to reduce pollution hazards at a specific development site.
<b>P8</b> discuss current relevant legislation in relation to water pollution, air pollution and contaminated land.	<b>M7</b> explain roles of local and national governments in the management of pollution, including other agencies.	

**PLTS:** This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

<b>Key</b>	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

## Essential guidance for tutors

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### Delivery

Delivery of this unit will involve practical and written assessments, visiting guest speakers, visits to suitable sites, supervised fieldwork and developing links with environmental protection bodies for potential work experience placement opportunities. Links with industry and charitable organisations will also provide guest speakers to talk about specific locations where pollution monitoring and treatment are important. Use of personal and/or industrial experience would also be suitable. Whatever methods are used, delivery should stimulate, motivate, educate and enthuse learners.

Any site visits should be checked for suitability and a risk assessment of activities carried out. Unfortunately, because of the dangerous nature of some hazardous wastes, many contaminated sites would be unsuitable for investigative research by learners at this level. Careful selection of sites with guidance from the regulatory authorities will be needed for specific investigations of land pollution. Health and safety regulations will be very stringent and access to suitable land, although possible, should be closely controlled. Detailed air and noise pollution investigations and monitoring may also be difficult without the support of specialised equipment and guidance from regulatory authorities or consultants. However, basic research from observation, local enquiries and record gathering can provide evidence for a general environmental assessment. Investigating water pollution may be an easier option for practical fieldwork. Wildlife charities have a wide range of reserves open to the public suitable for investigative site visits. Their educational departments can often support visits by providing expert guidance on the specific location, with tailor-made sessions and practical work. Many local water authorities have good education and interpretation programmes that allow site visits, provide expert speakers and sometimes offer work experience.

Health and safety issues relating to field visits must be stressed and regularly reinforced. A risk assessment must be prepared and implemented. Adequate personal protective equipment (PPE) must be used if required by legislation and industry best practice.

Industry placements should be monitored regularly to ensure the quality of the learning experience. It would be beneficial if learners and site supervisors were made aware of the requirements of this unit before any activities are carried out so that naturally occurring evidence can be collected. For example, learners may have the opportunity to use data logging equipment and a variety of different sampling techniques for monitoring polluting substances. Assessors should complete observation records and/or witness statements to confirm learners' achievement. Guidance on the use of observation records and witness statements is provided on the Edexcel website.

Guest speakers such as planning and regulation officers, site managers, pollution consultants and project managers could all describe their work and experience in the field of pollution control and management. Planning and regulation officers can also be useful in providing background information on legal requirements and health and safety considerations when recording and checking for pollution.

Whichever delivery methods are used, it is essential that tutors stress the importance of health and safety and sound environmental management.

Learning outcome 1 covers the nature of the environment and the natural systems that are affected by pollution. Delivery is likely to be in the form of lectures, with site visits and independent learner research where appropriate. Learners should gain a good understanding of the complexity and interdependence of natural systems and links between human activity, pollution and the environment.

Learning outcome 2 covers the most common sources of water and land pollution in the UK. Delivery is likely to be in the form of lectures, guest speakers, supervised site visits (subject to guidance above) and independent learner research where appropriate.



Learning outcome 3 covers the main causes and effects of air and noise pollution in the UK, its impact on the environment and methods of control. Delivery is likely to be in the form of lectures, guest speakers, practical experiments, site visits and independent learner research where appropriate.

Learning outcome 4 covers the skills required to investigate the environmental impact of a specific development in relation to water pollution (subject to the comments above). Delivery will be through a research project with supervised site investigations, sampling, data collection and analysis, practicals, lectures and work experience.

Tutors will need to guide learners to select the most suitable site where access to information and data collection is safe and straightforward. Samples can be collected from a variety of sources and analysis completed in the classroom. Setting up a scenario in a laboratory if suitable equipment is available is a possibility. The use of data logging equipment could be linked to a series of science-based lectures where, in a centre environment, science specialists may be able to assist.

Learning outcome 5 covers current legislation and the role of local authorities, national government departments and agencies in the control and management of pollution. As this subject is vast, only a general understanding of the main pieces of legislation is required; in-depth knowledge of specific Acts is not necessary. Delivery can be in the form of lectures, guest speakers from government bodies, and case studies of specific agencies, for example the Environment Agency.

## Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and assessment
Introduction and overview of the unit.
Interactive lectures: nature of the natural environment and natural systems <ul style="list-style-type: none"><li>• Consideration of natural systems and impacts of pollution caused by human activities.</li><li>• Study of evidence for global warming, for and against, initiated by human intervention or natural processes.</li><li>• Internet research.</li><li>• Visiting guest speaker.</li></ul>
<b>Assignment 1: Pollution: Types and Effects (P1, P2, M1, D1, P3, M2, P4, M3)</b>
Tutor introduces the assignment brief.
Group and individual study <ul style="list-style-type: none"><li>• Factors affecting composition of air.</li><li>• Environmental impacts of pollution.</li><li>• Causes of water and land pollution.</li><li>• Consequences and effects of water pollution and contaminated land.</li><li>• Methods of control and management.</li><li>• Site visits/work placement.</li><li>• Guest speakers.</li></ul>

## Topic and suggested assignments/activities and assessment

### Assignment 2: Air and Noise Pollution (P5, M4, D2, P6, M5)

Tutor introduces the assignment brief.

Investigative project: air and noise pollution

- Planning and Environmental Impact Assessment.
- Air pollution control and management.
- Noise pollution control and management.
- Visits to regulatory agencies, guest speakers, site visits.

### Assignment 3: Site Investigation (P7, M6, D3)

Tutor introduces the assignment brief.

Fieldwork investigative project: water pollution

- Selection of potential development site.
- Planning and implementing a site investigation.
- Site visits and supervised practical sessions.
- Collecting, recording, analysing data, monitoring.
- Evaluating results and recommendations.
- Visits to public agencies.
- Guest speakers/work placement.

### Assignment 4: Legislation and Roles of Authorities (P8, M7)

Tutor introduces the assignment brief.

Theory session: group study

- Current legislation in relation to water, air, noise pollution and contaminated land.
- Roles and responsibilities of local and national governments and agencies in the control and management of pollution.
- Learner independent research.

Review and evaluation of the unit.

## Assessment

For P1, learners need to discuss the human and natural factors that affect the composition of the air. Learners should outline the structure of the atmosphere and the main constituent gases. Reference should be given to the sources of the gases and the processes affecting their concentration and balance in the air. Evidence could take the form of a short report, presentation or information leaflet.

For P2, learners need to discuss the major environmental impacts of pollution. They must define the concept of pollution and discuss the various sources of pollution. Evidence of pollution impacts can be given in a presentation, a report or an illustrated article.

For P3, learners need to describe how the main types of water pollution occur in the UK. Evidence can be a report or presentation with notes.

For P4, learners need to describe the main ways in which land can become contaminated in the UK. A description of the main sources of contamination should be given and examples from industry and agriculture included. Evidence can be produced in a report, presentation or project.

For P5, learners need to describe how the main causes of air pollution occur in the UK. A summary of the principal consequences of air pollution should be given. Evidence could be produced as a report, investigative assignment or presentation.

For P6, learners need to describe the main sources and effects of noise pollution. Evidence can be a report, illustrated poster or a specific project on the impact of noise locally, eg investigating noise impacts of a major road, or development site.

For P7, learners need to collect relevant information from a development site with the potential to cause water pollution. Evidence could be provided in the form of photographs, data records, water/soil samples, tables, graphs, witness statements, site reports and a learner diary or logbook.

For P8, learners need to discuss current relevant legislation in relation to water pollution, air pollution and contaminated land. Evidence can take the form of presentations or role play of a court case investigating a pollution incident (supported by appropriate assessor observation records).

For M1, learners need to review the effects of pollution on different environmental cycles. Tutors should identify the specific environmental cycles to be covered in discussion with learners. Evidence is likely to take the form of an illustrated report.

For M2, learners need to discuss the different effects of water pollution and their management. Assessment of different monitoring techniques used in water quality management should be included. Evidence could be provided in a case study, written report or illustrated presentation.

For M3, learners should have a clear understanding of the issues affecting contaminated land, and discuss the difficulties of controlling and managing contaminated sites. Discussion needs to include clear reference to the legislation affecting contaminated land. Evidence could be provided in a report, presentation or via a structured debate (supported by appropriate assessor observation records).

For M4, learners need to explain the different consequences of air pollution on both the natural and built environment. Learners should cover how effects can go beyond national boundaries and the consequent international political pressure to control air pollution. Evidence can be provided in the form of a report, a presentation or a project based on one specific effect of air pollution, eg acid rain.

For M5, learners should discuss the different solutions to reduce noise impacts, from government restrictions on flight paths to better design of engines. Examples of noise abatement measures should be explored. Evidence can be a specific case study requiring independent research, a practical noise experiment, a report or interactive presentation.

For M6, learners need to analyse and interpret the information collected for P7. Appropriate presentation of data with an explanation and discussion of the data gained in the site investigation will be required. Suggestions to improve pollution management at the site could be given in a detailed report and illustrated ICT-based presentation.

For M7, learners need to explain the roles of local and national governments and agencies in the management of pollution. This can be linked to P8 and can be assessed in a similar way or as a role play of a planning inquiry or a media interview with a senior official about a serious pollution incident.

For D1, learners need to evaluate the importance of man on the balance of greenhouse gases in the atmosphere and relate this to the concept of global warming and climate change. Learners must show an understanding of how human activity affects natural cycles, processes and the concentration of different gases in the atmosphere. There should be discussion of different scenarios and recommendations of how man could change his behaviour to reduce global warming. Evidence could be in the form of a report, structured organised debate or presentation (supported by an assessor's observation record).

For D2, learners should discuss the need for stricter controls on water and air pollution in the UK. The financial burdens from more controls and regulations on business and the impact on the economy should be assessed against the improved benefits to the health and wellbeing of society and the natural environment. Evidence could be presented as a structured public debate, formal presentation or detailed report. If public debate or formal presentation are selected as assessment methods, assessors should complete appropriate observation records to confirm learners' achievement.

Criterion D3 is linked to P7 and M6. Learners need to present a detailed and valid Environmental Impact Assessment of a specific development site. Detailed analysis of the data, explanation and discussion of the issues should be included with reasoned conclusions and recommendations on how to reduce pollution hazards at the site. Evidence could be provided as a detailed report and ICT-based presentation to be given to the site owners and managers (supported by an appropriate assessor's observation record).

### Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, M1, D1, P3, M2, P4, M3	Pollution: Types and Effects	As a pollution consultant, explore the causes of water and land pollution, consequences and effects of water pollution and contaminated land, including methods of control and management.	Report. Presentation. Observation record.
P5, M4, D2, P6, M5	Air and Noise Pollution	As a planning/environmental health officer in a local council, you receive an application for a new waste incinerator/wind turbine. You need to investigate and assess the environmental impact of this development, and make recommendations to reduce potential air/noise pollution if the development is permitted.	Report. Presentations. Interviews. Observation record.

Criteria covered	Assignment title	Scenario	Assessment method
P7, M6, D3	Site Investigation	As a consultant you are asked to investigate the feasibility of developing a site. Plan and undertake a full site survey using different sampling techniques. Assess level of pollution/contamination of the site and suggest ways to ameliorate any problems in developing the site.	Practical observation and assessment. Presentation. Observation record/witness statement. Report/logbook.
P8, M7	Legislation and Roles of Authorities	As an adviser to an environmental protection action group, discuss the most important pieces of legislation relevant to the control and management of land, water, air and noise pollution. Explain the roles and duties of the various public bodies responsible for environmental protection.	Report. Leaflets. Role play/presentation. Observation record.

## Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC Environmental Sustainability sector suite. This unit has particular links with the following units in the BTEC Environmental Sustainability suite:

Level 3
Understand the Principles of Sustainable Development
Understanding Water Quality
Waste Management
Practical Chemical Analysis
Understanding Principles of Physical and Biological Environmental Processes

## Essential resources

Learners require supervised access to a selected development site that may be affected by pollution. Tutors should ensure they have the full cooperation and permission of the site manager to collect relevant data or samples (soil, water and biological monitoring). A competent risk assessment should be undertaken.

Equipment required will include normal safety gear for site investigation, for example hard hat, visibility jacket and life jackets. Learners also require a range of water quality and soil analysis equipment, for example dissolved oxygen meter, thermometer and chemical test kits, water sampling equipment, aquatic flora and fauna sampling equipment, soil sampling and testing kits, record-keeping equipment and a calculator.

Tutors delivering this unit should be competent and experienced in soil sampling and water quality management.

## Employer engagement and vocational contexts

Learners would benefit from access to a working environment. This can be achieved by creating links with environmental protection agencies, local authorities, local businesses, developers or charitable organisations which may run apprenticeship schemes. Local authorities and business education alliances can be a useful source of information. Environmental agencies, regulatory authorities and charitable organisations can often provide guest speakers to give lectures or organise educational site trips and demonstrations.

### Indicative reading for learners

#### Textbooks

Abel P – *Water Pollution Biology, 2nd Edition* (Taylor & Francis, 1996) ISBN 9780748406616

Davie T – *Fundamentals of Hydrology* (Taylor & Francis, 2002) ISBN 9780415220293

Defra – *Protecting our Water, Soil and Air* (The Stationery Office Books, 2009) ISBN 9780112432845

Defra – *Waste Strategy for England* (HMSO, 2007) EA: The Model Procedures for the Management of Land Contamination, CLR 11

Gilman K – *Hydrology and Wetland Conservation* (John Wiley & Sons, 1994) ISBN 9780471951520

Glasson J, Therivel R and Chadwick A – *Introduction to Environmental Impact Assessment* (Routledge, 2005) ISBN 9780415338363

Goudie A – *The Human Impact on the Natural Environment* (Blackwell Publishing, 2006) ISBN 9781405127042

Kerski J and Ross S – *The Essentials of the Environment* (Hodder Arnold, 2005) ISBN 9780340816325

Mason C – *Biology of Freshwater Pollution, 4th Edition* (Prentice Hall, 2002) ISBN 9780130906397

Perry J and Vanderklein E – *Water Quality: Management of a Natural Resource* (Blackwell Science, 1996) ISBN 9780865424692

Scottish Natural Heritage – *A Handbook on Environmental Impact Assessment* (Scottish Natural Heritage, 2006) ISBN 9781853974694

Stirling H – *Chemical and Biological Methods of Water Analysis for Aquaculturists* (Pisces Press, 1999) ISBN 9780952119852

#### Websites

Contaminated Land Exposure Assessment (CLEA) software and guidance	<a href="http://www.environment-agency.gov.uk/research/planning/33706.aspx">www.environment-agency.gov.uk/research/planning/33706.aspx</a>
Department for Communities and Local Government	<a href="http://www.communities.gov.uk">www.communities.gov.uk</a>
Department for Environment, Food and Rural Affairs	<a href="http://www.defra.gov.uk">www.defra.gov.uk</a>
Environment Agency	<a href="http://www.environment-agency.gov.uk">www.environment-agency.gov.uk</a>
Environment Agency: Environmental and agricultural consultancy	<a href="http://www.adas.co.uk">www.adas.co.uk</a>
Forestry Commission	<a href="http://www.forestry.gov.uk">www.forestry.gov.uk</a>
Health and Safety Executive	<a href="http://www.hse.gov.uk">www.hse.gov.uk</a>
Natural England	<a href="http://www.naturalengland.org.uk">www.naturalengland.org.uk</a>
NetRegs	<a href="http://www.netregs.gov.uk">www.netregs.gov.uk</a>
Nutrient Management	<a href="http://www.nutrientmanagement.org">www.nutrientmanagement.org</a>

Severn Trent Water	<a href="http://www.stwater.co.uk">www.stwater.co.uk</a>
Sustainable Development Commission	<a href="http://www.sd-commission.org.uk">www.sd-commission.org.uk</a>
Thames Water	<a href="http://www.thameswater.co.uk">www.thameswater.co.uk</a>
United Kingdom Pollutant Release and Transfer Register (UK PRTR)	<a href="http://prtr.defra.gov.uk">prtr.defra.gov.uk</a>
UK Royal Commission on Environmental Pollution	<a href="http://www.rcep.org.uk">www.rcep.org.uk</a>
Waste and Resources Action Programme	<a href="http://www.wrap.org.uk">www.wrap.org.uk</a>
Waste Directory	<a href="http://www.wasterecycling.org.uk">www.wasterecycling.org.uk</a>
Water operators	<a href="http://www.water.org.uk/home/resources-and-links/links/water-operators">www.water.org.uk/home/resources-and-links/links/water-operators</a>
Water Services Regulation Authority	<a href="http://www.ofwat.gov.uk">www.ofwat.gov.uk</a>
World News Network on pollution	<a href="http://www.pollution.com">www.pollution.com</a>

### **Journals**

*Farmers Guardian*

*International Journal of Water (IJW)*

*Journal of Environmental Science and Health*

*Water Environment Research*

## Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
<b>Independent enquirers</b>	discussing human and natural factors that affect climate change
<b>Creative thinkers</b>	discussing the major environmental impacts of pollution
<b>Reflective learners</b>	collecting relevant information from a development site
<b>Team workers</b>	collecting relevant information from a development site.

Although PLTS are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
<b>Creative thinkers</b>	asking questions and suggesting ways to improve detection and monitoring of pollution assessing changes which can be made to prevent different types of pollution
<b>Reflective learners</b>	evaluating completed work and the environmental impact of pollution suggesting improvements to techniques and site management
<b>Team workers</b>	carrying out joint projects, gathering evidence and analysing results.



## ● Functional skills – Level 2

Skill	When learners are ...
<b>ICT – using ICT</b>	
Select, interact with and use ICT systems safely and securely for a complex task in non-routine and unfamiliar contexts	researching legislation via the internet
<b>ICT – developing, presenting and communicating information</b>	
Enter, develop and refine information using appropriate software to meet requirements of a complex task	presenting data and reports
Use appropriate software to meet the requirements of a complex data-handling task	collecting, analysing and recording data from fieldwork investigations
Combine and present information in ways that are fit for purpose and audience	researching and comparing data on water quality, air quality, pollution incidents analysing and displaying data preparing presentations
<b>Mathematics – representing</b>	
Understand routine and non-routine problems in familiar and unfamiliar contexts and situations	using calculations in the analysis of water and soil samples
Identify the situation or problems and identify the mathematical methods needed to solve them	using formulae and percentages to calculate effluent discharges, concentration of gases and pollutant chemicals in water
Choose from a range of mathematics to find solutions	analysing data
<b>Mathematics – analysing</b>	
Apply a range of mathematics to find solutions	analysing data
<b>Mathematics – interpreting</b>	
Interpret and communicate solutions to multistage practical problems in familiar and unfamiliar contexts and situations	analysing data
Draw conclusions and provide mathematical justifications	analysing data.

Skill	When learners are ...
<b>English – Speaking, Listening and Communication</b>	
Make a range of contributions to discussions in a range of contexts, including those that are unfamiliar, and make effective presentations	giving presentations and contributing to group discussion
<b>English – Reading</b>	
Select, read, understand and compare texts and use them to gather information, ideas, arguments and opinions	reading relevant legislation
<b>English – Writing</b>	
Write a range of texts, including extended written documents, communicating information, ideas and opinions, effectively and persuasively	completing reports and environmental assessments