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# Edexcel BTEC Levels 4 and 5 Higher National units in Horticulture

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# Unit 1: Principles of Plant and Soil Science

Unit code: H/503/1051

Level: 5

Credit value: 15

- Aim

This unit will develop learners' understanding of plant and soil science, including how plant cells, tissues and organs are organised and their function and the processes involved. Learners will develop their understanding of soil and other media and how they relate to plant production and management.

- Unit abstract

This unit covers key ideas and concepts that are essential for a career in horticulture or the related sectors. Learners will develop their understanding of plant biology and the soil requirements needed for plant growth. They will explore the essential ideas needed in understanding plants and plant growth. They will undertake laboratory work to investigate plant physiology.

Learners will research the different media available and the requirements of each plant and the develop the ability to make educated decisions on plant feeding, mulching and specific mineral requirements at different times of the year.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand plant structures in terms of their functional significance
- 2 Understand physiological processes in plants
- 3 Understand the relationship between plant growth and the properties of soil and growing media
- 4 Understand the properties of soil and growing media.

## Unit content

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### 1 Understand plant structures in terms of their functional significance

*Structure and function:* anatomy; morphology; growth and function of plant cells, tissue and organs; root/shoot relationships; hormonal control of whole plant growth and development; identification features; exploitation of natural growth and development in industry

### 2 Understand physiological processes in plants

*Physiological processes:* cell division; photosynthesis; respiration; tropisms; water relations eg transpiration, osmosis; nutrient function in plants and their absorption; short- and long-distance transport systems within plants

*Processes:* experimentation and evaluation of the results eg nitrogen fixation experiments, photosynthesis measurements using an O<sub>2</sub> sensor, respiration measurements using an O<sub>2</sub> sensor, Mitosis observation using garlic root and a microscope, various data logging experiments

### 3 Understand the relationship between plant growth and the properties of soil and growing media

*Soil:* formation; biological properties eg micro flora and macro fauna; chemical properties eg mineral matter, colour; profiles, soil and land classification and mapping, soil as a rooting medium, colloids and their effects on the properties of soils and other rooting media; nutrient holding capacity; ease of cultivation

### 4 Understand the properties of soil and growing media

*Management:* properties (soil water management; principles of irrigation and drainage; colloids and plant nutrient availability, soil structure)

*Alternative media:* growing media other than soils eg hydroponics, nutrient film technique, open systems, closed systems; ingredients of soil-based and soil-less mixes, their physical and chemical properties, water and mineral nutrient management

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand plant structures in terms of their functional significance	1.1 examine the structure, morphology and main identification features of key plants 1.2 explain the significance of plant structures from cell to whole plant level in relation to their use in a selected land-based industry 1.3 relate plant development to key factors of importance in plant production for a selected land-based industry
LO2 Understand physiological processes in plants	2.1 perform suitable laboratory experiments to investigate the principles of plant physiology 2.2 evaluate the results of laboratory experiments with accuracy 2.3 explain the fundamental processes by which plants acquire energy and mass 2.4 relate physiological processes to the practice of plant production
LO3 Understand the relationship between plant growth and the properties of soil and growing media	3.1 examine the major physical, chemical and biological properties of soil which influence plant growth 3.2 analyse processes of soil formation and landform development 3.3 examine the mechanisms by which soils retain and release nutrients to plants
LO4 Understand the properties of soil and growing media	4.1 relate the properties of soils to their management for plant production and/or habitat management 4.2 critically evaluate the physical and chemical properties of soil-less growing media for use in plant production

## Guidance

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### Links

This unit links to other units in the specification for example *Unit 2: Work-based Experience*, *Unit 3: Project Management for Land based Industries*, *Unit 7: Plant Environmental Adaptation and Physiology*, *Unit 8: Plant Selection and Establishment*, *Unit 10: Biological Principles* and *Unit 14: Nursery Stock Production*.

### Essential requirements

Library resources such as plant and soil science textbooks should be available to enable learners to achieve this unit. It is essential that the learner is able to relate the concepts learnt in the field. Therefore theory sessions must be backed up by a minimum of 20 hours' practical work in laboratory and field and, where appropriate, greenhouse or nursery situations. Plant and soil analyses facilities should be available for the duration of the study period. Practical work must

be carried out in appropriately equipped laboratories and in field situations where plants are produced for different purposes.

### Employer engagement and vocational contexts

Learners would benefit from having access to a working environment. Often this is achieved through creating links with local businesses or charitable organisations who may benefit from taking on learners. Local nurseries and plant associations are a great source of information and are often very keen to share knowledge with learners. Business education alliances can also prove useful. Charitable organisations can often provide guest speakers to give lectures and demonstrations.

## Unit 2: Work-based Experience

Unit code: A/601/0328

Level: 5

Credit value: 15

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- **Aim**

This unit aims to enable learners to experience the scope and depth of learning which takes place in a work-based context by planning, monitoring and evaluating work experiences.

- **Unit abstract**

A significant amount of learning can be achieved by carrying out practical activities in a workplace. Learning may be enhanced by taking a more formal approach to work-based activities – by planning, carrying out the activities and reflecting on the benefits of the activities to the organisation, business and learner.

Learners will have the opportunity, supported by their supervisors, to negotiate and perform activities which will enable them to achieve work related understanding and skills. They will recognise the scope of what they have achieved by recording evidence of carrying out different activities. Learners will gain maximum benefit by reflecting on, and evaluating of, the work they undertake.

- **Learning outcomes**

**On successful completion of this unit a learner will:**

- 1 Be able to negotiate industry experience
- 2 Understand the specific requirements of the placement
- 3 Be able to undertake work experience as identified
- 4 Be able to monitor and evaluate own performance and learning.

## Unit content

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### 1 Be able to negotiate industry experience

*Suitable organisation and location:* types of establishments for placement eg industry-related work for a client brief at college, existing work environment, different department within current employer's business; other appropriate industry-related organisations or businesses

*Negotiation:* methods of contacting organisations; methods of undertaking negotiations

*Nature of duties:* type of undertaking eg routine duties and tasks, project work, development of new procedures/protocols

*Supervisors:* roles and responsibilities of academic and industrial mentors

*Expectations of learning:* aims eg proficiency in new tasks and procedures, time management and problem-solving skills; reflection; discussing progress with others; teamwork

*Business constraints:* consideration of possible limitations eg need to be fully trained, adherence to quality systems, health and safety considerations, supervision time, workload, customer satisfaction, limited staffing, cost of materials

### 2 Understand the specific requirements of the placement

*Tasks:* details of activities eg specific hourly, daily, weekly routine and non-routine tasks; breakdown of a project into stages; new procedures/protocols; adherence to health and safety practices

*Prioritise:* reasons for rationalising the order of tasks; methods of prioritising work

*Plan for the work experience:* methods used to develop detailed plan with schedule of tasks; proposed dates for reviews; expected input from supervisors

*Benefits to organisation and learner:* advantages to business eg allowing more routine tasks to be carried out, allowing procedures/techniques to be developed, increasing responsiveness, identifying cost saving measures; advantages to learner eg understanding how a business operates, understanding importance of teamwork, learning new techniques, development of problem-solving and time management skills

### 3 Be able to undertake work experience as identified

*Carry out the planned activities:* realisation eg carrying out tasks and project work according to relevant legislation, training, health and safety measures and codes of practice; developing new procedures or protocol

*Record activities in the appropriate manner:* systematic and appropriate recording of relevant activities eg logbook, diary, portfolio, spreadsheets, databases; list of resources

*Revise the initial plan as required:* methods used to review activities at the appropriate time to see if they meet requirements; make alterations as needed

#### 4 Be able to monitor and evaluate own performance and learning

*Evaluation of the quality of the work undertaken:* meeting industry standards and evaluating own performance against original proposal; comments/testimony from supervisors; adherence to health and safety measures

*Account of learning during the work experience:* details of experience gained eg new procedures, interpersonal skills, time management, problem solving, teamwork; details of evidence eg portfolio of evidence, scientific report, management report

*Recommendations on how the learning experience could have been enhanced:* alternative ideas eg different location(s), different brief, different time period, more/less support, better time management, better preparation

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Be able to negotiate industry experience	1.1 research and evaluate suitable organisations that could provide industry experience 1.2 negotiate with work and academic supervisors a proposal for the work experience 1.3 recognise the business constraints on the work experience offered
LO2 Understand the specific requirements of the placement	2.1 agree and prioritise the tasks and responsibilities involved in the work experience 2.2 produce a plan for the work experience 2.3 analyse the benefits of the proposed activities to the business and the learner
LO3 Be able to undertake work experience as identified	3.1 fulfil specified requirements of placement conforming to all related codes of practice 3.2 produce systematic records of work undertaken 3.3 revise the initial plan as required 3.4 make suggestions for improvement and review these with appropriate supervisor
LO4 Be able to monitor and evaluate own performance and learning	4.1 monitor progress against original proposal 4.2 evaluate the quality of own performance 4.3 analyse the learning which has taken place during the work experience using suitable reflections 4.4 make recommendations on how the experience could have been enhanced

## Guidance

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### Links

This unit has obvious links with others in this subject area such as *Unit 3: Project Management for Land-based Industries*, *Unit 30: Business Environment* and *Unit 31: Small Business Enterprise*. There may also be scope for *Unit 6: Research Project* to be undertaken in collaboration with placement providers to further enhance the learner's experience and prospects for employment.

### Essential requirements

Learners must undertake a minimum of 450 hours work experience in a professional work environment. Given the work-based nature of the unit, the majority of resources used will be those available to the learner in the workplace. Work will normally be planned to be achievable within the resource constraints of the employer. Therefore knowledge of company structures and daily routines and expectations is essential.

Learners should have access to a wide range of research facilities including careers library and/or careers services.

Tutor support and guidance are essential. Learners should remain in contact with tutors during their work experience – email is a good way but some centres may have access to a virtual learning environment where learners can share information and experiences with each other and the tutor.

### Employer engagement and vocational contexts

Learners might find it beneficial to describe their placement experiences to peers on completion. Whether this is informal, or as part of an assessment, hearing about each other's placements will broaden the vocational context of the programme area for all learners. Learners may also wish to collect photographs, videos and other materials whilst undertaking their placements to enhance their presentations.

The unit is designed to allow flexibility of study for part-time and full-time learners. It is expected that learners will be supervised in the workplace in addition to the supervision provided by their centre supervisor.



## Unit 3: Project Management for Land-based Industries

Unit code: K/503/1052

Level: 4

Credit value: 15

- Aim

The aim of this unit is to equip learners with the understanding and practical experience to identify, develop and contribute to the management of projects developed to support organisational and commercial initiatives by planning, recording and monitoring all aspects of projects.

- Unit abstract

At this level, it is imperative that learners are able to successfully manage projects within their chosen land-based sector or industry. Not only does this prepare learners for management level employment, but it also enables them to gain the necessary skills that will equip them for future employment such as planning, overseeing, recording, analysing and monitoring projects, all of which are as transferable skills.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the appropriate characteristics of projects that can be applied to land-based industries
- 2 Be able to generate project plans that can be applied to identified requirements and needs
- 3 Be able to implement planning, recording and reporting strategies
- 4 Understand approaches to monitoring activities that ensure effective delivery.

## Unit content

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### 1 Understand the appropriate characteristics of projects that can be applied to land-based industries

*Characteristics:* organisational needs and abilities; goals; determining appropriate goals for the organisational needs; functions of the project; how to assess the functions; products of the project; essential personnel involved in the project; land-based organisations and their values and how these are achieved; organisational staffing; selection of group to be involved in the project

*Features:* features of the project environment (audience, market, compatibility with local environment, effect on habitats and species, stakeholders, affected personnel); baseline assessment of attributes of features; relationships between internal and external stakeholders eg partners steering groups, project team, volunteers, contractors; organisational structures for managing a project

*Influencing factors:* social; financial; environmental; political; factors affecting target condition; ability to influence factors; identification and qualification of project activity

### 2 Be able to generate project plans that can be applied to identified requirements and needs

*Objectives:* developing and determining objectives appropriate to the project; local and environmental factors; generating work programmes and their influences; sequencing project activities; techniques for identifying essential activities

*Resource acquisition:* cost estimation; financial breakdown of project; funding/finance (sources, procurement); cost cutting; influences on cost of project; contingencies; how to propose cost estimation to personnel involved with funding (stakeholders, audience and organisations); methods of acquiring funding for the project

### 3 Be able to implement planning, recording and reporting strategies

*Planning activities:* breakdown of project into sections; storage and retrieval systems; identifying and analysing existing work methods; specifying new methods and their validity; resource requirements; accessing resources; operational/organisational guidelines

*Recording systems:* techniques for recording activities and outcomes; assessing and evaluating activities (qualitative and quantitative)

*Reporting information:* internal and external reporting of outcomes and progress; communication and disseminating successful and unsuccessful outcomes; methods of communication appropriate to audience; (wider audience, iterative/summative, various media)

#### 4 Understand approaches to monitoring activities that ensure effective delivery

*Risk management:* robust risk management implementation; risk register; effective prioritisation of tasks

*Adaptive management:* learning culture; planning and reviewing; feedback from activities; from feature attributes

*Performance and target condition indicators:* key indicators; concepts; target condition indicators; selection criteria for identification and use of indicators

*Protocols:* monitoring performance (technical, social, economic); monitoring target conditions (socio-economic, ecological); assessment; analysis and interpretation of activity performance and impact; trend analysis

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand the appropriate characteristics of projects that can be applied to land-based industries	1.1 explain the relationship between organisational needs and abilities, and project goal(s), functions and products 1.2 determine appropriate features of the project environment 1.3 analyse a project's ability to influence factors affecting a target condition 1.4 explain the relationships between internal and external stakeholders for project management
LO2 Be able to generate project plans that can be applied to identified requirements and needs	2.1 generate an appropriate objective and work programme to meet a specified target condition 2.2 propose an appropriate cost estimate for conducting a programme of work
LO3 Be able to implement planning, recording and reporting strategies	3.1 assemble an effective specification for a practical work activity 3.2 record the outcomes of a completed work activity 3.3 interpret the outcomes of a completed work activity 3.4 present valid information regarding the outcomes of successful and unsuccessful project activities
LO4 Understand approaches to monitoring activities that ensure effective delivery	4.1 examine the importance of robust risk management for projects 4.2 explain the process of adaptive management 4.3 justify the selection of performance and target condition indicators 4.4 evaluate activities selected to monitor performance and target indicators

## Guidance

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### Links

This unit introduces learners to managing projects in the land-based industries and therefore has links to the following units in this qualification:

- *Unit 2: Work-based Experience*
- *Unit 6: Research Project*
- *Unit 30: Business Environment*
- *Unit 31: Small Business Enterprise.*

### Essential requirements

Learners must have access to the internet and spreadsheet and word-processing facilities. Access to well-stocked, recent literature on project management must be available.

### Employer engagement and vocational contexts

Learners should discuss their work with real project managers to enhance their understanding of the methods and techniques necessary for managing a land based project.

Learners would benefit from being involved in running an actual or simulated project, for example a fund-raising event for a charity or for the centre. This could involve learners planning and pitching the project to the centre's staff or personnel, achieving funding for the project, carrying it out and then analysing the final project.

It would also benefit learners if they had the opportunity to evaluate and analyse other projects, whether carried out in the centre or at a different location, and then feed this information back to an appropriate audience.

Visiting speakers from charities and companies in the land-based sector could be useful.



## Unit 4: Enterprise and Financial Management for Land-based Industries

Unit code: M/503/1053

Level: 5

Credit value: 15

- Aim

This unit aims to develop understanding of the management of land-based industries, as learners plan and evaluate business performance.

- Unit abstract

This unit allows learners to understand concepts of the management of the land-based business, from the performance at enterprise level through to overall financial performance and stability of an entire business.

Learners will identify sources of finance and learn how management principles can be used to analyse, organise, plan and control the business. The techniques used will be referred to in the context of the latest business and environmental initiatives.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand sources of finance available for land-based businesses
- 2 Understand principles of land-based business and resource management
- 3 Understand the management of physical and financial information in order to control the performance of land-based businesses
- 4 Be able to plan and evaluate the performance of a land-based business.

## Unit content

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### 1 Understand sources of finance available for land-based businesses

*Sources:* proprietor's capital; retention of profits; creditors; grants and loans; the use of different sources to meet business needs; membership subscriptions; charitable donations

*Capital cycle:* retained profit; allowance for finance charges; capital repayments; taxation, drawings; repayment of creditors' capital; relationships between the trading profit, net profit, continued growth in capital

*Sources of credit:* long-term, medium-term, short-term finance; purpose of loans; criteria for each loan type; repayment terms; security; relevant finance organisations eg Agricultural Mortgage Corporation (AMC) ; Leasing; Eurocurrency; Syndicate Credit Schemes

*Interest rate protection:* hedging; level of protection; risk analysis; fixed interest rate products; option-based products; cost of protection

### 2 Understand principles of land-based business and resource management

*Resources:* land; labour; capital and finance

*Principles:* effective use of the resources; identification and application of good husbandry; best practice

*Environmental issues:* sustainability; waste disposal; energy use; recycling; welfare and traceability

*Objectives:* strategic, eg longer term, vision/mission; business structure, future direction

*Planning cycles:* making plans, making decisions, monitoring and controlling, evaluation of plans against objectives set for the business, SMART targets

### 3 Understand the management of physical and financial information in order to control the performance of land-based businesses

*Physical information:* performance records; employee records; health and safety records, legal and statutory records, visual records eg maps, plans etc, maintenance records

*Financial information:* sales and purchase records; quotes; financial monitoring records

*Procedure:* office; storage and retrieval; accuracy; legal constraints; Data Protection Act 1998; role of computers and available software

*Performance factors:* physical eg quality, growth rates, response to treatments; quality factors eg weights, food conversion ratio, mortality, birth data, feeding rates, feed inputs

*Financial indicators:* eg added value, quality and value, market, subsidies, replacement costs, cost of inputs, quality of inputs, variable cost analysis and comparison

*Analysis and evaluation:* enterprise studies; gross margins; comparative analysis; bench marking

**4 Be able to plan and evaluate the performance of a land-based business**

*Performance:* physical and financial

*Factors affecting viability:* tax status; profitability; feasibility; competitors; consumer demands; economic climate

*Future planning:* SWOT analysis; resource limitations; competencies and capabilities; institutional limits and financial restrictions

*Planning methods:* core competency analysis; cash flow; variance analysis; capital investment; appraisal methods; labour and machinery planning methods; succession planning

*Evaluate financial structure:* balance sheet analysis; stability; viability; ratios; liquidity; gearing; landlord and tenant's capital; rate of return

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand sources of finance available for land-based businesses	1.1 evaluate different sources and uses of business capital 1.2 assess how the capital cycle operates in two land-based businesses 1.3 examine sources of credit in relation to a given business 1.4 assess methods available to provide a business with interest rate protection
LO2 Understand principles of land-based business and resource management	2.1 examine resources available to a given land-based business 2.2 explain environmental issues surrounding the use of resources in a business 2.3 define the role of objectives in the strategic development of a business 2.4 evaluate the objective planning cycle for a given business
LO3 Understand the management of physical and financial information in order to control the performance of land-based businesses	3.1 evaluate physical and financial information 3.2 examine the management of information utilised within a business 3.3 evaluate the performance factors which highlight the efficiency of an enterprise 3.4 critically evaluate the performance of a business: <ul style="list-style-type: none"> <li>• physical information</li> <li>• quality processes</li> <li>• financial indicators</li> </ul>
LO4 Be able to plan and evaluate the performance of a land-based business	4.1 assess factors affecting the viability of a business 4.2 relate past business performance to future planning 4.3 use planning methods to establish resources and develop business opportunities 4.4 evaluate the financial structure of the business

## Guidance

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### Essential requirements

Resources should include visits and case studies based on a variety of businesses, appropriate management software, industrial representatives for additional input and access to the internet.

Guest speakers from the land-based Industry could offer an insight into relevant business practices. This would help to contextualise the unit and current issues facing the industry.

Learners must keep up to date with any current issues that influence business management within land-based industries. They must be encouraged to engage in regular research through a variety of sources, eg reading quality newspapers and industry specific journals, watching TV news and current affairs programmes.

### Employer engagement and vocational contexts

A team of employers could be identified to help to support delivery of this unit. Employers could help tutors with, for example, the planning of programmes of learning, visits, guest speakers and mentors. They could also help to design assessment activities

The delivery of this unit would be enhanced by employer engagement involving, for example, employers with knowledge of business management (eg relating to a real organisation that the learner may research/visit where they carry out work experience).

The learning experience would be enhanced if theory is applied to a local business with which the learner can engage. For example the learner can complete a SWOT analysis for this business to help them inform future decisions.



## Unit 5: Human Resource Management

Unit code: K/601/1264

Level: 4

Credit value: 15

- Aim

The aim of the unit is to provide an understanding of the personnel function of management through the consideration of systems and frameworks which create and sustain the employment relationship within the organisation.

- Unit abstract

Human resources are the most important investment any business or organisation can make. The efficient and effective management of these resources is vital to the success of any enterprise. This unit will enable learners to understand the principles and practices of modern human resource management, including the recruitment, selection and retention of staff. Through the study of local land-based enterprises, learners will also be able to appreciate the impact of human resource management on workplace culture and practices.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the difference between personnel management and human resource management
- 2 Understand how to recruit employees
- 3 Understand how to reward employees in order to motivate and retain them
- 4 Know the mechanisms for the cessation of employment.

## Unit content

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### 1 Understand the difference between personnel management and human resource management

*The role and function of human resource management:* models of personnel management – Tyson and Fell; personnel as a specialist function; personnel policies, strategies and operating plans; personnel roles and responsibilities (manager, supervisor, worker); contribution to organisational purposes

*Legal and regulatory framework:* the influence of relevant national and international legislation; the influence of relevant codes of practice

### 2 Understand how to recruit employees

*Human resource planning:* definition; reasons for; processes; limiting factors in the land-based sector; stages of planning human resources

*Recruitment and selection:* legislative framework; recruitment policy; recruitment procedure; job analysis and description; personnel specification; recruitment methods and media; selection methods and procedures; offers of employment; evaluation and comparison of processes

### 3 Understand how to reward employees in order to motivate and retain them

*Performance appraisal:* purpose of appraisal; team appraisal; individual appraisal; appraisal procedures and techniques; the appraisal interview; following up appraisals; influence on remuneration

*Reward management:* motivational and reward theory; purpose and methods within a land based enterprise; factors determining pay; payment system; incentive schemes; legislative framework on pay and benefits; effectiveness of different reward systems

*Discipline and grievance procedures:* definition; model disciplinary procedure; ACAS code of practice; disciplinary interviews; grievance procedures; evaluating effectiveness of procedures

*Human resource management information systems:* personnel records and statistics; the use of statistics; computerised systems; legislative framework eg Data Protection Act (1984)

### 4 Know the mechanisms for the cessation of employment

*The legal framework on employment protection:* dismissal – wrongful, unfair and justified; role of industrial tribunals; impact of legal and regulatory framework

*Termination of employment:* reasons eg retirement, resignation, termination of contract

*Exit procedures in land-based enterprises:* procedure for dismissal; notice of dismissal; exit interviews; counselling and re-training; evaluation and comparison of procedures

*Redundancy:* definition; legislative framework; selection for redundancy; procedures for handling redundancy; dealing with redundancy – outplacement, redeployment, retraining

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand the difference between personnel management and human resource management	1.1 distinguish between personnel management and human resource management 1.2 assess the function of human resource management in contributing to organisational purposes 1.3 evaluate the role and responsibilities of line managers in human resource management 1.4 analyse the impact of the legal and regulatory framework on human resource management
LO2 Understand how to recruit employees	2.1 analyse the reasons for human resource planning in organisations 2.2 outline the stages involved in planning human resource requirements 2.3 compare the recruitment and selection procedures used for two different organisations 2.4 evaluate the effectiveness of the recruitment and selection techniques in two organisations
LO3 Understand how to reward employees in order to motivate and retain them	3.1 assess the link between motivational theory and reward 3.2 evaluate the process of job evaluation and other factors determining pay 3.3 assess the effectiveness of reward systems in different contexts 3.4 examine the methods organisations use to monitor employee performance
LO4 Know the mechanisms for the cessation of employment	4.1 identify the reasons for cessation of employment with an organisation 4.2 describe employee exit procedures used by two organisations 4.3 consider the impact of the legal and regulatory framework on employment cessation arrangements

## Guidance

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### Links

This unit links with the following units:

- *Unit 4: Enterprise and Financial Management for Land-based Industries*
- *Unit 30: Business Environment*
- *Unit 31: Small Business Enterprise*
- *Unit 34: Land-based Business Planning.*

This unit maps with the Horticulture Management National Occupational Standards:

- D3: Recruit, select and keep colleagues.

### Essential requirements

In order to meet the assessment criteria, learners will require access to a variety of up-to-date texts, journals and papers on the principles and practices of human resource management. Learners will also require access to the current national and international legislation and codes of practice relating to all aspects of human resource management. Learners must study at least one land-based enterprise when meeting the assessment criteria.

### Employer engagement and vocational contexts

Centres delivering this unit will need links with local land-based industries. Such links could facilitate learners investigation of the working culture and practices within the sector and to identify and evaluate specific recruitment and retention issues in their local area.

Links with national and international professional bodies such as the Society of Human Resource Management and the Chartered Institute of Personnel and Development will help learners to access current developments within the land-based industries.

## Unit 6: Research Project

Unit code: K/601/0941

Level: 5

Credit value: 20

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- Aim

This unit aims to develop learners' skills of independent enquiry and critical analysis through undertaking a sustained research investigation of direct relevance to their higher education programme and professional development.

- Unit abstract

In this unit learners will conduct an in-depth investigation into an aspect of their programme of study. This research may be developed from elements of the programme linked to the learner's individual interests or to areas where they may wish to seek future employment.

Completion of this unit will enhance learners' understanding of the techniques used in the formulation of research projects, typical research methodologies and formats of presentation. Whether the methodology is experimental, observational and/or involves the collection of data from other sources, it will enable the production of significant primary data and encourage learners to be innovative.

This unit will also develop transferable skills in areas such as planning, data collation and handling, data analysis, working safely and communication skills in aspects such as report writing and data presentation.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand how to formulate a research specification
- 2 Be able to implement the research project within agreed procedures and to specification
- 3 Be able to evaluate the research outcomes
- 4 Be able to present the research outcomes.

## Unit content

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### 1 Understand how to formulate a research specification

*Formulate research specifications:* rationale for project selection; aims and objectives; research questions and formulation of hypotheses; limitations

*Factors affecting selection:* methodology for data collection and analysis; literature review; critique of references from primary sources eg pilot studies, questionnaires, interviews; secondary sources eg books, journals, internet; scope and limitations; implications eg equipment and resources, health and safety considerations in practical work – potential hazards, assessment of risk, procedures for minimisation of risk

*Critical review:* access to key secondary texts, websites and other information sources

*Project specification:* suitability; skills and knowledge to be gained; aims and objectives; terms of reference; duration; ethical issues; type of research eg qualitative, quantitative, systematic, original; methodology; resources; statistical analyses; validity; reliability; control of variables; sources of error

*Research plan:* rationale for research questions or hypotheses; milestones; task dates; review dates; monitoring/reviewing process; strategy

### 2 Be able to implement the research project within agreed procedures and to specification

*Implement:* according to research design and method; health and safety equipment and procedures; test research hypotheses; consider test validity; reliability

*Data collection:* selection of appropriate tools for data collection; types eg qualitative, quantitative; systematic recording; methodological problems eg bias, variables and control of variables; required repetitions, if appropriate, to establish reproducibility; reliability and validity; correct use of appropriate units

*Data analysis and interpretation:* qualitative and quantitative data analysis – interpreting transcripts; coding techniques; specialist software; statistical tables; comparison of variable; trends; forecasting

### 3 Be able to evaluate the research outcomes

*Results:* establish validity; use of correct statistical techniques; sources of error identified

*Evaluation of outcomes:* overview of the successes and failings of the research project's processes and findings eg planning, aims and objectives, evidence and findings, validity, reliability, benefits, difficulties, conclusion(s)

*Implications for future research:* significance of research investigation; application of research results; implications; limitations of the investigation; improvements; recommendations and suggested areas for future research

#### 4 Be able to present the research outcomes

*Format:* professional delivery format appropriate to the audience; use of appropriate media

*Written structure:* report conforms to appropriate academic format eg includes an abstract introduction, literature review, methodology, results, discussion, conclusion; references in appropriate format

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Understand how to formulate a research specification	1.1 formulate and record possible research project outline specifications 1.2 identify the factors that contribute to the process of research project selection 1.3 undertake a critical review of key references 1.4 produce a research project specification 1.5 provide an appropriate plan and procedures for the agreed research specification
LO2 Be able to implement the research project within agreed procedures and to specification	2.1 match resources efficiently to the research question or hypothesis 2.2 undertake the proposed research investigation in accordance with the agreed specification and procedures. 2.3 record and collate relevant data where appropriate
LO3 Be able to evaluate the research outcomes	3.1 use appropriate research evaluation techniques 3.2 interpret and analyse the results in terms of the original research specification 3.3 make recommendations and justify areas for further consideration
LO4 Be able to present the research outcomes	4.1 use an agreed format and appropriate media to present the outcomes of the research to an audience

## Guidance

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### Links

This unit could offer links with several other units from the specification depending upon the research project undertaken and the learners' individual interests. *Unit 33: Research Methods for Land-based Industries* is not an essential pre-requisite for undertaking this unit, but learners may benefit from its previous completion.

### Essential requirements

Access to library resources appropriate to independent academic research at this level is essential. Learners will also need access to the internet and IT facilities, complete with statistical and presentational software packages.

Learners must agree the use of resources with their supervisors to ensure that appropriate apparatus/equipment, training, health and safety considerations and permissions are all in place before beginning any practical activities.

### Employer engagement and vocational contexts

Depending on the individual learner's interests and choice of research project, it may be possible for them to undertake research in conjunction with a business, organisation and/or work experience provider. This could enhance the learning experience by increasing the relevance of the research and improving a learner's employability skills.



## Unit 7: Plant Environmental Adaptation and Physiology

Unit code: T/503/1054

Level: 5

Credit value: 15

- Aim

This unit introduces the learner to the main physiological processes that occur within a typical mesophytic plant and how these are adapted to allow survival of the xerophytic and hydrophytic plant species.

- Unit abstract

Life on Earth is amazing and diverse. Over millions of years plants and animals have evolved and adapted to the environments they find themselves in. Plants have taken this to the extreme and have adapted to areas that even humans struggle to survive in. In the Mojave desert, south-eastern California the creosote bush has leaves coated in resin which prevent water loss in the heat of the day. The resin also protects the plant from being eaten by animals. Many also believe it produces a toxic substance to keep away other plants and inhibit their growth! At the other extreme, aquatic plants such as kelp have adapted to gain as much light for photosynthesis as possible by developing floats or air-filled bladders that lift the stem and blades towards the surface. Kelp has also developed a strong holdfast adhesive to anchor itself in place.

This unit allows the learner to explore the lives of desert, aquatic and terrestrial plants, their anatomy, adaptation and use.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand plant anatomy in relation to the physiological processes
- 2 Understand plant adaptation to extreme habitats
- 3 Be able to investigate use of plants in environmental restoration
- 4 Understand the use of plant types in local re-vegetation and habitat maintenance.

## Unit content

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### 1 Understand plant anatomy in relation to the physiological processes

*Root structure:* cell types and cellular arrangements; function of cell types in relation to the structure; water and mineral uptake and pathways followed; soil plant water relations

*Stem structure:* cell types and cellular arrangements; functions of cell types in relation to function; specific mechanisms of transportation

*Leaf structure:* cellular arrangements in relation to functional capacity in terms of optimising photosynthesis; leaf morphology

### 2 Understand plant adaptation to extreme habitats

*Xerophytic adaptations:* comparative anatomy and physiology of the root, stem and leaf structures; changes that result in physiological pathways

*Hydrophytic adaptations:* comparative anatomy and physiology of the root, stem and leaf structures; changes that result in physiological pathways

*Identification:* classification taxonomy; classification keys eg dichotomous keys; use of the range and variation of plant anatomical arrangement; variety of plant types

### 3 Be able to investigate use of plants in environmental restoration

*Restoration:* site assessment inclusions eg soil sampling, toxicology, drainage; factors affecting typical soil and native plant species choice; community/public use of site post-restoration; maintenance requirements; typical plant species indigenous to the area; plant interrelations; long-term survival for biodiversity establishment; use of plant species for rectifying sites eg toxicity, harmful runoff etc; use of indicator species

### 4 Understand the use of plant types in local re-vegetation and habitat maintenance

*Physical and practical factors:* the plant species that are used and maintained within an area should be included on merit of environmental survival; physical factors eg drainage, weathering, general climatic fluctuations, soil characteristics and surrounding foliage type; variety of habitat types; practical factors eg soil chemistry, size of site, colour, scent, cost; theoretical interpretations of different maintenance techniques for different site types eg SSSI, natural re-vegetation site etc

*Conservation and biodiversity:* policies of alternative site use; the interaction of standard farm practices with habitat creation and maintenance eg hedgerows, aquatic areas, SSSI; incentives available to create and maintain sites; personnel skills and educational aspects; the use of sites in local authority research

*Plant genetics and habitats:* the interrelationship of natural and modified species and the effect it may have on the natural population of plant species in terms of interbreeding and species dominance; genetic diversity of an area; genetics for construction eg increasing diversity, genetic modification to improve survival etc; genetics for deterioration eg reduced variation, inbreeding, links to fragmentation, reduced population size and isolation

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand plant anatomy in relation to the physiological processes	1.1 explain the functions of different root types and structures 1.2 examine the functions of stem structure 1.3 explain the functions of leaf form and structure
LO2 Understand plant adaptation to extreme habitat type	2.1 explain xerophytic adaptation to habitat in comparison with the mesophytic plant form 2.2 explain hydrophytic adaptation to habitat in comparison with the mesophytic plant form 2.3 classify a range of plants using binomial keys
LO3 Be able to investigate use of plants in environmental restoration	3.1 explain the methodologies implemented in the restoration of mineral working waste lands 3.2 determine methodologies for the production of water habitat types for species diversity and public enjoyment 3.3 analyse the restoration requirements for a site with erosion symptoms as a result of human influence 3.4 propose schemes for the restoration, or regeneration, of a local site using appropriate plant species 3.5 determine indicator species for selected habitat types
LO4 Understand the use of plant types in local re-vegetation and habitat maintenance	4.1 examine physical and practical factors which need to be taken into account when selecting plants for a range of sites 4.2 determine the role of conservation and management in enhancing indigenous biodiversity for given sites 4.3 assess the role of plant genetics in habitat construction or deterioration for given sites

## Guidance

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### Links

Delivery of this unit could be linked to other units within the specification for example;

- *Unit 1: Principles of Plant and Soil Science*
- *Unit 2: Work-based Experience*
- *Unit 3: Project Management for Land-based Industries*
- *Unit 9: Environmental Management*
- *Unit 10: Biological Principles*
- *Unit 16: Public Horticulture*
- *Unit 32: Sustainable Development.*

### Essential requirements

Library resources including soil chemistry books, plant physiology texts, classification guides and land management guides should be available.

The internet contains a wide range of material and has a number of interesting university papers on projects around the world involved with land restoration and biodiversity. South Africa has invested a lot of time in this area and the Kirstenbosch website ([www.sanbi.org](http://www.sanbi.org)) provides a useful introduction to the work currently being carried out.

Equipment/consumables required include soil testing kits, pH kits, data-logging equipment to record nutrient levels, microscopes with related accessories and areas of land to test and monitor. Some of the equipment requirements can be met through educational visits to reserves and protected sites run mainly by charities or local councils.

Regular supervised practical work is an essential part of this unit and as a result, this unit would benefit from at least 15 hours of practical work.

### Employer engagement and vocational contexts

It would be useful for learners to have access to a working environment. This can often be achieved by creating links with local businesses or charitable organisations who could benefit from taking on learners. Local charity, run sites and local authority sites are a great source of information and are often very keen to share knowledge with learners. Business education alliances can also prove useful. Charitable organisations, eg The Wildlife Trust can often provide guest speakers to give lectures and demonstrations.

## Unit 8: Plant Selection and Establishment

Unit code: A/503/1055

Level: 4

Credit value: 15

- Aim

This unit will develop learners' understanding of the wide range of plants available for use in landscape and garden design. The learner will be able to manage the identification and selection of the plants for a diverse range of situations and circumstances and review the process of plant supply.

- Unit abstract

Learners studying this unit will develop an understanding of the binominal system of naming plants and the reasons behind it. Learners will study a wide range of different plant types and identify individual points of interest.

The main intention of this unit is to enable learners to develop learners understanding of plant use and establishment in gardens and landscapes. Learners will increase their skills in linking plants to function and aesthetic applications. They will also be able to explain plant tolerances for a range of conditions and suitability for a range of situations.

This unit will enable learners to review a range of plant sources and discuss the use of native species over the trends of the more alien. Once learners are familiar with plant use they will then develop a clearer understanding of what makes planting successful and how the horticulturalist can assist this process.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand use of the binomial system
- 2 Understand the use of plants in different site conditions
- 3 Understand the sourcing of plants
- 4 Understand successful establishment of plants in gardens and landscapes.

## Unit content

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### 1 Understand use of the binomial system

*Binomial system:* Linnaeus; classification; international code of botanical nomenclature; genus; species; plant characteristics eg flower, bark, buds

*Range of plants:* trees; shrubs; herbaceous; grasses; groundcover; hedges; climbing plants and bulbs

### 2 Understand the use of plants in different site conditions

*Range of plants:* trees; shrubs; herbaceous; grasses; groundcover; hedges; climbing plants and bulbs; functional/aesthetical applications eg structural, ornamental, focal point, ground cover, screening, temporary use

*Plant tolerance:* site conditions; soil type; pH levels; aspect; exposure; frost; drought; moisture

*Plant use for different situations:* private sites; public sites; coastal; rural, urban and suburban

*Interest through the year:* foliage; flowers; bark; fruit; autumn colour

### 3 Understand the sourcing of plants

*Standards:* British Standards for nursery stock; codes of practice for plant handling; Defra standards; plant passports; plant health; plant specification

*Sourcing:* UK and imports; specialist nurseries; wholesale; auction; internet buying

*Plant use:* native species; alien species; benefits; limiting factors

### 4 Understand successful establishment of plants in gardens and landscapes

*Factors:* site preparation; soil analysis; soil preparation; planting techniques; short-, medium- and long-term maintenance requirements; identification and treatment of pest, disease, disorders; control of weeds; competition; manipulation

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand use of the binomial system	1.1 explain the use of the binomial system in diverse situations  1.2 examine the use of a wide range of trees, shrubs, herbaceous grasses ground cover, hedges, climbing plants and bulbs to provide interest from foliage, flowers, autumn colour, fruit and bark
LO2 Understand the use of plants in different site conditions	2.1 evaluate a range of plants for use in functional/aesthetic applications  2.2 explain plant tolerance for a range of site conditions  2.3 explain the selection of plants which are suitable for a range of sites
LO3 Understand the sourcing of plants	3.1 explain a range of standards and codes of practice relevant to the supply of plants  3.2 review a range of sources of plant material  3.3 analyse the use of native and alien species at given sites
LO4 Understand successful establishment of plants in gardens and landscapes	4.1 examine factors which affect plant establishment  4.2 explain the relationships between the principal factors that affect successful plant establishment  4.3 justify methods of assisting the plant establishment process

## Guidance

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### Links

This unit develops learner understanding of plant selection and establishment and could link with other units in this qualification as follows:

- *Unit 7: Plant Environmental Adaptation and Physiology*
- *Unit 16: Public Horticulture*
- *Unit 19: Plant Health and Environmental Relationships*
- *Unit 23: Management of Historic Parks and Gardens*
- *Unit 25: Manage the Identification and Classification of Plants*
- *Unit 44: Historical Influence in Garden Design*
- *Unit 49: Planting Design.*

### Essential requirements

To successfully complete this unit, learners will need to have access to a wide range of plant books, journals and magazines and will need to keep up to date with current issues and trends that surround their sector.

It is important for learners to have access to grounds and gardens to relate theory and practice. By linking units learners will experience first hand the use and successful establishment of plants and develop essential skills needed to understand some of the key points in this unit.

### Employer engagement and vocational contexts

Employers could help tutors, for example, with the planning of programmes of learning, or provision of visits or guest speakers. They could also help to design assessment activities.

The delivery of this unit would be enhanced by employer engagement involving for example visits to a variety of parks and gardens where learners could study the use of a wide range of plants. Sustained links with employers may support further units as well as work placement opportunities.

A guest speaker from the local Defra office could be invited to help learners' understand the role of the government. They could give up-to-date information on the movement of plants and what the plant passport process involves.

## Unit 9: Environmental Management

Unit code: F/503/1056

Level: 5

Credit value: 15

- Aim

This unit aims to provide an understanding of how an organisation's commercial activities will impact on the environment, how these activities might be altered in order to minimise their impact on the environment and how this can be done in a manner that ensures the continued profitability of the organisation.

- Unit abstract

Our natural environments face threats from both an increased demand for its resources from a growing human population and from the impact of the waste generated to meet these requirements. By undertaking this unit, the learner will gain an increased understanding of several of the key aspects relating to recognising, and dealing with, these threats.

The necessity of developing sustainable methods for meeting our needs is a key concept in this unit. Learners will also gain an understanding of how our activities impact on the natural environment and how it can be monitored and reduced. Environmental management policies, legislation and techniques are considered alongside the roles of organisations involved in this area. The learner will also understand the need for effective waste management and reduction and the various approaches used to achieve these outcomes.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the concept of sustainability in a land-based sector
- 2 Understand the impact of land-based activities on the environment
- 3 Understand the need for environmental management
- 4 Understand the need for waste management in a land-based sector
- 5 Be able to devise environmental policy in a land-based sector.

## Unit content

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### 1 Understand the concept of sustainability in a land-based sector

*Sustainability:* conservation of the natural environment; renewable and non-renewable resources; biodiversity; the Earth's life support systems and processes; the depletion of finite resources; *the* Earth's carrying capacity; duty of care; the quality of human life

*Factors:* commercial decision-making; economic; socio-political; legal; codes of practice; ecological; scientific and technological information

*Sustainable practice:* changes to existing practice; use of alternative technology and resources; legislation and regulation; commitment; corporate policy

### 2 Understand the impact of land-based activities on the environment

*Direct:* pollution (atmosphere, water and soil); acid deposition; food contamination; soil exhaustion; waste; loss of visual amenity; animal and human health disorders; transport; increased population; global warming; ozone layer depletion; depletion of natural resources; loss of biodiversity and habitats

*Indirect:* customer pressure; social change and environmental awareness; insurance industry and lenders changing policies of property and land ownership issues; employees' raised awareness and concerns about health; EU and UK legislation; markets; prices

*Monitoring and assessment:* self-regulation; non-government organisations (NGO's); independent environmental consultants; legislation; field surveys; literature reviews; collection; storage; analysis and presentation of information; local information sources

*Environmental performance:* Environmental Impact Assessment (EIA); management systems; organisational design and decision-making cultures; monitoring change; reaching environmental targets; required investment; savings to organisations and the environment; quality systems

### 3 Understand the need for environmental management

*Approaches:* objectives; policies; strategies; operational; legal requirements; organisational commitment

*Organisational culture:* corporate responsibility/values; environmental values and attitudes; education and training for staff; contribution of the individual; community at large; public information

*Environmental policy:* allocation of responsibility; record keeping; targets; waste minimisation and recycling; energy use and conservation; reduction in costs; environmental sensitivity; environmental audits; health and safety legislation; technological efficiency; public information

*Legislation:* self-regulation; UK legislation and EU directives; enforcement agencies eg Defra, Environment Agency; pressure groups eg Greenpeace, Friends of the Earth

**4 Understand the need for waste management in a land-based sector**

*Factors:* training; implementation; monitoring use of energy and waste; purchase of specific equipment and plant; cost benefits to the organisation

*Benefits of waste reduction:* conservation of energy; use of by-products; on-selling of waste products; increased sales from greening of products/processes; cost reduction; increased market share; customer retention; increased loyalty and image

*Methods of reduction:* initial product design; natural methods versus chemical treatment; recyclable material; use of biodegradable materials; reparability versus replacement; benefits of design to meet legislation; “technofix” solutions

**5 Be able to devise environmental policy in a land-based sector**

*Factors:* training; implementation; monitoring use of energy and waste; purchase of specific equipment and plant; cost benefits to the organisation

*Methods of reduction:* initial product design; natural methods versus chemical treatment; recyclable material; use of biodegradable materials; reparability versus replacement; benefits of design to meet legislation; ‘technofix’ solutions

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand the concept of sustainability in a land-based sector	1.1 analyse factors that affect the sustainability of a land-based organisation/enterprise's activities 1.2 explain how a selected organisation/enterprise might improve sustainable practice on a local and national scale
LO2 Understand the impact of land-based activities on the environment	2.1 evaluate direct and indirect impacts of current environmental issues on industry, organisations and stakeholders 2.2 explain how environmental performance is monitored in a land-based organisation/enterprise 2.3 assess the environmental impacts of a selected land-based organisation/enterprise 2.4 explain how environmental performance can be improved in a land-based organisation/enterprise
LO3 Understand the need for environmental management	3.1 examine different approaches to environmental management within organisations in a relevant land-based sector 3.2 examine how organisations in a relevant land-based sector can be more environmentally aware 3.3 explain the impact of UK and EU environmental legislation with which organisations in a relevant land-based sector must comply
LO4 Understand the need for waste management in a land-based sector	4.1 examine different approaches to waste management in organisations in a relevant land-based sector 4.2 examine the different types of waste that are produced by organisations in a relevant land-based sector 4.3 justify ways in which land-based organisations in a relevant sector could reduce waste 4.4 evaluate the environmental and commercial benefits of reducing waste for a chosen land-based organisation
LO5 Be able to devise environmental policy in a land-based sector	5.1 devise appropriate environmental policy for a selected land-based organisation/enterprise 5.2 recommend suitable ways to reduce waste and recycle in a selected land-based organisation/enterprise

## Guidance

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### Links

This unit considers aspects of sustainability, the impact of human activities on the environment and environmental and waste management. It therefore has clear links to several other units including *Unit 37: Land Use Issues and Regulation*; *Unit 32: Sustainable Development* and *Unit 40: Waste Management*.

### Essential requirements

A diverse library resource and access to the internet will increase opportunities for learner-centred research. There are numerous websites dealing with environmentalism and environmental management freely available online.

The use of audio-visual materials such as slides and documentaries etc can engage learners in the learning experience.

### Employer engagement and vocational contexts

Learners would benefit from visits to organisations and businesses such as water treatment works, waste management sites, power stations and sources of renewable energy.

Lectures from appropriate guest speakers would enhance and contextualise the learning experience and introduce learners to a broader range of professionals and career opportunities available in this subject area.

Relating the unit content to the work of organisations such as The Institute of Environmental Management and Assessment (IEMA), Natural England, The Scottish Environment Protection Agency (SEPA) and the Centre for Alternative Technology (CAT) will also strengthen the vocational context.



## Unit 10: Biological Principles

Unit code: J/503/1057

Level: 5

Credit value: 15

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- Aim

This unit aims to develop learners' understanding of the biological principles that underpin the management of biological systems. Learners will improve their scientific understanding of the fundamental processes within living organisms and familiarise themselves with basic cell structures and function intrinsic to the existence of living organisms.

- Unit abstract

Biological principles are the key to an understanding of the basis of life and are core to learners' exploration of living organisms they work with. This will enable learners to understand and interpret a wide range of biological evidence essential to making informed scientific decisions.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the relationship between the structure and function of plant and/or animal cells and tissues
- 2 Understand the organisation of cells and tissues into organ systems in plants and/or animals
- 3 Understand the importance and role of homeostasis in plants and/or animals
- 4 Be able to investigate fundamental biological principles in plants and/or animals
- 5 Understand basic biochemical principles in plant and/or animals.

## Unit content

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### 1 Understand the relationship between the structure and function of plant and/or animal cells and tissues

*Cellular structure and functions:* eukaryotic cell structures (plasma membrane, centrosome, cytoskeleton, peroxisome, mitochondria, lysosome, golgi apparatus, ribosomes, nucleus, rough and smooth endoplasmic reticulum), specialist eukaryotic structures (chloroplasts, cell wall, vacuole, plasmodesmata, cilia, microvilli, flagella) prokaryotic cell structures (nucleoid, ribosomes, plasma membrane, flagella, cell wall, capsule, fimbriae); process of protein production

*Tissue structure:* key cell and tissue types in plants (eg parenchyma, collenchymas, sclerenchyma, xylem, phloem, dermal tissue, epidermis, cuticle, cork cambium, periderm) and/or animals (eg simple, stratified and pseudostratified epithelial tissue, fluid, dense, irregular and regular connective tissue, smooth, cardiac and skeletal muscle tissue, nervous tissue)

### 2 Understand the organisation of cells and tissues into organs systems in plants and/or animals

*Organs and organ systems:* key systems in plants (eg stems, meristems, roots, shoots, leaves, reproductive organs) and/or animals (eg peripheral, central, somatic and sympathetic and parasympathetic nervous systems, endocrine, autocrine and paracrine, respiratory and circulatory, digestive system, urinary, musculoskeletal, reproductive, immune, integumentary)

### 3 Understand the importance and role of homeostasis in plants and/or animals

*Changing environments:* oxygen, carbon dioxide, pH, waste products, temperature, osmolarity, energy source (eg blood glucose and dietary availability), macro and micronutrients (eg lipids, vitamins, minerals)

*Mechanisms:* feedback loops (negative, positive; set points, acclimatisation; sensors, stimulus, response; end product inhibition; alterations in enzyme activity, gene transcription, intracellular (cascades, second messengers eg calcium, cyclic AMP, cyclic GMP, protein kinases, IP3) and extracellular signalling (hormonal and nervous)

### 4 Be able to investigate fundamental biological principles in plants and/or animals

*Planning and carrying out investigations:* null hypotheses, predictions based on previous knowledge and observation; selection and competent use of appropriate techniques, randomisation; independent, dependent and confounding variables, use of controls, sampling

*Analyses of investigation results:* application of relevant statistical tests, potential sources of experimental error, accuracy and validity of experiments; drawing relevant conclusions from data

**5 Understand basic biochemical principles in plants and/or animals**

*Chemical structure:* functional groups (hydroxyl, carbonyl, carboxyl, amino, sulfhydryl, phosphate, methyl); acids and bases; structures of carbohydrates (monosaccharides, disaccharides, polysaccharides); lipids; proteins (primary, secondary, tertiary, quaternary); nucleic acids

Biochemical reactions: chemical bonding (ionic, covalent, hydrogen, van der Waals); properties of water (polarity, specific heat capacity, solvency, insulation, evaporative cooling); free energy, equilibrium constant, activation energy; catalysts, enzymes; oxidation and reduction; strength, pH and buffering of acids and bases

*Transport into and out of cells:* diffusion, osmosis, passive and active transport, transporter types (symport, uniport, antiport); vesicle-mediated transport; endocytosis and exocytosis

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand the relationship between the structure and function of plant and/or animal cells and tissues	1.1 examine the structure and function of major cell organelles 1.2 explain the differences between prokaryote and eukaryote cells 1.3 explain the process of protein production in the cell 1.4 evaluate the structure of cells as related to their function and arrangement within various tissues
LO2 Understand the organisation of cells and tissues into organ systems in plants and/or animals	2.1 discuss the co-ordination of tissues to form organs 2.2 examine the structure and function of two organ systems in plants and/or animals
LO3 Understand the importance and role of homeostasis in plants and/or animals	3.1 discuss the homeostatic control of major body systems 3.2 explain the mechanisms of action of homeostasis
LO4 Be able to investigate fundamental biological principles in plants and/or animals	4.1 plan practical experiments to investigate a given proposal 4.2 use appropriate techniques to investigate a given proposal 4.3 make appropriate recommendations, based on findings, to inform decisions 4.4 justify recommendations made based on findings
LO5 Understand basic biochemical principles in plants and/or animals	5.1 examine the basic chemical structure of different molecules 5.2 explain basic chemical reactions relevant to biology 5.3 explain the transport of molecules into and out of cells

## Guidance

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### Links

This unit offers links with the following units:

- *Unit 1: Principles of Plant and Soil Science*
- *Unit 19: Plant Health and Environmental Relationships.*

### Essential requirements

A well-equipped science laboratory is essential in which learners can plan and carry out practical experiments. Learners must have access to supporting materials including higher level biology and chemistry textbooks.

### Employer engagement and vocational contexts

Organisations involved in scientific research, such as industrial or academic laboratories, could enable learners to experience scientific investigation in a range of contexts.

Producers of feed products may be able to provide an industrial context for determining the nutritional content of feed stuffs using chemical methods, which would be valuable for all learners.

Links with producers and retailers may also provide useful experience for learners as well as a source of material for examination.



## Unit 11: Horticultural Technology

Unit code: L/503/1058

Level: 5

Credit value: 15

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- Aim

This unit aims to develop learners' skills and understanding in technological concepts, design and operational characteristics of horticultural machinery and the safe operation of equipment, along with a consideration of environmental factors.

- Unit abstract

Commercial horticulture is an ever-increasing complex subject. This unit gives the learner the scientific foundation for the technological components found in other units. It introduces the learner to technological concepts, design and operational characteristics of industrial equipment and machinery and the safe operation of equipment, along with a consideration of environmental factors.

One of the most specialised applications is in environmental control and crop manipulation and the learner will develop an in-depth understanding and appreciation of basic engineering principles and their applications in these specialist areas of the horticultural industry.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to apply basic technological concepts to their applications in horticulture
- 2 Understand the design and operational characteristics of a range of horticultural machinery and equipment
- 3 Understand the influences of environmental and sustainable factors on horticultural technology development
- 4 Be able to manage the safe operation of machinery and equipment.

## Unit content

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### 1 Be able to apply basic technological concepts to their applications in horticulture

*Concepts:* SI units; working cycles eg engine, and refrigeration; electricity; environmental control and instrumentation; technical terms – eg power, work rates, fuel consumption; electronics, pneumatics, hydraulics; electricity; Boyle's law, Charles's law pressure/volume law; heat transfer – conduction, convection radiation and expansion; latent heat and its application; light levels; noise – level and intensity; energy, work, force power and torque and their application; materials eg metals, non-metals, and plastics and their properties

*Applications:* machinery and equipment; environmental control instrumentation; methods for environmental manipulation; controlled environment structures; controlled environment and plant production; light, temperature gas control; ventilation; supplementary lighting; irrigation; humidity control and fogging; CO<sub>2</sub> enrichment

*Electricity:* power requirements; units eg volt, amp, and Ohm; power outputs, distribution and delivery; tariffs

*Storage:* cold storage, controlled atmosphere stores, refrigeration

*Irrigation:* theory; pressure and flow relationship

### 2 Understand the design and operational characteristics of a range of horticultural machinery and equipment

*Power units:* fuels; small engines; two stroke and four stroke engines including petrol, diesel, and gas; electric motors; advantages and disadvantages of power unit types eg pollution by fumes, noise, fuel efficiency, running time; specifications eg power, work rates, fuel consumption, torque

*Machinery/equipment:* cultivation, irrigation, pesticide/fertiliser/seed application; heating eg air heating, underflow, hot water, steam; environmental control; lighting; CO<sub>2</sub> enrichment; storage

*Equipment selection:* requirements; compatibility; capacity; work rates; cost; availability; dealer support; fixed and variable costs; purchase cost

### 3 Understand the influences of environmental and sustainable factors on horticultural technology development

*Energy conservation:* background, methods, auditing

*Environmental impact:* short- and long-term effects of using materials/machinery/equipment

*Developments:* engine technology, equipment design

*Sustainable factors:* appropriate technology; waste reduction and waste management; recycling; pollution sources and reduction

*Irrigation:* water application efficiencies; water collection; water treatment; storage and recycling, irrigation regimes and timing

*Heating:* range of fuels available eg gas (natural gas and propane), oil, wood, waste products, and coals; glasshouse heat loss and boiler efficiency; combustion theory; heat distribution systems; heat distribution and by products of combustion; heat pumps and heat recovery; insulation and screening

*Energy sources:* conventional fossil fuels v renewable energy sources eg solar, wind, bio-fuels, and wave/tide/hydro

### 4 Be able to manage the safe operation of machinery and equipment

*Safety:* legislation; regulation, risk assessment, possible causes of accidents; safe systems of work; personal protective equipment; training requirements; supervision; establishing and maintaining a safety culture

*Maintenance:* commissioning; routine machinery maintenance, what and why; preventative maintenance; record keeping; facilities, tools and equipment

*Operation:* of pedestrian/rider-operated powered machinery eg pre-start checks, safe operation, and return; field efficiencies; work rates wheel slip; percentage down time; machinery equipment usage identified; annual monthly usage concepts; fixed and variable costs

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Be able to apply basic technological concepts to their applications in horticulture	1.1 justify the suitability of materials for particular work situations 1.2 relate engine/refrigeration working cycles to operational use 1.3 determine electrical power requirements, tariffs and equipment for given situations 1.4 justify selection of suitable instrumentation for measuring/controlling a particular environment
LO2 Understand the design and operational characteristics of a range of horticultural machinery and equipment	2.1 interpret technical specifications for a range of machinery 2.2 evaluate the suitability of power units for different work situations 2.3 review the range of equipment available to carry out a given operations
LO3 Understand the influences of environmental and sustainable factors on horticultural technology development	3.1 carry out an energy audit for a given situation 3.2 assess the environmental impact of using materials, machines and equipment to carry out a given operation 3.3 evaluate recent developments in power technology in terms of their environmental impact
LO4 Be able to manage the safe operation of machinery and equipment	4.1 explain the safety requirements for specified machinery/equipment operations 4.2 supervise basic maintenance procedures on powered machinery 4.3 manage the use of a range of pedestrian/rider-operated powered machinery in a safe manner

## Guidance

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### Links

This unit forms the technological foundation for a wide range of units such as *Unit 29: Plan and Manage Protected Crops*, *Unit 36: Mechanisation for Land-based Industries*, *Unit 13: Fruit and Vegetable Production Management* and *Unit 32: Sustainable Development*.

### Essential requirements

It is essential that learners have access to a basic workshop, small-engine equipment, a range of suitable tractors/ride-on machinery and a range of equipment to cover aspects of cultivation, pesticide/fertiliser/seed application and irrigation. Learners must also have access to commercial horticultural units (eg nursery, glasshouse, field operations). These should be large enough and use crops, equipment, tools and materials suitable to meet the needs of the unit: access to equipment for environmental control is essential.

Learners in employment and studying part time may find their own workplace to be a suitable resource.

Resources for the study of this unit could be provided by the college farm or nursery, learning resource centres, trade exhibits and local farms and horticultural enterprises to broaden the range of operations that can be experienced.

### Employer engagement and vocational contexts

It is essential that this unit be delivered in an applied and vocational context. Work-based experience will also be important.

Because of the range of crops grown by the horticultural industry and the diversity of possible growing systems, this unit will be considerably enhanced by contact with employers. Centres are encouraged to develop links with local businesses, manufacturers and suppliers who can support the breadth and application of the unit. These employers can provide real work practical exercises and guest speakers and experts to support the learning experience. Employer engagement will ensure the use of technically up-to-date information and processes.



## Unit 12: Garden Design Principles

Unit code: R/503/1059

Level: 5

Credit value: 15

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- **Aim**

This unit aims to develop learners understanding of the role of the garden designer, the principles of design and simple graphical skills.

- **Unit abstract**

In this unit learners will examine the design process in detail to enhance their understanding and experience of the application of garden design principles. By undertaking a 'real life' design project, learners will explore the design process from site surveying and analysis to the presentation of final drawings. To fulfil their clients' brief, learners will be required to display their understanding of the application of design principals to produce effective design solutions in real situations.

- **Learning outcomes**

**On successful completion of this unit a learner will:**

- 1 Understand the process of garden design and the role of the garden designer
- 2 Understand the application of garden design principles
- 3 Be able to research garden sites including factors that determine an appropriate design solution
- 4 Be able to produce a design for a small garden area.

## Unit content

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### 1 Understand the process of garden design and the role of the garden designer

*Design:* the objectives of garden design; approaches to problem solving; the design process; influences on the evolution of design eg functional, environmental, social, cultural, legal

*Exploration of other designers' work:* design objectives; the impact of fashion; design philosophies; approaches to the design process; influence of other artistic forms

*The designer's role:* the relationship between designer and client; relationships with contractors and sub-contractors; contractual obligations; statutory obligations; the implications of the project management role

### 2 Understand the application of garden design principles

*Application of primary principles:* unity, rhythm, scale, proportion, balance and variety

*Application of secondary principles:* light and shade, texture, colour, focal point, pattern

*Factors influencing the application of design principles:* influence of intrinsic factors eg financial factors, timescales; influence of extrinsic factors eg physical factors, climate

### 3 Be able to research garden sites including factors that determine an appropriate design solution

*Surveying:* line surveying; the accurate location of internal features; the recognition and location of relevant external features; surveying changes of level; identification and location of services; use of appropriate scales and symbols to produce survey plans

*Site data and analysis:* general climatic conditions; microclimate; soil type – structure, pH, drainage; site topography; existing vegetation; access – internal, external; legal constraints, site history – potential for underground masses and voids; accurate recording of data

### 4 Be able to produce a design for a small garden area

*Producing plans to the client's brief:* plan views – master plan, planting plan, hard landscaping detail plans; elevations and cross-sections; 3-dimensional projections

*Graphic and technical skills:* drawing techniques; using computer aided design (CAD); choice of appropriate scales; use of symbols for hard and soft landscaping; lettering form and style; paper sizes; layouts; colouring techniques

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand the process of garden design and the role of the garden designer	1.1 explain the different influences that have affected the evolution of the process of design 1.2 analyse the work done by other designers in relation to their design objectives 1.3 discuss the role of the designer in a given design process
LO2 Understand the application of garden design principles	2.1 assess the factors influencing the use of design principles 2.2 critically evaluate the use of design principles
LO3 Be able to research garden sites including factors that determine an appropriate design solution	3.1 analyse site conditions in preparation for a given design 3.2 produce an accurate survey plan of a garden
LO4 Be able to produce a design for a small garden area	4.1 produce a design for a garden site which fulfils the needs of the client brief 4.2 demonstrate graphical and technical skills in plan drawing

## Guidance

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### Links

This unit links with level 4 units:

- □ *Unit 42: Professional Garden Design Practice*
- □ *Unit 43: Major Integrated Garden Design Project*
- □ *Unit 45: Graphic Skills for Garden Designers*
- □ *Unit 46: Garden Styles and their Influence*
- □ *Unit 49: Planting Design.*

### Essential requirements

To successfully undertake this unit, learners will need access to a drawing studio equipped with drawing boards, graphical equipment, printing facilities and CAD. Access to surveying and soil-testing equipment is also essential.

Use of 'real life' garden situations for survey and design work is also necessary to ensure that learners gain realistic working experience.

Appropriate texts and journals on the topic of garden design, both in the UK and abroad, must be easily available to the learner.

### Employer engagement and vocational contexts

Learners will benefit from links with design practices and professional designers. Every opportunity should be taken to visit designed landscapes to explore how design principles have been applied in practice. Visits to 'live' sites, where there may be an opportunity to speak with designers and contractors, are especially useful. Learners will also benefit from discussing their own work with 'guest' professional designers.

Learners should be encouraged to attend seminars, conferences and shows relating to landscape and garden design, to keep up to date with the latest developments within the industry.

## Unit 13: Fruit and Vegetable Production Management

Unit code: J/503/1060

Level: 4

Credit value: 15

- Aim

This unit aims to develop learner understanding of the management of the production and marketing of fruit and vegetable crops in the UK. Learners will also develop their supervisory skills in the context of the establishment and husbandry of crops.

- Unit abstract

Fruit and vegetable production is an ever-growing industry attracting multi-million pound contracts. This unit introduces learners how to manage these crops to ensure the best quality end product.

Learners will plan, prepare and supervise schedules for the production and establishment of fruit and vegetable crops. Learners will also learn to recognise problems with pests, diseases, disorders and weeds, and supervise others in the monitoring and control of these.

In this unit learners will develop learner on understanding of determining harvest dates, pre-harvest preparations and post-harvest care of crops. They will also examine market specifications, the distribution of produce and the range of possible market outlets.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand storage and distribution systems for specified fruit and vegetable market outlets
- 2 Be able to plan and manage the establishment of crops
- 3 Be able to prepare and manage husbandry programmes for crops
- 4 Understand the harvesting of produce to maintain product quality for specified market outlets.

## Unit content

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### 1 Understand storage and distribution systems for specific fruit and vegetable market outlets

*Storage:* post-harvest care of fresh product, store types and storage regimes

*Product specifications:* packhouse operation, supply and demand, order taking, sampling; sundries required; buyer specifications

*Distribution:* systems, packing, transport; market outlets eg supermarkets, greengrocers, market stalls, restaurants, pre-pack wholesalers, food production, animal feeds

### 2 Be able to plan and manage the establishment of crops

*Planting:* crop production schedules, production timings, costs, growth needs, monitoring, sale dates; plant specifications; intensive and extensive cropping systems

*Sowing and planting:* methods and equipment required; establishment methods; supervision of others eg work patterns, responsibilities, timings, teamwork, costs

### 3 Be able to prepare and manage husbandry programmes for crops

*Husbandry:* pests, diseases and weed identification; monitoring; control schedules; nutritional disorders

*Management:* Integrated Crop Management (ICM); Assured Produce (AP) Scheme; supervision of others in monitoring and controlling pests, diseases, disorders and weeds

*Manipulation:* maintaining or improving production schedule; environmental factors eg light, temperature, water, protection; growth eg pruning, training, nutrition, growth regulators

### 4 Understand the harvesting of produce to maintain product quality for specified market outlets

*Harvest:* determination of harvest date; pre-harvest preparations; harvesting methods; equipment requirements; hygiene; legislation; regulations; health and safety

*Post-harvest:* immediate care; storage; grading specifications

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Understand storage and distribution systems for specified fruit and vegetable market outlets	1.1 evaluate appropriate storage regimes 1.2 explain the operation of a packhouse supplying a range of market outlets 1.3 determine the product specifications required by specified market outlets 1.4 examine the methods of distribution of product to market outlets
LO2 Be able to plan and manage the establishment of crops	2.1 prepare schedules of production for specified crops 2.2 determine plant specification and its propagation to fulfil a production schedule 2.3 manage the sowing and planting of crops 2.4 explain methods to aid the establishment of crops after planting
LO3 Be able to prepare and manage husbandry programmes for crops	3.1 prepare appropriate control schedules for given pests, diseases and weeds 3.2 explain the treatment of nutritional disorders 3.3 manage the appropriate monitoring and control of pests, diseases, disorders and weeds 3.4 evaluate the techniques used to manipulate the growing of a crop to maintain and/or improve a production schedule and its product quality at harvest
LO4 Understand the harvesting of produce to maintain product quality for specified market outlets	4.1 review the methods of harvesting crops to maintain product quality 4.2 explain factors determining the date of harvest 4.3 determine pre-harvest preparations for a successful harvest 4.4 discuss the care of produce immediately after harvest

## Guidance

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### Links

This unit introduces learners to fruit and vegetable production and links with the following units in this qualification:

- *Unit 7: Plant Environmental Adaptation and Physiology*
- *Unit 19: Plant Health and Environmental Relationships*
- *Unit 20: Understanding Organic Soil Management*
- *Unit 26: Plan and Manage the Movement of Plants*
- *Unit 27: Plan and Manage the Growth and Development of Crops*
- *Unit 29: Plan and Manage Protected Crops.*

### Essential requirements

To successfully complete this unit, learners will need require to work with, or least visit, a fruit or vegetable grower. They will need access to growing areas, packhouses and storage facilities. It would also benefit for learners to visit a range of market outlets, both retail and wholesale.

### Employer engagement and vocational contexts

Delivery of this unit would be enhanced by employer engagement, for example local supermarkets, growers or food production factories.

Learners could meet with a local grower and discuss supply and demand in the fruit and vegetable sector. Links with fruit and vegetable growers may support other units as well as work placement opportunities.

A talk from a representative from the local Defra office would help learners to understand the role of the government and legislation in their area.

## Unit 14: Nursery Stock Production

Unit code: L/503/1061

Level: 5

Credit value: 15

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- Aim

This unit aims to develop learner understanding of the production and marketing of nursery stock in the UK. Learners will investigate the practical design, management, production and marketing of a selection of nursery stock plants grown to meet market requirements.

- Unit abstract

As a horticulturalist, being able to grow and produce your own stock successfully is vital. For specialist nurseries this is even more important. Certain nurseries do not have the option of buying in limitless amounts of stock so self-production is their main source of stock. Nurseries dealing with specialist plants such as *Primula auricula* would have detailed management plans that include sowing of new seed, division of offsets, how to monitor and care for plants, how to establish and re-pot plants as well as detailed, time intensive breeding programmes that aim to improve stock by introducing new varieties and increasing vigour in older varieties. In this unit learners will experience working in a nursery and produce, monitor and establish stock all of which are skills required in the nursery sector, as well as being skills needed by gardeners, garden centre staff and estate groundskeepers.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the harvest, storage and distribution of plants
- 2 Be able to manage the design of a nursery stock production site
- 3 Be able to manage the implementation of plant propagation, establishment and potting
- 4 Understand the preparation and monitoring of crop establishment and husbandry.

## Unit content

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### 1 Understand the harvest, storage and distribution of plants

*Harvesting:* field-lifting methods and equipment; container plant collection; plant specifications; ordering and stock control

*Post-harvest care of product:* store types; storage regimes; despatch preparation; distribution systems; market outlets

### 2 Be able to manage the design of a nursery stock production site

*Site physical characteristics:* facilities; resources; waste disposal; costs of facilities, resources and staff

*Planning:* regulations; legislation

*Design:* prepare a design for field-grown plants or for container plant growing; costs involved; facilities required eg water, electricity, materials, communication links

### 3 Be able to manage the implementation of plant propagation, establishment and potting

*Propagation:* crop production schedules; commercial propagation techniques; plant specifications

*Planting:* soil preparation; planting of field crops; planting of container grown crops

*Potting:* potting of plants and required sundries; establishment techniques

### 4 Understand the preparation and monitoring of crop establishment and husbandry

*Husbandry:* recognise, monitor and plan the control of pests, diseases and weeds; nutritional disorders; correction of nutritional disorders

*Management:* crop manipulation techniques; production schedule improvement; harvest quality improvement

## Learning outcomes and assessment criteria

Learning outcomes  On successful completion of this unit a learner will:	Assessment criteria for pass  The learner can:
LO1 Understand the harvest, storage and distribution of plants	1.1 explain the lifting of field-grown plants 1.2 explain the collection of container-grown plants for despatch 1.3 evaluate methods of storage to maintain plant quality after lifting and collection 1.4 appraise systems of distribution to specified market outlets
LO2 Be able to manage the design of a nursery stock production site	2.1 evaluate a site for the establishment of a production nursery 2.2 specify the facilities and resources required for a new nursery 2.3 prepare an appropriate design for a site to produce field and/or container-grown plants 2.4 calculate accurate costs of establishing a nursery on a new site
LO3 Be able to manage the implementation of plant propagation, establishment and potting	3.1 prepare schedules of production for plants 3.2 determine plant specification and propagation to fulfil a production schedule 3.3 supervise the implementation of field planting and potting of plants 3.4 justify methods to aid the establishment of plants after their planting and/or potting
LO4 Understand the preparation and monitoring of crop establishment and husbandry	4.1 recognise and monitor pests, diseases and weeds 4.2 explain the treatment of nutritional disorders of both field- and container-grown plants 4.3 evaluate the techniques used to manipulate the growing of crops to maintain and/or improve a production schedule and product quality at harvest 4.4 determine an appropriate pest and disease control strategy

## Guidance

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### Links

This unit can be linked to a number of different units within this qualification. Other units that have a common theme or which also cover ideas in this unit are *Unit 31: Small Business Enterprise*, *Unit 1: Principles of Plant and Soil Science*, *Unit 12: Garden Design Principles*, *Unit 2: Work-based Experience (a work experience placement at a nursery)*, *Unit 3: Project Management for Land based Industries (taking part in the revision and implementation of a crop production schedule or similar)*, *Unit 13: Fruit and Vegetable Production Management* and *Unit 19: Plant Health and Environmental Relationships*.

### Essential requirements

Learners should have access to sufficient library resources, including soil chemistry text books, crop specification texts, harvesting guides and design resources.

A wide range of materials available on the internet and a number of design tools with downloadable content will enable learners to design a site. There are also a number of design programmes available to buy.

Equipment/consumables required include soil testing kits, polytunnels or greenhouses for container-grown crops, land for field-grown crops, harvesting and maintenance equipment (depending on species studied), data-logging equipment to record nutrient levels, and microscopes/hand lenses with related accessories for pest monitoring. Some of the equipment requirements can be met through visits to farms and nurseries.

Regular supervised practical work is an essential part of this unit and learners must complete at least 15 hours of practical work related to the unit.

### Employer engagement and vocational contexts

Learners would benefit from having access to a working environment. This can be achieved by creating links with local businesses or charitable organisations who may even benefit from taking on learners. Local nurseries, garden centres, estates and specialist plant growers are great sources of information and are often keen to share their knowledge with students. Business education alliances can also prove useful and charitable organisations can often provide guest speakers to give lectures as well as demonstrations.

## Unit 15: Hard Landscape Principles and Practice

Unit code: R/503/1062

Level: 5

Credit value: 15

- Aim

This unit aims to develop learner understanding of and skills in the practical management of hard landscape elements through the development of a garden construction project.

- Unit abstract

This unit introduces learners to the use and construction of hard landscaping features and elements through the development of a small garden construction project. Learners will develop the skills needed to work in a work-based environment.

Learners will research and evaluate a range of materials used in gardens today and investigate how they are used functionally and aesthetically. Learners will also develop their practical construction skills including contract management, project management and site construction skills.

This unit also enables learners to develop their management skills as they will manage all aspects of the project from planning to handover. Learners will also consider current health and safety and design legislation that will impact on their project.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the range of hard landscape features and elements used in designed landscapes and gardens
- 2 Understand the use and construction of hard landscaped features
- 3 Be able to plan hard landscape construction
- 4 Be able to manage a small construction project containing hard elements.

## Unit content

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### 1 Understand the range of hard landscape features and elements used in designed landscapes and gardens

*Materials:* hard surfaces eg bricks, blocks, slabs, timber; enclosures eg walls, fencing, trellis; ornamental features eg water features, gazebo, pergola, ornaments/statues; conventional and traditional material eg rocks, metals, plastics, steel, aluminium; range of data sources eg catalogues, web pages, CD ROMs, books, publications, television

*Future use of materials:* rigid and flexible materials; historical and contemporary context

### 2 Understand the use and construction of hard landscaped features

*Materials:* combined and structured to create features eg paving, enclosures, raised areas, sunken areas, water features; evaluate and select materials, aesthetics, cost, performance

*Hard surfaces outdoors:* soil analysis; sub-base construction; blinding; bedding for surfaces; falls and surface water run-off; ramps; steps; safety in use

*Enclosures and walls:* brickwork/blockwork; height to thickness; mortars; jointing and pointing; foundations; damp proof; fencing types and styles eg wire, post and rail, panel, picket, decorative, natural screening eg willow, beech, thatch, bamboo

*Landscaping features:* raised areas; sunken areas, water features

### 3 Be able to plan hard landscape construction

*Planning:* office- and site-based work; project planning and critical path; resource requirements; budgetary control; work planning; risk assessments

*Management:* people eg staff, customers, contractors; budgets; machinery and equipment eg owned, hired, licensed operatives; health and safety procedures

*Stages of work:* site preparation; construction; handover

### 4 Be able to manage a small construction project containing hard elements

*Contract management:* site identification; analysis for project development; health and safety regulations and assurance; construction design and management (CDM) regulations; client relationships

*Project management:* recording techniques; site survey; levelling techniques; contract specifications; fee arrangements

*Site construction:* earth moving and handling; materials storage and distribution; construction skills; time constraints; assessment of quality

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand the range of hard landscape features and elements used in designed landscapes and gardens	1.1 evaluate the range of materials available for hard surfaces 1.2 evaluate the range of materials available to create enclosures 1.3 evaluate the range of materials available for ornamental features
LO2 Understand the use and construction of hard landscaped features	2.1 justify the use of landscape features at given sites 2.2 explain the use of materials, construction and key features of a range of hard surfaces 2.3 explain the use of materials, construction and key features of a range of wall and fence enclosures 2.3 detail the construction of a range of landscape features
LO3 Be able to plan hard landscape construction	3.1 plan a small landscape project appropriately 3.2 prepare the necessary health and safety and construction design and management documentation for the project 3.3 determine appropriate resource requirements
LO4 Be able to manage a small landscape construction project containing hard elements	4.1 carry out a range of landscape construction skills for a given hard landscape project: <ul style="list-style-type: none"> <li>• contract management</li> <li>• project management</li> <li>• practical site construction skills</li> </ul> 4.2 manage people, budgets, machinery, equipment, health and safety effectively 4.3 evaluate own performance throughout project to inform actions

## Guidance

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### Links

This unit develops learners' skills in managing a small landscape project and links with the following units in this qualification:

- *Unit 4: Enterprise and Financial Management for Land-based Industries*
- *Unit 12: Garden Design Principles*
- *Unit 39: Health and Safety in the Land-based Workplace*
- *Unit 41: Develop and Implement Plans for the Storage and Disposal of Inorganic Waste*
- *Unit 48: Landscape Design Process*
- *Unit 50: Contract Documentation and Management for Land-based Industries.*

### Essential requirements

To complete this unit, learners will need access to an outside practical area to develop their practical hard landscaping skills. They will also need access to a wide range of research sources.

It will also be beneficial for learners to visit a range of landscape projects to increase their knowledge and help them to develop ideas.

### Employer engagement and vocational contexts

Delivery of this unit would be enhanced by employer engagement, for example local material suppliers, landscape or design companies, gardens, parks or building projects where hard landscaping is included.

Sustained links with local suppliers or landscape companies may support other units as well as work placement opportunities.

A talk from a health and safety officer would also help learners to understand the legislation that relates to their projects.

## Unit 16: Public Horticulture

Unit code: Y/503/1063

Level: 4

Credit value: 15

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- Aim

This unit aims to develop learner understanding of public horticulture and its benefits for the environment and the community.

- Unit abstract

Horticulture is becoming increasingly popular especially with 25–35 year olds. As a result public horticulture has become a priority in many local authorities. Parks and gardens departments have moved away from traditional, formal bedding arrangements to more community-orientated schemes such as cut your own herb flower beds, community orchards and the planting of scent gardens. Groups have emerged carry out 'guerrilla gardening' where unplanted land is cultivated and planted with vegetable plants for the local community to pick, cook and eat. Some local authorities around the country are getting involved with these groups and are starting to support their work.

In this unit learners will explore the role of public horticulture in today's society as well as why public horticulture is still an important part of community life even with the maintenance and management issues related to public areas.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the scope of public horticulture and its role in contemporary society
- 2 Understand the factors influencing the provision and implementation of public horticulture
- 3 Understand the interaction between public horticulture and the community it serves
- 4 Understand management issues in public horticulture.

## Unit content

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### 1 Understand the scope of public horticulture and its role in contemporary society

*Provision:* facilities and services available eg parks, gardens, roadside plantings, playgrounds, allotments, school allotments, cemeteries, wildlife gardens, pocket parks and public open spaces

*Historical context:* Victorian development of public parks eg Derby arboretum; modern and traditional features eg band stand, raised beds; changing role over time; the need for change

*Contemporary society:* trends; uses; modern-day considerations

### 2 Understand the factors influencing the provision and implementation of public horticulture

*Political provision of public horticulture:* structure of national and local government; government policy and legislation

*Financial provision:* financing public horticulture eg National Lottery; government initiatives and funding; role of private enterprise; commercial ventures and sponsorship; Best Value Initiative

*Social:* benefits of 'greening' the urban environment; provision of facilities and amenity landscapes in new developments; education

*Technical:* the growing environment of towns and cities; influences on plant selection and establishment; environmental issues; planting strategies

### 3 Understand the interaction between public horticulture and the community it serves

*Public consultation:* investigating needs, requirements and wishes of the community with regard to public horticulture; common issues

*Design:* design criteria to be considered; catering for all sectors of the community; security issues

*Community involvement:* benefits of community involvement; issues to be considered; educational benefits; benefits for local government

### 4 Understand management issues in public horticulture

*Management issues:* strategic management plans; financial issues; public safety; security; park ranger schemes; urban park warden schemes

*Grounds maintenance:* contracts; contract management; specifications; best value; maintenance methods; environmental issues eg reduced pesticide use; sustainable working practices; health and safety

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Understand the scope of public horticulture and its role in contemporary society	1.1 examine the component areas of public horticulture 1.2 discuss the historical development of key areas such as public open space, allotments and urban landscaping drawing on relevant examples 1.3 evaluate the role of public horticulture today drawing on relevant examples 1.4 examine current trends in public horticulture drawing on relevant examples
LO2 Understand the factors influencing the provision and implementation of public horticulture	2.1 explain policies of both central and local government that influence the provision of public horticulture 2.2 examine appropriate means for financing public horticulture 2.3 assess the benefits of public horticulture drawing on relevant examples 2.4 discuss the growing conditions of the environment and its influence on public horticulture drawing on relevant examples
LO3 Understand the interaction between public horticulture and the community it serves	3.1 evaluate the methods commonly used to identify community needs and wishes 3.2 discuss the issues involved when designing with and for the community 3.3 assess the benefits, to both organisations and the community, of involving the community in all aspects of public horticulture
LO4 Understand management issues in public horticulture	4.1 discuss the issues to be considered when formulating a management plan 4.2 discuss the issues that influence grounds maintenance practices 4.3 examine the components of a grounds maintenance contract

## Guidance

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### Links

This unit can be linked to a number of units within this qualification. Other units that have a common theme or also cover ideas in this unit investigative policy (an investigation linked to community projects), *Unit 1: Principles of Plant and Soil Science*, *Unit 9: Environmental Management*, *Unit 32: Sustainable Development*, *Unit 2: Work-based Experience (a work experience placement shadowing a park ranger or a local authority parks and gardens department)*, *Unit 3: Project Management for Land-based Industries(taking part in park re-development)*, *Unit 12: Garden Design Principles*, *Unit 4: Enterprise and Financial Management for Land-based Industries*, *Unit 17: Landscape and Garden Maintenance* and *Unit 37: Land Use Issues and Regulations*.

### Essential requirements

Sufficient library and computer-based resources should be available to enable learners to achieve this unit. Access to the internet is essential so learners can research current policies that influence public horticulture as well as the current financial provision available for public horticulture. Textbooks should include resources on historical gardens and the design and maintenance of public spaces.

There is a wide range of material available on the internet including garden design programmes that can be used to design planting plans, planting designs and bedding schemes.

Learners also need to visit public parks and/or gardens preferably with the guidance of staff employed there. Alternatively, many local authorities have gardens, parks, orchards and decorative roundabouts that learners can visit. It would also be beneficial for learners to talk to community project leaders involved in public land maintenance and to volunteer groups.

### Employer engagement and vocational contexts

Learners would benefit from having access to a working environment. There are many options available for through local authorities (as stated above). Local businesses and charitable organisations may be useful and could even benefit from taking on learners. Local community projects and city farms are great sources of information and are often keen to share their knowledge. Business education alliances can be useful and charitable organisations can provide guest speakers to give lectures as well as demonstrations.

## Unit 17: Landscape and Garden Maintenance

Unit code: D/503/1064

Level: 5

Credit value: 15

- **Aim**

This unit aims to enable learners to develop the skills and knowledge needed to prepare maintenance schedules to facilitate appropriate maintenance regimes for existing garden and/or landscape areas.

- **Unit abstract**

This unit will give learners with an understanding of the maintenance requirements of gardens and landscapes and their importance within the initial design. The unit covers the skills and knowledge needed to prepare maintenance schedules and facilitate appropriate maintenance regimes for new and existing garden/landscape areas. Learners will carry out surveys to evaluate and recommend short- and long-term maintenance schedules, showing care and commitment to continuing of the original design concept while also allowing for creative enhancement and development over time.

- **Learning outcomes**

**On successful completion of this unit a learner will:**

- 1 Understand maintenance requirements for landscape and garden elements
- 2 Understand different methods and techniques to achieve low-cost maintenance
- 3 Be able to plan maintenance for a garden or landscape area
- 4 Be able to evaluate an existing garden or landscape.

## Unit content

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### 1 Understand maintenance requirements for landscape and garden elements

*Requirements:* establishment; short- and long-term maintenance needs of a range of garden/landscape areas

*Elements:* trees; shrubs; hardy perennials; roses; climbers; alpines; turf; wild flower areas; hedges; water features; hard surfaces; enclosure materials including walls and fences; garden furniture; ornaments; structures

### 2 Understand different methods and techniques to achieve low-cost maintenance

*Methods:* achieve low-maintenance designs but retain design interest, material selection, construction specifications, mulches, choice of plants

*Design ideas:* edge treatments; selection of materials, relationship between correct construction methods and future maintenance needs

### 3 Be able to plan maintenance for a garden or landscape area

*Maintenance:* schedules for routine annual work and occasional longer-term needs, methods of measuring

*Layout of schedule:* methods of presentation and level of information, use of appropriate software

*Methods of approach:* use of tools; equipment; sustainability issues; organic/chemical; effect on the environment; staffing requirements

### 4 Be able to evaluate an existing garden or landscape

*Improvements:* survey of area/garden, identification of attractive features; level of maintenance; facilities; problem areas; accurate recording of data

*Practical suggestions for improvements:* evaluate in terms of staffing; costs; plant or material changes to provide additional interest and attraction

## Learning outcomes and assessment criteria

Learning outcomes  On successful completion of this unit a learner will:	Assessment criteria for pass  The learner can:
LO1 Understand maintenance requirements for landscape and garden elements	1.1 explain the short-term maintenance of hard landscape/garden elements 1.2 explain the short-term maintenance of soft landscape/garden elements 1.3 explain the long-term maintenance of hard landscape/garden elements 1.4 explain long-term maintenance of soft landscape/garden elements
LO2 Understand different methods and techniques to achieve low-cost maintenance	2.1 determine design and construction issues that are likely to cause maintenance problems 2.2 discuss design and construction issues in the context of a given scenario 2.3 explain additional or alternative proposals to provide design-acceptable solutions
LO3 Be able to plan maintenance for a garden or landscape area	3.1 schedule annual maintenance for a complex landscape/garden area 3.2 explain the long-term maintenance requirements for the area concerned
LO4 Be able to evaluate an existing garden or landscape	4.1 carry out a survey to establish the condition of a garden/landscape area 4.2 evaluate the condition of a garden/landscape area 4.3 justify suggested practical long- and short-term improvements appropriate to the area

## Guidance

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### Links

This unit links with *Unit 12: Garden Design Principles* and *Unit 15: Hard Landscape Principles and Practice*. It is essential when striving for attractive and fictional landscape designs to take into account the future maintenance requirements of all materials involved.

### Essential requirements

Learners will need access to a 'live' garden/landscape site open to the public and information on a professional range of maintenance tools, equipment and machinery. A range of appropriate texts and journals covering the maintenance of all hard and soft landscape elements is important for learners to have access to.

### Employer engagement and vocational contexts

Delivery of this unit would be enhanced by employer and client engagement, for example visits to private gardens, public landscape features, parks and gardens and particularly any local authority or organisation responsible for maintenance programmes.

Learners could meet with head gardeners from local parks and gardens to investigate real issues and challenges with maintenance schedules and their application. Links with the landscape industry may support other units as well as work placement opportunities.

Guest speakers would help learners to gain a better understanding of the role and importance of effective maintenance programmes and how they are carried out. Learners could also be encouraged to become student members of professional organisations within the horticulture and landscape sector.

## Unit 18: Interior Landscape and Plant Displays

Unit code: H/503/1065

Level: 5

Credit value: 15

- Aim

This unit aims to develop learner understanding of the value and use of interior landscaping and plant displays and of their function in the decoration of buildings.

- Unit abstract

In this unit learners will have the opportunity to experience all aspects of the design and management of indoor landscapes. Learners will analyse interior environments and, by combining this analysis with a client brief, manage the installation and maintenance of plant displays. Learners will also carry out the specification of interior landscapes and examine aspects of tender application and contract management.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand technical and functional analysis for interior landscape and plant displays
- 2 Be able to produce designs for interior landscape and plant displays
- 3 Be able to select, install and maintain interior landscapes and plant displays
- 4 Understand the elements required for an interior landscape and plant displays contract.

## Unit content

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### 1 Understand technical and functional analysis of interior landscape and plant displays

*Technical analysis:* light levels; light quality; other environmental factors eg temperature, humidity, air flow; measuring and recording environmental conditions; dimensions of site; access for fire exits; sight lines; location of windows and doors; desire lines; location and type of heating and ventilation units; routes of cables and other services; positions and style of other furnishings

*Functional analysis:* function of the site eg private office, shopping mall; function of display eg, privacy, manipulating access; life span of display eg permanent, temporary; level of public access; health and safety implications; planned fluctuations of environmental conditions

eg closure of site during holidays; proposed maintenance regime; capital and maintenance budgets

*Communication with clients:* managing the client interview; managing client preferences and expectations; formulating the brief

### 2 Be able to produce designs for interior landscape and plant displays

*Plants:* foliage and floral; permanent and temporary; seasonal; the use of artificial plants, flowers and foliage

*Materials:* containers; growing media; surface treatments eg organic mulches; lighting; other decorative features eg sculpture; other utility features eg seating; irrigation systems; hydroponic systems

*Application of design principles:* scale and proportion; balance; unity and variety; rhythm and repetition; light and shade; texture; colour; focal points

*Factors influencing the application of design principles:* influence of intrinsic factors eg financial factors, timescales; influence of extrinsic factors eg environmental conditions

*Methods of communicating ideas:* concept drawings; plan views – master plan, planting plan, structural detail plans; elevations and cross-sections; 3-dimensional projections; photo montages; virtual presentation techniques

### 3 Be able to select, install and maintain interior landscapes and plant displays

*Selection:* appropriate plants; materials eg containers, growing media, mulches; other decorative and landscape features

*Reasons for selection:* aesthetic; functional; environmental conditions; financial

*Installation:* assessing and overcoming constraints imposed by the site eg limited access; health and safety implications of installation; minimising damage and waste

*Maintenance:* maintenance schedules; timing of operations to suit client requirements; routine operations eg cleaning, trimming, feeding; plant replacement policy and practice; plant health policies and practices; irrigation; maintenance of supplementary features eg lighting, automatic irrigation systems; health and safety implications – for operatives, for the public; minimising waste

### 4 Understand the elements required for an interior landscape and plant displays contract

*Specifications and tendering:* appropriate terminology and format; schedules and bills of quantities; specifying maintenance; cost estimates; fee structures; professional and public liabilities

*Contracts and contractual elements:* type of contractual arrangement eg install and maintain, leasing arrangements, maintenance only; memorandum of agreement; standard forms of contract; sub-contractors; access to site; waivers of responsibility; variations; certification of completion; repairing defects

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand technical and functional analysis for interior landscape and plant displays	1.1 evaluate information required to develop interior landscape and plant displays 1.2 measure the physical characteristics of the building environment in relation to interior landscaping 1.3 communicate with clients to ascertain their needs 1.4 explain limitations imposed by the building environment
LO2 Be able to produce designs for interior landscape and plant displays	2.1 apply the results of technical and functional analysis 2.2 design interior landscape and plant displays using appropriate plants and materials 2.3 produce plans and drawings of a quality suitable to present to clients
LO3 Be able to select, install and maintain interior landscapes and plant displays	3.1 justify plant and material selection 3.2 undertake the installation and maintenance of interior landscape and plant displays 3.3 use appropriate techniques, materials and equipment 3.4 work in an appropriate manner given the nature of the site in a building
LO4 Understand the elements required for an interior landscape and plant displays contract	4.1 explain specifications produced for interior landscape and plant displays 4.2 explain the types of contract used for interior landscape and plant displays 4.3 discuss the required elements of a contract

## Guidance

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### Links

This unit links with the following units in this qualification:

- *Unit 1: Principles of Plant and Soil Science*
- *Unit 7: Plant Environmental Adaptation and Physiology*
- *Unit 12: Garden Design Principles*
- *Unit 19: Plant Health and Environmental Relationships*
- *Unit 49: Planting Design.*

This unit also links with the Horticulture National Occupational Standards:

- L 26: Estimate resource requirements and programme work
- L 27: Plan, monitor and evaluate the establishment and management of planted areas.

### Essential requirements

To achieve this unit, learners need access to light, temperature, relative humidity and air movement measuring and recording equipment. Learners also need access to a range of appropriate plants and materials and to a site where interior plantings can be installed and maintained.

Appropriate textbooks and journals on the topic of interior landscape practices and design in the UK and abroad must be available for learners.

### Employer engagement and vocational contexts

Learners will benefit from links with professional interior landscape designers and contractors. Every opportunity should be taken to enable learners to visit interior landscapes to explore how design principles have been applied in practice. Visits to sites under construction, where there may be an opportunity to speak with designers and contractors, are especially useful. Learners will also benefit from discussing their own work with the 'end users' of existing interior landscapes.

Learners should be encouraged to attend seminars, conferences and shows relating to interior landscape design to keep up to date with the latest developments within the industry. Links with professional organisations such as the British Association of Landscape Industries (BALI) and the European Federation of Interior Landscaping Groups (eFIG) would also be useful.



## Unit 19: Plant Health and Environmental Relationships

Unit code: K/503/1066

Level: 5

Credit value: 15

### ● Aim

This unit aims to combine the recognition and biology of the major groups of plant pests, diseases, disorders and weeds. Learners will develop understanding that controlling these problems is carried out using a variety of methods which break the life cycle.

### ● Unit abstract

In this unit learners will examine the effects of pests, pathogens and nutrient disorders on crops and ornamental plants. They will develop the skills needed to identify and diagnose problems correctly and the knowledge to select the best control method.

This unit will give learners the knowledge to be able to classify a broad range of pests and pathogens and study their biology. Learners will gain an understanding of the process of forecasting epidemics and assessing damage.

Learners will identify the different types of weeds, study their biological make up and examine the problems they cause. They will understand weed control and the differences in physical structure and biochemical reactions.

Ecological awareness should be an integral part of any aspect of horticulture. Learners should be made aware of the structure and function of ecosystems and the dynamic processes which take place. This will enable learners to appreciate the need for appropriate intervention when managing natural and semi-natural habitats.

### ● Learning outcomes

#### **On successful completion of this unit a learner will:**

- 1 Understand the effects of pests, pathogens and nutrient disorders on the growth and appearance of crop and ornamental plants
- 2 Understand plant pests and pathogens
- 3 Understand the biological characteristics related to the control of weeds
- 4 Understand the dynamics, structure, function and management of ecosystems.

## Unit content

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### 1 Understand the effects of pests, pathogens and nutrient disorders on the growth and appearance of crop and ornamental plants

*Range of symptoms:* factors responsible for poor growth eg pests, pathogens, disorders

*Plant problems:* identification, diagnosis and verification; pests; pathogens; nutritional disorders

*Selection of control methods:* biological, chemical, environmental; strengths and limitations

### 2 Understand plant pests and pathogens

*Pests:* classification; biology; types eg insects, mites, nematodes, molluscs, rodents, birds, herbivores

*Pathogens:* classification; biology; types eg fungi, bacteria, mycoplasmas, viruses, parasitism; pathogenicity; the disease cycle; Koch Postulates; disease causation

*Control:* identification; prevention; cultural; biological; chemical

*Epidemiology:* factors and cultural practices which affect disease inoculums; forecasting epidemics; assessment of degree of damage

### 3 Understand the biological characteristics related to the control of weeds

*Range of weeds:* identification; biology; classification; types eg broadleaved, grasses, sedges, annual, perennial, biennial; common names; scientific names

*Control:* principles of weed control; differences in physical structure and biochemical reactions; identification; prevention; cultural; biological; chemical

### 4 Understand the dynamics, structure, function and management of ecosystems

*Principles of ecology:* abiotic and biotic composition; function and dynamics, energy flow, nutrient cycling, food webs and food chains

*Habitat types:* eg woodland, heathland, grassland, wetland, upland, marshland, meadow, mountain, peatland, river, scrub, hedgerows, urban

*Survey techniques:* quadrants/line transects; species identification; limiting factors; population ecology and dynamics; biotic relationships; competition; mutualism; parasitism

*Survey report:* collation of results; quantitative, qualitative; written; graphical; pictorial; record-keeping requirements

*Management:* evaluation; intervention on habitat eg grazing; mowing; coppicing; pollarding; drainage; irrigation; cultivation

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand the effects of pests, pathogens and nutrient disorders on the growth and appearance of crop and ornamental plants	1.1 examine a range of symptoms of plant pests, pathogens and disorders on crops and ornamental plants 1.2 explain the diagnosis and verification of given plant problems 1.3 justify the selection of pest and pathogen control methods
LO2 Understand plant pests and pathogens	2.1 explain the classification and biology of a wide range of plant pests and pathogens 2.2 relate the biology and classification of organisms to their control by cultural, biological and chemical methods 2.4 explain how epidemics may be forecast effectively
LO3 Understand the biological characteristics related to the control of weeds	3.1 classify weeds using common and scientific names 3.2 relate the biology and classification of weed species to their control
LO4 Understand the dynamics, structure, function and management of ecosystems	4.1 explain the principles of ecology in relation to a given situation 4.2 carry out a planned survey of a given habitat 4.3 report on the results of the survey 4.4 evaluate the impact of management interventions on the habitat and its associated ecosystems

## Guidance

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### Links

This unit links with the following units in this qualification:

- *Unit 1: Principles of Plant and Soil Science*
- *Unit 7: Plant Environmental Adaptation and Physiology*
- *Unit 19: Plant Health and Environmental Relationships*
- *Unit 21: Organic Principles and Practice*
- *Unit 27: Plan and Manage the Growth and Development of Crops*
- *Unit 55: Grassland Management.*

### Essential requirements

Learners should have access to a wide range of plants and weeds to help to enable them to identify and monitor different pests, pathogens and disorders. They should also be involved in the control of these in a variety of ways. It is also essential that learners have access to at least one habitat to survey. However this can be carried out on an off-site visit.

### Employer engagement and vocational contexts

Delivery of this unit would be enhanced by employer engagement and expert guest speakers, for example, a plant inspector from a local Defra office or an environmental officer.

Sustained links with plant growers may support other units as well as work placement opportunities.

## Unit 20: Understanding Organic Soil Management

Unit code: M/503/1067

Level: 5

Credit value: 15

- Aim

This unit aims to give learners an understanding of the principles and processes involved in the management, production and use of organic matter materials. Learners will explore the soil rhizosphere, biological life cycles, morphology and the biology of soil biota in relation to ecology and natural ecological balances including biological nitrogen fixation.

- Unit abstract

The quality of soil can be improved with good management. In this unit learners explore which management plans improve rather than degrade soil quality, as well as exploring the practice of adding organic matter to soils. On average, an acre of soil contains millions of microscopic and macroscopic life forms which form a living community rather than just an inert mass. A healthy, living soil can support human activity, producing healthy plants with minimum disease, high productivity and low susceptibility to insect attack. Land-based employees involved in plant and soil management must understand working with soil to achieve this.

The unit focuses on the soil principles required by people in the horticulture industry, working in garden trades and gardeners. The ideas covered are vital to achieving successful and healthy plant growth.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the importance of soil biota to soil ecology
- 2 Understand soil fertility and sustainability
- 3 Be able to review methods and systems of using plant and animal residues
- 4 Understand management and maintenance practices in a whole-systems approach.

## Unit content

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### 1 Understand the importance of soil biota to soil ecology

*Rhizosphere*: definition; function; benefits; processes eg proteins and sugars released by roots, protozoa and nematodes that feed on bacteria, nutrient cycling

*Soil biota*: classification and range of mega fauna, macro fauna, meso fauna, micro fauna, micro flora

*Biological interactions*: decomposition of organic matter; nutrient cycling; nitrogen fixation; fauna importance eg bacteria, actinomycetes, fungi, algae, protozoa, viruses, nematodes, earthworms

*Biological life cycles*: importance; energy flow and recycling; nutrient flow; food chains and food webs eg primary consumers, secondary consumers, producers, decomposers, autotrophs (halophytes), heterotrophs (holozoites and saprophytes); interactions; ecosystems

### 2 Understand soil fertility and sustainability

*Fertility*: definitions; concept; soil components eg minerals, air, water, organic matter; physical conditions; soil chemistry eg pH, macronutrient requirements, micronutrient requirements; short-term and long-term fertility; sustainable maintenance and management; measurement and monitoring of fertility

*Organic matter*: definitions, types eg dead animal and plant material; value and importance; humus eg humification, humic acid, humus builders (commercial and natural), stability and benefits of humus

*Chemical and biological processes*: humification; nitrification; denitrification; leaching; advantages of feeding the soil as opposed to the plant; nutrient measurement in soil eg carbon; nutrient cycles (sulphur, nitrogen, hydrological and carbon); nutrient budgeting; effects of interaction of soil/water/plant roots/ion exchange/bridges/microbes; soil-water relationships; ion exchange processes

*Fertilisers and manures*: types of manures; nutrient levels; nutrient analysis; uses; application and management; fertilisers; availability and use; nutrient analysis; standards and certification for fertilisers, manures, soil conditioners; prohibited and restricted materials

*Green manures*: definition; types; benefits; uses

**3 Be able to review methods and systems of using plant and animal residues**

*Animal residues:* types; uses; nutrient content; application; benefits; organic standards

*Plant residues:* types; uses; nutrient content; application; benefits; sources

*Composting :* suitable and unsuitable materials; physical requirements needed to compost; location requirements; required conditions eg aerobic, anaerobic; methods eg sheet, trench, pit, small and large scale; chemical and biological processes required eg activators, accelerators, temperature and PH; problem diagnosis; timing and determining readiness; standards

*Large-scale composting:* municipal and on-farm composting eg methane digesters and other biogas digesters, incinerators, aerated static pile composting, in-vessel composting; advantages of each

**4 Understand management and maintenance practices in a whole-systems approach**

*Inputs and outputs:* types of input and output eg nutrient budgets, crop protection, machinery, energy, climate; open systems; closed systems; effects; how to achieve a closed system; conversion to organic farming

*Management:* standards; certification; care of the soil, land, wildlife, biodiversity and local communities; use of rotation

*Maintenance:* monitoring nutrient levels eg carbon, nitrogen; soil testing eg PH, microbial populations, soil toxicity; aeration; drainage; nutrient balance; sustainability

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand the importance of soil biota to soil ecology	1.1 explain the function and benefits of a healthy rhizosphere 1.2 explain the classification of a range of soil biota 1.3 examine the importance of biological interactions 1.4 explain energy flow and recycling in biological life cycles
LO2 Understand soil fertility and sustainability	2.1 review definitions and concepts of soil fertility 2.2 explain the role and benefits of organic matter and humus in soil 2.3 explain chemical and biological processes of soil 2.4 evaluate the nutrient levels and uses of organic fertilisers and manures 2.5 evaluate the potential benefits of green manures
LO3 Be able to review methods and systems of using plant and animal residues	3.1 examine the use of animal and plant residues in crop production 3.2 evaluate a range of composting methods and procedures for given requirements 3.3 compare the use of on-farm and municipal composting
LO4 Understand management and maintenance practices in a whole-systems approach	4.1 review the effects of a range of inputs and outputs 4.2 evaluate management practices in compliance with organic standards 4.3 analyse maintenance operations for long-term sustainability and cropping 4.4 recommend valid improvements to given maintenance operations

## Guidance

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### Links

This unit can be linked to a number of units within this qualification. Other units that have a common theme or also cover ideas in this unit are *Unit 21: Organic Principles and Practice*, *Unit 19: Plant Health and Environmental Relationships*, *Unit 2: Work-based experience (a work experience placement at a nursery or farm that has achieved or is trying to achieve organic standards as stated by Defra)*, *Unit 3: Project Management for Land-based Industries (assisting with the conversion to organic methods)*, *Unit 32: Sustainable Development*, *Unit 9: Environmental Management* and *Unit 1: Principles of Plant and Soil Science*.

### Essential requirements

Sufficient library resources should be available to enable learners to achieve this unit, including soil chemistry text books, organic standards information, composting guides, waste use legislation and soil biology text books.

A wide range of materials available on the internet and a number of interesting 'how to' composting guides.

Equipment/consumables required include soil-testing kits, pH kits, data-logging equipment to record nutrient levels, composting equipment and microscopes with related accessories. However, some of the equipment requirements can be met through visits to organic farms and nurseries.

Regular supervised practical work is an essential part of this unit and learners as a result, would benefit from carrying out at least 15 hours of practical work.

### Employer engagement and vocational contexts

Learners would benefit from having access to a working environment. This can be achieved by creating links with local businesses or charitable organisations who may even benefit from taking on learners. Local farms (contact the NFU for details) and nurseries are great sources of information and are often keen to share their knowledge. Business education alliances can also be useful and charitable organisations can often provide guest speakers to give lectures as well as demonstrations.



## Unit 21: Organic Principles and Practice

Unit code: T/503/1068

Level: 5

Credit value: 15

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- Aim

This unit aims to give learners underpinning understanding of the key philosophies, principles and practices that underpin of organic production systems. Learners will consider the history of the organic movement and its organisations, key issues, development and roles and the importance of organic organisations.

- Unit abstract

It is difficult to visit a supermarket or watch a food-related programme without being reminded organic purchases. In this unit learners will explore these arguments for themselves by studying the key principles and practices of organic crop production.

A farmer or horticulturalist can choose to 'go organic' for a number of reasons-the contamination of soil and ground water may be reduced, wildlife (some of which may help with pest control) will not be harmed by pesticide build up, waste production is minimised, energy usage and pollution may decrease. However, it is the potential health benefits that are persuading more and more people to select organic produce.

This unit would be useful for benefit anyone hoping to work in horticulture or agriculture, organic or not, as it provides an opportunity to study alternatives to standard practices.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand organic principles, practices and standards
- 2 Be able to plan an organic cropping system
- 3 Understand how to maintain the healthy growth of organic crops
- 4 Understand management practices for organic production.

## Unit content

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### 1 Understand organic principles, practices and standards

*History:* definition of organic; background; founders and development of the organic movement

*Certification:* procedures; certification bodies eg The Soil Association; importance; European and national standards eg for organic food and farming, crop husbandry, food processing

*Conversion:* process; inspection requirements; documentation eg records.

*Organisations:* roles, benefits, contributions and marketing strategies of eg International Federation of Organic Agricultural Movements, United Kingdom Register of Organic Food Standards, British Organic Standards Committee, The Soil Association, Elm Farm Research Centre, Organic Farmers and Growers Ltd, The Bio-Dynamic Agricultural Association (Demeter), Henry Doubleday Research Association (The Organic Horticulture Association)

*Practices:* general techniques; comparisons with conventional production; share farming; yield differences; homeopathic practices; social and demographic considerations; holistic practices; renewable and sustainable resources; localisation; pollution; chemical pathways; health and welfare; whole-systems approach; environmental impact

### 2 Be able to plan an organic cropping system

*Planning:* plan must include general information eg location, name; crops for certification and projected yields; plants/seeds used including variety and brand; how crops will be grown eg greenhouse, field; soil type; major components of the soil; compost use; manure use; natural resources; adjoining land use

*Considerations:* soil fertility; pest control; disease control; water use; problems with adjoining land; nutrient application; crop rotation

### 3 Understand how to maintain the healthy growth of organic crops

*Monitoring:* soil sampling; nutrient sampling; plant sampling; pest observation; signs of disease; soil fertility checks; buffer areas eg tree line, hedgerow, grass strip; observation eg visual, photographic, wind direction/speed data, residue analysis

*Nutrients:* soil fertility; soil foliar fertiliser requirements; NPK requirements; organic sources of nutrients and application procedures; organic residues and nutrient cycling; Mg requirements

*Causes of crop losses:* drought; excessive temperature changes eg excessive heat/frost; excessive moisture eg rainfall, flood; disease and pests; birds eg waterfowl; big game eg deer

#### 4 Understand management practices for organic production

*Site:* location; selection; factors; standards; relationship with neighbouring operations

*Practices:* whole-systems approach; animal and plant integration; specialist and approved practices; restricted practices; prohibited practices; production systems; weed control; rotation; companion planting; biological control; animal treatments; feeds; sustainable practices

*Economics:* acceptable market prices; crop yields in comparison with conventional production; premium pricing; variable input costs; margins; fixed costs; grants; social implications; external costs; quality; ethical investment; food miles and carbon footprint considerations; farmers' markets; share farming

*Resources:* sustainability; quality; harmony with nature; renewable resources; reduce/reuse/recycle/restore; diversity; intercropping; ecosystem protection; holistic approach; environmental impact in relation to production practices

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand organic principles, practices and standards	1.1 explain the definition of organic agriculture and horticulture 1.2 examine certification procedures and conversion to organic methods 1.3 compare the marketing strategies of major organic organisations 1.4 explain major organic principles and practices 1.5 evaluate the influence of a range of practices on the environment
LO2 Be able to plan an organic cropping system	2.1 plan for cropping an organic production system 2.2 discuss factors which affect soil fertility and suitability for an organic cropping system 2.3 plan nutrient application to satisfy specific organic crop requirements 2.4 examine the importance of crop rotation within an organic production system
LO3 Understand how to maintain the healthy growth of organic crops	3.1 explain the importance of monitoring as a means of controlling organic crop production 3.2 explain the role of nutrients in an organic cropping system 3.3 review the major causes of crop production losses within an organic system
LO4 Understand management practices for organic production	4.1 evaluate site selection factors 4.2 analyse a range of organic management practices 4.3 explain how economic factors influence organic production 4.4 analyse methods of renewable resource management

## Guidance

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### Links

This unit can be linked to a number of units within this qualification. Other units that have a common theme or also cover ideas from in this unit are *Unit 1: Principles of Plant and Soil Science*, *Unit 9: Environmental Management*, *Unit 2: Work-based experience (a work experience placement at a farm or organic nursery)*, *Unit 3: Project Management for land-based Industries (taking part in a farm conventional to organic conversion)* and *Unit 13: Fruit and Vegetable Production Management*.

### Essential requirements

Sufficient library resources should be available, including soil chemistry books, organic standards information, crop production and soil biology text books.

A wide range of materials is available on the internet, including papers concerning organic crop management from around the world, for example organic cranberry growing in America and how it was first established.

Equipment/consumables required include soil-testing kits, pH kits, data-logging equipment to record nutrient levels, composting equipment, cameras and microscopes with related accessories. However, some of the equipment requirements can be met through visits to organic farms and nurseries.

Regular supervised practical work is an essential part of this unit and, as a result, learners would benefit from carrying out at least 15 hours of practical work.

### Employer engagement and vocational contexts

Learners would benefit from having access to a working environment. This can be achieved by creating links with local businesses or charitable organisations who may even benefit from taking on learners. Local farms (contact the National Farmers Union for details) and nurseries are great sources of information and are often very keen to their share knowledge. Business education alliances can also be useful and charitable organisations can often provide guest speakers to attend and give lectures as well as demonstrations.



## Unit 22: Golf Course Design Principles

Unit code: M/503/1070

Level: 5

Credit value: 15

- Aim

This unit aims to give learners an understanding of the principles applied to designing a new golf course and encourage debate over issues relating to golf course design.

- Unit abstract

Golf is a popular leisure past time and golf courses are continuously being re-designed to meet user's needs. In addition, new golf courses continue to be developed to meet consumer needs.

This unit is essential for learners looking to go into golf course design, construction, or course, management as learners will evaluate golf course design and required including natural and constructed, that enhance the player experience at all levels. Debate and discussion are essential elements of this unit as are visits to golf courses and industry competent guest speakers. Learners will investigate and learn about the importance and theory underpinning golf course design.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand philosophy and strategy applied to golf course design
- 2 Understand the use of natural and constructed site features
- 3 Understand golf hole design and layout
- 4 Understand the use of other features in golf course design.

## Unit content

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### 1 Understand philosophy and strategy applied to golf course design

*Design team:* golf course architect; land planner; building architect; civil engineer; irrigation designer; landscape architect; ecologist; planning consultant

*Financial:* budget management; financial planning and the design process; private and council managed courses

*Legal and environmental:* planning consents and permissions; health and safety legislation relating to design; environmental considerations and legislation

*Design considerations:* types of course – 9/18/36 hole courses, public and private courses; specialist facilities and resources putting greens, driving ranges, hospitality facilities ie clubhouse

*Design factors:* principles of aesthetics and harmony in relation to natural surroundings and overall purpose of the course; interpreting philosophy; characteristics of strategy

### 2 Understand the use of natural and constructed site features

*Advantages and disadvantages:* natural features; constructed features

*Types of features:* slopes; level ground; rough; tees; greens; fairways; bunkers; natural landscape and surroundings

*Landscape considerations:* environmental impact; visual impact; planning considerations; enrichment of playing experience; financial considerations

### 3 Understand golf hole design and layout

*Design process:* grading plans; drainage plans; clearing plans; landscape plans; green, tee, fairway and bunker details; construction details; specifications and bills of quantities

*Green and hole design:* par 1, 2, 3, 4, 5, 6 and characteristics, strategic penal and heroic hole design

*Maintenance considerations:* fairways; rough; tees; greens

### 4 Understand the use of other features in golf course design

*Design process:* landscape plans; green, bills of quantities and specifications

*Features:* water; trees and shrubs

*Maintenance considerations:* water maintenance; tree and shrub maintenance schedules and regimes

*Environmental considerations:* environmental impact; conservation issues; visual impact; planning considerations; enrichment of playing experience; financial considerations

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Understand philosophy and strategy applied to golf course design	1.1 explain Dr Mackenzie's 13 points for the ideal golf course 1.2 explain the principles of aesthetics and harmony in golf course design 1.3 examine the influence of strategy, variety, beauty, economy and utility on the design process
LO2 Understand the use of natural and constructed site features	2.1 compare natural and constructed features in golf course design 2.2 critically evaluate the features used for given sites
LO3 Understand golf hole design and layout	3.1 explain the categories of golf hole design 3.2 justify the use of basic green types, bunkers and trees 3.3 examine modern approaches towards fairways and rough
LO4 Understand the use of other features in golf course design	4.1 examine the use of features in given golf course designs 4.1 explain how environmental considerations are implemented 4.2 evaluate environmental considerations in given golf course designs

## Guidance

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### Links

This unit has direct links with the following professional bodies and national occupational standards and the professional guidance that they oversee and implement: The British and International Golf Greenkeepers Association, European Institute of Golf Course Architects, The Golf Course Builders Association of America, The American Society of Golf Course Architects, The Royal and Ancient Golf Club of St Andrews, The Sports Turf Research Institute, The United States Golf Association.

This unit also links with *Unit 53: Construction and Maintenance of Sports Turf Surfaces*, *Unit 52: Quality and Performance Standards for Turf*, *Unit 54: Mechanisation Management – Turf* and *Unit 57: Golf Course Planning*. Some aspects can also be linked to *Unit 12: Garden Design Principles*.

### Essential requirements

Learners need access to ICT and internet facilities, a well-resourced library and a range of different styles of golf course, either through site visits or multimedia resources.

### Employer engagement and vocational contexts

Centres should create links with a range of golf course businesses within visiting distance of the centre which learners can visit as part of their studies and which can be used for work experience for learners wishing to expand their knowledge in this field. Also visits to golf courses outside the 50-mile radius should be included so learners can experience regional differences in the design of golf courses.

Centres must establish close links with the British and International Golf Greenkeepers Association and learners should join as student members. They should register with the Sports Turf Research Institute to access their resources. Visiting speakers, including the managers of established golf course facilities and landscape architects would add to delivery of this unit, enabling learners to question and interact with professionals with current industry experience.

## Unit 23: Management of Historic Parks and Gardens

Unit code: T/503/1071

Level: 5

Credit value: 15

- Aim

This unit aims to develop learner understanding of historic parks and gardens, their influences, management and sources of income.

- Unit abstract

The term 'historic parks and gardens' encompasses a vast range of types, styles, sizes and ages of landscapes which together form an important part of our national heritage. In this unit learners will learn about complex issues involved in their management and maintenance.

Learners will investigate aspects of management planning, in particular preserving and developing the heritage value of an historic site. They will appreciate the legal constraints governing the management of historic sites and investigate the various funding streams available for their maintenance and improvement.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to manage a historic park or garden to pre-determined standards
- 2 Understand how to manage historic parks and gardens
- 3 Understand historical garden styles and their influence on parks and gardens
- 4 Understand sources of historic parks and gardens income generation.

## Unit content

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### 1 Be able to manage a historic park or garden to pre-determined standards

*Management planning:* aims of management planning; setting management objectives; timescales relevant to historic parks and gardens; the allocation of material and human resources; using management objectives to implement appropriate management and maintenance schedules

*Planning improvement and renovation:* planning constraints relevant to historic parks and gardens; obtaining planning consent; regulatory and consultative bodies; improving access in historic parks and gardens; renovation philosophies – conservation versus restoration, Future Heritage

*Maintenance planning:* maintenance objectives; maintenance schedules; timescales relevant to historic parks and gardens; allocation of human and material resources; specialist materials, techniques and procedures relevant to the historic context

*Communication:* with individuals, teams and the wider public; with regulatory and consultative bodies

*Monitoring management and maintenance:* aims of monitoring; setting standards; monitoring systems and procedures; record keeping; using the information gathered to inform management decisions

### 2 Understand how to manage historic parks and gardens

*Management of resources:* building an effective team; roles and responsibilities of team members; selection and maintenance of machinery and equipment; the use of existing structures eg for storage, for growing plant material; sourcing materials suited to the historic context

*The legislative framework:* general legislation and directives regarding the management of horticultural operations eg Tree Preservation Orders; legislation and directives specific to historic parks and gardens eg the English Heritage Register, National Heritage Act 1987; legislation regarding public use eg Disability Discrimination Act 1995; health and safety considerations for staff, contractors and visitors including vulnerable groups

### 3 Understand historical garden styles and their influence on parks and gardens

*The development of styles:* classical gardens; parks and gardens of the Medieval world; the impact of the Renaissance; early modern gardens eg the Baroque, the Landscape Movement, the Picturesque; modern gardens eg the Gardenesque, Neo-Classicism; 20th century and contemporary gardens eg modernism, post-modernism, the Naturalistic Movement; impact of historic context on current management and maintenance practices and procedures

*The context within which garden styles should be understood:* historical and political setting; social, economic and cultural factors; the interactions of styles across time and between cultures

*The selection and interpretation of data:* sources of information; interpreting historic sources; identification of appropriate historic styles and features; recording data (written, electronic, visual); using historic data to inform current management practices; how landscapes will change over time; how social, cultural and aesthetic criteria influence the acceptance of historic styles and features

### 4 Understand sources of historic parks and gardens income generation

*Income generation:* income from visitors; on-site catering; associated sales eg gift shop, plant sales; events and activities eg concerts, workshops; corporate and private events eg weddings, conferences; the use of volunteers; constraints and legal implications of income generation operations

*External funding sources:* national and international grant awarding bodies; grants for restoration, renovation and conservation projects; maintenance grants; UK tax relief eg from inheritance and capital gains tax; sponsorship

*Evaluation of management regimes:* the responsibilities of ownership/stewardship; private ownership by individuals and corporations; implications of charitable status; small charitable trusts; the National Trust; English Heritage; ownership by local or central government

## Learning outcomes and assessment criteria

Learning outcomes  On successful completion of this unit a learner will:	Assessment criteria for pass  The learner can:
LO1 Be able to manage a historic park or garden to pre-determined standards	1.1 oversee the allocation of resources to achieve planned management and maintenance objectives 1.2 plan long-term historic park or garden management to meet given objectives 1.3 ensure all schedules and activities are implemented according to legal requirements, and in context with the historical influences of the park or gardens 1.4 ensure management and implementation procedures are communicated to the relevant people 1.5 monitor the management and maintenance of the park or gardens
LO2 Understand how to manage historic parks and gardens	2.1 determine materials which are in keeping with the historical influence of a given park or garden 2.2 examine the legal requirements relating to the management of historic parks and gardens 2.3 discuss health and safety considerations associated with the management of historic parks and gardens
LO3 Understand historical garden styles and their influence on parks and gardens	3.1 examine the influence of historical garden styles on the establishment, maintenance and restoration of parks and gardens 3.2 analyse the use of historical data in order to identify historical styles and features 3.3 explain how historical data influences current planning and management of the gardens
LO4 Understand sources of historic parks and gardens income generation	4.1 analyse the role, application for and use of sources of funding for historic parks and gardens 4.2 compare the management of privately owned gardens and those managed by charities and other organisations

## Guidance

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### Links

This unit links with the following unit:

- *Unit 12: Garden Design Principles*
- *Unit 16: Public Horticulture*
- *Unit 49: Planting Design*
- *Unit 44: Historical Influence in Garden Design.*

### Essential requirements

Learners will need access to a variety of historic parks and gardens so that they can fully comprehend their design and management. Centres delivering this unit will need to develop a close working relationship with at least one historic park or garden to enable learners to achieve learning outcome 1. Learners must have access to both a good horticultural/history library stocked with national and international journals, textbooks and academic papers, and to ICT facilities with internet access.

### Employer engagement and vocational contexts

Centres are encouraged to form links with owners and managers of historic parks and gardens (including, for example, the National Trust, English Heritage and the Royal Parks). This will not facilitate visits and may also generate opportunities for learners to gather information both on-site and from guest speakers. Contacts with organisations such as the Garden History Society, the Professional Gardeners Guild and the Historic Houses Association are also recommended (the Garden History Society, for example, presents a regular programme of seminars, lectures and visits).



## Unit 24: Growing Media

Unit code: A/503/1072

Level: 4

Credit value: 15

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- Aim

This unit aims to develop the management skills and understanding needed to plan and manage growing media.

- Unit abstract

This unit will give learners an understanding of the growing media essential to all growing plants. This may be soil, soilless or in a liquid form. The unit examines how the growing media can best be managed to ensure optimum plant growth. Learners will develop their knowledge of plant nutrition and also of soil pH and its importance in relation to nutrient availability. They will examine properties of growing media and how plant growth can be manipulated.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the growing media requirements for plant growth
- 2 Understand the range of growing media
- 3 Understand the management issues related to a range of growing media
- 4 Be able to select and manage suitable growing media for a range of plants.

## Unit content

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### 1 Understand the growing media requirements for plant growth

*Requirements of growing media:* protected and field scale; soil and soilless media; container; hydroponics; nutrient film techniques; sources; environmental issues; water holding characteristics; drainage; air-filled porosity; electrical conductivity and nutrient status; handling systems; storage; soil types to include podzols, brown earths; soil classification, age and shelf life

*Soil:* as a rooting medium; texture; structure; organic matter; fauna and microflora; nutrient status

*Properties:* physical, chemical, soil water, soil atmosphere, soil organic matter, flocculation, pH, salinity, anion and calcium exchange, water retention agents

### 2 Understand the range of growing media

*Media:* protected and field scale; soil-based and soilless media; peat free composts; nutrient film techniques; hydroponics; rockwool; ingredients eg soil, peat, bark, vermiculite/perlite, lecca

*Fertiliser:* types and incorporation

*Soils:* soil- self-perpetuating and self-renovating; formation; parent materials; climate, topography, vegetation, time and man; development of soil profiles; soil and land classifications and mapping

*Ingredients:* plant nutrient availability; ingredients of soil-based and soilless mixes; their physical and chemical properties; water and nutrient management; material eg rockwool, peat, coir, bark, vermiculite, perlite, and lecca

### 3 Understand the management issues related to a range of growing media

*Plant nutrients:* availability; pH and its modification; provision of plant nutrients; sampling and analysis of soil and growing media; fertiliser recommendations for specific purposes; fertiliser for different situations; nutrient deficiencies and disorders; legislation

*Soils:* cultivation, weathering, testing and control, nutrient application, loss, balance and interaction (compaction, capping, smearing, nutrient and micro-nutrient interactions); legislation and codes of practice

*Management of soil properties:* soil water management; irrigation and drainage; colloids and plant nutrient availability; growing media other than soils; ingredients of soil-based and soilless mixes; physical and chemical properties; water and nutrient management

*Manipulation of growth:* yield and quality; nutrient availability; chemical modification; temperature; water availability

*Sources and handling:* bought-in or self-mixed; bulk, loose or packaged; costs

**4 Be able to select and manage suitable growing media for a range of plants**

*Media:* protected and field scale; soil-based and soilless media; peat-free composts; nutrient film techniques; hydroponics; rockwool; ingredients eg soil, peat, bark, vermiculite, perlite, and lecca

*Management:* air, water, porosity; fertiliser requirements; pH; irrigation

*Management of soil properties:* soil water management; irrigation and drainage; colloids and their effect on the properties of soils and other rooting media

*Manipulation of growth:* yield and quality; nutrient availability; chemical modification; temperature; water availability

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Understand the growing media requirements for plant growth	1.1 examine the relationship between plant growth and the properties of growing media 1.2 evaluate the nutrient status of different growing media
LO2 Understand the range of growing media	2.1 compare soil and soilless growing media 2.2 explain liquid growing media systems
LO3 Understand the management issues related to a range of growing media	3.1 examine regulations relating to the use of growing media 3.2 relate the behaviour of nutrients to the symptoms and treatment of mineral nutrient disorders 3.3 explain pH, how it affects nutrient availability and how it can be varied 3.4 explain how fertiliser requirements can be calculated to give optimum plant growth
LO4 Be able to select and manage suitable growing media for a range of plants	4.1 justify the selection of a growing medium for a given plant and product 4.2 supervise the management of selected growing media for optimum plant growth 4.3 evaluate management carried out recommending improvements

## Guidance

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### Links

This unit links with the following units in this qualifications: *Unit 27: Plan and Manage the Growth and Development of Crops*, *Unit 14: Nursery Stock Production* and *Unit 29: Plan and Manage Protected Crops*.

### Essential requirements

It is essential that learners have access to the type and range of crops and growing media used in crop production. Learners require supervised access to horticultural production sites that use commercial crop production methods.

Learners in employment and studying part-time may find their own workplace to be a suitable resource.

Suitable resources for this unit could be provided by the centre farm or nursery, learning resource centres, trade exhibits, local farms and horticultural enterprises to broaden the range of operations for learners.

### Employer engagement and vocational contexts

It is essential that this unit be delivered in an applied and vocational context and work based-experience will also be important.

Due to the wide range of crops grown and the growing media available to growers, this unit will be enhanced by contact with employers. Centres are encouraged to develop links with local businesses, manufacturers and suppliers who can support the breadth and application of this unit. Employers can provide real work practical exercises, and guest speakers and experts to support the learning experience. Employer engagement will help to ensure the use of technically up-to-date information and processes.



## Unit 25: Manage the Identification and Classification of Plants

Unit code: F/503/1073

Level: 4

Credit value: 15

- Aim

This unit aims to enable learners to gain the knowledge and understanding required to identify a range of important plant families, forms and species.

- Unit abstract

Plant identification is an essential part of horticulture. In this unit learners will be taught about the wide range of plant types and species and introduced to the concept of nomenclature. Learners will develop the skills needed to identify a range of important plant families and species and to recognise plant types and forms. They will examine the use of identification keys and of Latin as a common language for plant nomenclature.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to manage the identification and classification of plants
- 2 Be able to identify and classify plants
- 3 Understand how to manage the identification and classification of plants
- 4 Understand the legislative implications relating to managing the identification and classification of plants.

## Unit content

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### 1 Be able to manage the identification and classification of plants

*Nomenclature:* family, genus, species, sub-species, variety, cultivar, form; synonyms

*Management:* responsible plant sourcing; liaison with relevant organisations; effective use of plant collections to promote the site and engage communities; interpretation, historic significance, events; a range of genera and species; increasing awareness and access to plants on site; management of native flora and fauna; management of competition; plant pest and disease invasion

*Plant recording:* purpose and requirements; record types eg ledgers, index cards, paper forms, notebooks, computer-based and CAD (computer-aided design) systems; added value; national databases; use of International Transfer Format for Botanic Gardens Plant Records (ITF); labelling

*Plants:* to include evergreens, conifers, deciduous, seaside plants, native and exotic trees, herbaceous, perennials and annuals, shade and woodland plants, water plants, alpiners, plants for arid areas; native and non-native; invasive species

### 2 Be able to identify and classify plants

*Use of plant keys:* online, computer-based or hard copy text, glossaries and keys; use of Latin as international language

*Identification:* using visual characteristics including flowers, leaves, stems, overall morphology; where found and morphology in relation to habitat

*Nomenclature:* family, genus, species, sub-species, variety, cultivar, form, synonyms; hybrids- inter-specific, inter-genetic

*Plant diversity and nomenclature:* International Code of Botanical Nomenclature, International Code of Nomenclature for Cultivated Plants

### 3 Understand how to manage the identification and classification of plants

*Relevant organisations:* eg National Council for the Conservation of Plants and Gardens (NCCPG), Royal Botanical Gardens Kew, Botanic Gardens Conservation International (BGCI), Royal Botanic Garden Edinburgh; International Plant Exchange Network (IPN)

*Plant naming:* the binomial systems; linnean system, APG (Angiosperm Phylogeny Group) and others; difficulties of common names and regional variations

*Identification:* use of plant collections; plant collection organisation; plant introductions; herbariums and their purpose; plant collectors

#### 4 Understand the legislative implications relating to managing the identification and classification of plants

*Legislation:* Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on Biological Diversity (CBD), invasive species legislation; national wild plant legislation eg Wildlife and Countryside Act 1981; Biodiversity Action Planning and Plans

*Plant registration:* systems and requirements; plant breeders' rights (PBR); Plant Variety Rights office; ProVaR (Protected Varieties Ltd.)

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Be able to manage the identification and classification of plants	1.1 discuss the plant species within the site, including common British flora 1.2 select a plant record system appropriate to the site 1.3 discuss the heritage, conservation and amenity value of plants on site 1.4 assess any invasive species and act accordingly 1.5 ensure that plant collections and horticultural practices do not impact negatively on the conservation of wild flora and fauna
LO2 Be able to identify and classify plants	2.1 select appropriate plant identification and classification keys 2.2 classify 200 plants taxonomically 2.3 explain plant morphology in relation to habitat requirements
LO3 Understand how to manage the identification and classification of plants	3.1 source relevant information from suitable organisations 3.2 explain botanical nomenclature as it relates to current and correct use of taxonomic terms 3.3 evaluate the reasons for plant nomenclature
LO4 Understand the legislative implications relating to managing the identification and classification of plants	4.1 explain the relevant legislative requirements affecting plant sourcing, propagation and distribution 4.2 determine systems relating to the registration of new varieties 4.3 examine the requirements and restrictions relating to plant breeders' rights, Provar and the PBR inspectorate

## Guidance

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### Links

This unit links with the following units in this qualification: *Unit 12: Garden Design Principles, Unit 14: Nursery Stock Production, Unit 17: Landscape and Garden Maintenance, Unit 18: Interior Landscape and Plant Displays, and Unit 23: Management of Historic Parks and Gardens.*

### Essential requirements

It is essential that learners have access to a wide range of plants – families and species. Learners require supervised access to horticultural production sites, botanical gardens and plant collections.

Learners in employment and studying part time may find their own workplace to be a suitable resource.

The centre estate and grounds could provide suitable resources, but these are likely to be insufficient on their own. Learning resource centres and visits to local gardens and plant collections are needed to enhance delivery of this unit.

### Employer engagement and vocational contexts

It is essential that this unit is delivered in an applied and vocational context and work-based experience will also be important.

The plant kingdom is enormous and diverse. It is unlikely that one establishment can provide for the range required for this unit will be considerably enhanced through visits to botanical gardens and plant collections. Centres are encouraged to develop links with gardens that can support the breadth and application of this unit. Owners, head gardeners and employers can provide real work practical exercises and guest speakers and experts to support the learning experience.



## Unit 26: Plan and Manage the Movement of Plants

Unit code: J/503/1074

Level: 5

Credit value: 15

- Aim

This unit aims to enable learners to manage the handling and transport of plants in an efficient manner, maintaining quality and minimising damage. The unit is work based and aims to give learners commercial expertise.

- Unit abstract

This unit focuses on a vital and costly aspect of practical plant production and will give learners an understanding of commercially-based plant movement processes and techniques.

Learners will follow the movement of plants along the distribution chain, from grower to end user, and investigate a variety of handling systems and processes. They will learn how each link in the distribution chain impacts on plant quality, prices and profits, and how commercial practice is governed by national and international legislation.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to identify and prepare plants for transport
- 2 Understand the movement of plants within the work area
- 3 Understand the movement of plants on public highways
- 4 Understand the distribution of plants.

## Unit content

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### 1 Be able to identify and prepare plants for transport

*Range of plants:* bedding plants, house plants, herbaceous perennial plants, shrubs, trees, semi-mature specimens; containerised, root-balled, bare rooted

*Selection of plants:* plants are correctly identified; plants meet customer requirements; plant quality; physical constraints eg drought, water logging, frost

*Preparation of plants:* lifting; packaging; containerisation eg crates, pallets; fragile and over-sized plants; labelling; record keeping

*Storage before transportation:* avoiding physical damage; minimising stress; dealing with adverse conditions

### 2 Understand the movement of plants within the work area

*Effects of transportation:* physical damage; stress eg dehydration, damage from dropping and shaking; minimising damage and stress

*Evaluation of the range of equipment:* vehicles; vehicular attachments; manual eg barrows, Dutch trolleys; appropriate road surfaces; cost/benefits of equipment; integrated systems; health and safety implications; staff training

*Minimising manual handling:* layout of the work area eg width of beds, nature and width of roadways and paths; mechanical aids eg conveyer belts, carry trays; minimising staff fatigue; integrated systems; cost/benefits of systems

### 3 Understand the movement of plants on public highways

*Evaluation of vehicles:* loading/unloading requirements; site access for collection and delivery; ability to minimise plant damage and stress; cost/benefits of different vehicles; integrated systems; specialist equipment eg for semi-mature specimens

*Securing plants for transport:* containers; maximising vehicle capacity; securing for efficient multi-drop deliveries; securing fragile and over-sized plants; health and safety of operatives

*Maintaining plant quality:* recognising causes of plant damage and stress; techniques for minimising damage and stress; statutory responsibilities to maintain quality

#### 4 Understand the distribution of plants

*Transportation on public highways:* definition of vehicles which may be used on the public highway; legal requirements for the security of loads; legislation governing drivers' hours; vehicle exclusion zones

*Exportation and importation of plants:* export/import to countries within the European Union; export/import to non-European Union countries; regulations governing plants susceptible to notifiable pests and diseases; export/import of plants covered by the Convention on International Trade in Endangered Species (CITES)

*Managing distribution:* distribution logistics; distribution control systems; management information systems; utilising courier services and other third parties for distribution; managing distribution to suit customer requirements; economic considerations

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Be able to identify and prepare plants for transport	1.1 inspect the condition of plants ensuring that they are fit for transportation 1.2 select appropriate packaging, containers and labelling 1.3 plan appropriate storage techniques before transport
LO2 Understand the movement of plants within the work area	2.1 explain how to minimise adverse effects of transportation on selected plants 2.2 evaluate the range of equipment and machinery suitable for moving selected plants within the work area 2.3 evaluate systems for minimising the need for manual handling of selected plants
LO3 Understand the movement of plants on public highways	3.1 evaluate the range of vehicles available for transport on public highways 3.2 explain how to secure selected plants for transport 3.3 explain how to maintain selected plant quality during transportation
LO4 Understand the distribution of plants	4.1 explain how legislation governs the movement of selected plants on public highways 4.2 assess the legal requirements for exportation and importation of selected plants 4.3 examine the planning and management of distribution networks

## Guidance

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### Links

This unit links with the following units in this qualification:

- *Unit 14: Nursery Stock Production*
- *Unit 16: Public Horticulture.*

### Essential requirements

Learners should have access to up-to-date information on the full range of plant handling techniques, equipment and machinery. This should include company promotional literature, trade reviews, such as those available in the relevant trade journals, and relevant professional journals.

Learners should also have the opportunity to inspect and evaluate sites and facilities where plants have to be transported on a commercial scale. These sites and facilities must reflect the full range of the local industry.

### Employer engagement and vocational context

Centres are encouraged to develop close links with a range of enterprises engaged in the movement of plants. These could include growers, wholesale nurseries and marketing companies. To gain a broader view of the whole distribution process, it is beneficial for learners to have the opportunity to gather information from end users, such as garden centres, and third parties, such as courier services. These links will facilitate site visits and enable learners to learn from the experience and knowledge of professionals in the distribution network.

In addition, learners should be encouraged to attend relevant trade shows and events organised nationally and regionally.



## Unit 27: Plan and Manage the Growth and Development of Crops

Unit code: L/503/1075

Level: 4

Credit value: 15

- **Aim**

This unit aims to develop learner understanding of and practical skills in the management of crops. Learners will consider the planning and management of crop establishment, development, harvesting and storage, and supervise others in carrying out these processes.

- **Unit abstract**

This unit will give learners the knowledge and understanding required to produce outdoor crops. They will develop the practical skills needed to manage the growth and development of crops.

In this unit learners will examine the increasing complexity of crop planning, crop selection, propagation, production, establishment, growth, of maintaining plant health and harvest and storage requirements, along with the relevant legislation and codes of practice. They will explore soils and the related cultivation and management techniques used to establish crops. Learners will also learn about plant health requirements including nutrient requirements and pest and disease control.

- **Learning outcomes**

**On successful completion of this unit a learner will:**

- 1 Be able to plan and manage the growth and development of crops to meet given requirements
- 2 Understand the development and management requirements of crops
- 3 Understand the planning requirements of crops
- 4 Understand the harvest and storage requirements of crops.

## Unit content

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### 1 Be able to plan and manage the growth and development of crops to meet given requirements

*Crops:* non-protected crops; non-organic crops eg flowers, herbs, vegetables, fruit; field-scale tree production

*Variety choice:* recommended lists, yield, quality, specific market requirements, agronomic factors; time of harvesting; continuity of supply

*Crop management:* labour and equipment requirements and management; site preparation to include tilth; soil temperature and moisture content; fertiliser levels; weed control; propagation methods, establishment from seed, transplants, plugs, modules; undercutting and transplanting; storage of plant material; planting depth; timing and density; support methods; training; pruning; requirements for establishment, growing, maintenance up to harvest; use of temporary coverings

*Soil cultivation techniques:* sub-soiling and drainage; ploughing; spading; progressive cultivations; harrowing; bed formation; tilth and structure; possible problems eg compaction, capping, smearing

*Soil health:* nutrients and manures; mulches and coverings; management of soil pH, eg use of lime, timing, methods of application; pH and nutritional status; soil disorders and fertility problems

*Pest and disease control and waste management:* cultural, chemical and biological control methods; integrated pest management; waste disposal; recycling and hygiene measures

*Health and safety:* risk assessment; personal protective equipment (PPE); relevant current legislation, eg Health and Safety at Work Act 1974, Environment Act 1995

*Product:* appraise crop quality and assess potential yield; required quantity and quality including size, weight, colour, and maturity; crop assurance schemes

### 2 Understand the development and management requirements of crops

*Plant health:* integrated pest management; produce assurance scheme requirements; weed control; physiological disorders; timing of operations; varietal suitability; continuity of supply; growth regulation; crop rotation; soil disorders; pest and disease control methods; crop irrigation methods and systems

*Management requirements:* labour and equipment requirements; cultivations and preparation; identification of key weeds, pests and diseases; weed, pest and disease control; nutrients and irrigation; crop sensing and precision systems; weed and disease resistance prevention strategies; temporary crop covers; changes in market requirements; weather conditions

*Pest control:* identification of key pests; entomology; cultural and chemical control methods; integrated pest management; economic spray thresholds; prediction techniques

*Disease control:* identification of key diseases; biology; cultural and chemical control methods; economic spray thresholds; prediction techniques; diagnostics; cost/benefit analysis

*Plant growth regulation:* nutrient requirements; fertiliser and micronutrient application; methods and timing of application; use of plant growth regulators and their influence on plant structure; cost/benefit analysis

### 3 Understand the planning requirements of crops

*Site assessment:* availability of services (mains water, drainage and electricity); access; site orientation, aspect and climate; soil types and structure; types of crop for soil; factors affecting irrigation eg climate change, legislation, site; irrigation systems; plant requirements for irrigation; availability and types of labour; buildings and accommodation availability; locality and likelihood for competition; access to markets; relevant current legislation eg planning regulations, environmental impact assessment

*Planning:* influence of soil type; types of crop for the soil; climate; propagation; crop rotation; market outlets and market requirements; gross margin analysis; botanical types and hybridisation; time of year; following crop; environment; light levels; fertiliser requirements; irrigation; weed and pest control; equipment requirements; labour requirements; building and storage accommodation

*Production methods:* evaluation and comparison of common production methods; labour and equipment inputs; capital and running costs; fixed and variable costs and gross margins

*Legislation:* health and safety; risk assessment; relevant current legislation and codes of practice; environmental impact assessment; employment law

### 4 Understand the harvest and storage requirements of crops

*Harvesting and storage:* cropping programmes; handling and packing systems; mechanical harvesting; field heat reduction; cold storage; modified atmosphere systems; cool chain and transport; grading; customer specifications; waste and recycling systems; environmental impact; pollution prevention and control; relevant current legislation and codes of practice

*Harvesting requirements:* labour and equipment requirements; capital cost; running costs; training requirements; environmental issues (washings, waste); legal requirements

*Storage methods:* suitability; cost; labour requirements; complexity; storage life; effect on crop; crop losses; simple and controlled atmosphere storage

*Markets:* retail; wholesale; multiple; multiples and marketing strategy; contract; farm shop; produce assurance schemes; EU standards; international; phytosanitary controls; plant passports; relevant current legislation

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Be able to plan and manage the growth and development of crops to meet given requirements	1.1 plan crop management for a given crop to meet given requirements 1.2 plan integrated pest management relevant to a given crop 1.3 supervise others in the preparation of a site for a given crop 1.4 supervise others in the establishment of a given crop 1.5 manage the growth of crops to meet given requirements 1.6 supervise others in the harvesting of a crop to meet given requirements
LO2 Understand the development and management requirements of crops	2.1 explain factors that affect the management of a given crop 2.2 justify the nutrient programme developed for a given crop 2.3 evaluate pest and disease controls for a given crop
LO3 Understand the planning requirements of crops	3.1 explain the criteria that affect the planning for a given crop 3.2 evaluate crop management planning and associated financial planning 3.3 explain how health and safety and legislative requirements influence crop production and management
LO4 Understand the harvest and storage requirements of crops	4.1 review appropriate crop harvesting techniques 4.2 analyse key issues relating to harvesting methods 4.3 explain how the condition of a given crop can be affected post-harvest 4.3 evaluate crop storage methods

## Guidance

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### Links

This unit links with the following units in this qualification: *Unit 29: Plan and Manage Protected Crops*, *Unit 24: Growing Media*, *Unit 28: Plan and Manage the Harvesting, Preparation and Storage of Crops* and *Unit 36: Mechanisation for Land-based Industries*.

### Essential requirements

It is essential that learners have access to the type and range of crops, machinery and equipment used in outdoor crop production. Learners require supervised access to outdoor horticultural production sites that use commercial methods. These should be large enough and use crops, equipment, tools and materials suitable to meet the needs of this unit.

Learners in employment and studying part-time may well find their own workplace a suitable resource.

Suitable resources for this unit could be provided by the centre farm or nursery, learning resource centres, trade exhibits and local farms and horticultural enterprises to broaden learner understanding of the range of operations that can be experienced.

### Employer engagement and vocational contexts

It is essential that this unit is delivered in an applied and vocational context and work-based experience will also be important.

Due to the range of crops grown in the horticultural industry, and the diversity of possible growing systems, this unit will be enhanced by contact with employers. Centres are encouraged to develop links with local businesses, manufacturers and suppliers who can support the breadth and application of this unit. Employers can provide real work practical exercises, and guest speakers and experts to support the learning experience. Employer engagement will help to ensure the use of technically up-to-date information and processes.



## Unit 28: Plan and Manage the Harvesting, Preparation and Storage of Crops

Unit code: R/503/1076

Level: 4

Credit value: 15

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- Aim

This unit aims to raise learner's awareness of the complexities of crop harvesting and storage. They enable to learn how to plan for and react to problems that arise during the processes of crop harvesting and storage.

- Unit abstract

This unit covers all the aspects associated with the harvesting and storage of crops. Although the unit is not intended to develop learners' competence in using harvesting machinery, it will enable learners both to analyse harvesting and storage methods and make informed judgements in relation to the management procedures needed in today's rapidly changing crops industry.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand crop harvesting requirements
- 2 Be able to manage the harvesting of crops
- 3 Understand crop storage requirements
- 4 Be able to manage the storage of crops.

## Unit content

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### 1 Understand crop harvesting requirements

*Planning for crop harvesting:* timing of harvest to suit crop quality and market (eg recognise crop maturity, end use of crop, influence of weather, quality standards, market requirements); machinery, equipment and labour; staff briefing and training; workshop practice (eg compliance with health and safety, waste disposal, maintenance schedules); review risk assessment procedures; environmental requirements (eg compliance with current legislation, soil and water management, pollution)

### 2 Be able to manage the harvesting of crops

*Pre-harvesting:* machinery preparation (eg spares, workshop equipment, safe handling, machinery maintenance and cleaning)

*Harvesting:* communication with staff (eg mobile phones, crop monitoring during harvesting, reaction to changes in weather conditions); monitor safety and legislative requirements; monitor food hygiene and quality standards; records and record keeping

### 3 Understand crop storage requirements

*Storage layout:* store will maintain crop quality (eg dimensions, size, temperature, ventilation); materials and equipment needed (eg plastic sheeting, divisions, handling and transporting crop, testing equipment)

*Quality control:* methods of minimising crop damage; recording procedures; health and safety; pest control; environmental requirements

### 4 Be able to manage the storage of crops

*Managing crops in store:* handling and transporting crops (eg trailers, forklifts, conveying equipment, augers); regular monitoring of crops (eg testing methods, pest control, chemical control); emergency plans; health and safety in relation to machinery and equipment use; pollution control; records for quality control

## Learning outcomes and assessment criteria

Learning outcomes  On successful completion of this unit a learner will:	Assessment criteria for pass  The learner can:
LO1 Understand crop harvesting requirements	1.1 explain the link between crop maturity and harvesting 1.2 compare types of machinery/equipment appropriate to the harvesting of crops 1.3 explain environmental factors that influence the harvesting of crops 1.4 examine legal and safety considerations relevant to crop harvesting
LO2 Be able to manage the harvesting of crops	2.1 undertake appropriate and efficient management of harvesting crops: <ul style="list-style-type: none"> <li>• preparation and maintenance of harvesting machinery and equipment</li> <li>• harvesting operations</li> <li>• achievement of harvesting objectives</li> <li>• completion of relevant records</li> </ul> 2.2 ensure personnel involved meet agreed expectations 2.3 ensure effective communication with personnel involved 2.4 evaluate efficiency and appropriateness of harvesting operations
LO3 Understand crop storage requirements	3.1 evaluate appropriateness of storage conditions for crops 3.2 compare types of machinery/equipment appropriate to the storage of crops 3.3 assess different types of crop store 3.4 examine legal and safety considerations relevant to crop storage
LO4 Be able to manage the storage of crops	4.1 manage the preparation of crop storage 4.2 work effectively with others to manage the storage of crops 4.3 ensure effective communication with personnel involved 4.4 ensure legal and safety considerations relevant to crop storage are adhered to 4.5 evaluate efficiency and appropriateness of harvesting operations

## Guidance

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### Links

This unit gives learners the opportunity to experience planning, implementing and monitoring aspects of all crop harvesting and storage procedures. It links with all units that cover crop production, crop management and food production.

### Essential requirements

It is important that learners can experience harvesting and storage for a broad range of crops. The emphasis of the unit is on learners being made aware of the planning, implementation and monitoring processes relevant to the crops they are studying.

### Employer engagement and vocational contexts

As a result of the range of crops studied links will need to be made with both local farms and storage and processing centres, such as crisping, brewing, bread making or crops for energy use.

Where farms are used for visits, the timing will be important learners should be briefed on the background to the growing season in relation to crops. Farmers and managers should be made aware of the aims of the unit, so learners can see at first hand the management processes needed to achieve the smooth running of harvesting and storage processes. Learners so need to be made aware of the various links in the food chain and where the harvesting and storage of crops fits in.

## Unit 29: Plan and Manage Protected Crops

Unit code: Y/503/1077

Level: 4

Credit value: 15

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- Aim

This unit aims to develop learners of understanding and practical skills in the management of protected crops. Learners will consider the planning and management of protected crop establishment, development, harvesting and storage, and supervise others in carrying out these processes.

- Unit abstract

This unit gives learners the knowledge, understanding and practical husbandry skills needed to plan and manage protected crops. These crops are an important part of horticultural production. They require a more controlled environment to achieve on improved quality, continuity of supply, reduced growing time and improved crop scheduling to meet target markets and present something new to consumers. There are also opportunities to grow novel and exotic crops that cannot be grown outdoors in the UK.

Learners will develop the knowledge and understanding needed to make decisions on suitable structures, crop culture and environmental control including requirements of weed and pest control, propagation, nutrition, and plant health. Learners will also investigate the harvesting of produce and how to match it to market requirements.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to plan and manage the growth and development of protected crops
- 2 Understand the planning of protected crops
- 3 Understand the management of protected crops
- 4 Understand the harvesting of protected crops.

## Unit content

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### 1 Be able to plan and manage the growth and development of protected crops

*Protected crops:* those not grown in the field; grown under structures

*Forms of protection:* polythene tunnels, glass-based structures, polycarbonate structures, netting structures, enclosed structures with artificial environments; suitability of protection; costs and running costs

*Edible and ornamental crops:* eg cut flowers, pot plants, herbs, vegetables, fruit; plug and module production

*Establishment:* from seed, transplants, plugs, and modules

*Crop management:* labour requirements and management; facility and media preparation; space maximisation; cropping plans and layout; propagation methods; prepare, maintain and control the environment to meet given objectives; irrigation; nutrition; supports; environmental requirements; mechanisation of the processes; harvesting; record keeping

*Pest and disease control and waste management:* cultural, chemical and biological control methods; integrated pest management; waste disposal; recycling and hygiene measures

*Health and safety:* risk assessment; personal protective equipment (PPE); relevant current legislation eg Health and Safety at Work Act 1974, Environment Act 1995

*Product:* appraise crop quality and assess potential yield; required quantity and quality including size, weight, colour, maturity

### 2 Understand the planning of protected crops

*Planning:* time of year, labour requirements and management and legislation; propagation; crop rotation; subsequent cropping; environment; light levels; fertiliser requirements; irrigation; climate control; weed and pest control

*Selection of structures:* types of crop cultivated in protected environments; reasons for providing structures to protect crops; types and sizes of structures available eg glasshouses, polythene-clad tunnels, polycarbonate structures, shade structures, retractable roof structures, other materials; light and heat transmission properties; relevant current legislation; glazing materials; shading equipment; irrigation; benching; heating; environmental control

*Provision of services:* heat sources and distribution within the structure; ventilation; shading; irrigation; benching; space utilisation

### 3 Understand the management of protected crops

*Controlling the environment:* reasons for controlling crop environments; methods, eg manual, computer controlled; potential of computerised environmental control; relationship between heating, lighting, CO<sub>2</sub> and humidity; opportunities for fuel economy; crop scheduling; quality control

*Crop production:* effect of potential market on production methods and product specification; chemical and non-chemical control of pests and diseases; weed control; production systems eg integrated crop management systems; cost, income and financial returns

*Manipulation of plant growth:* for yield and quality; nutrient availability; chemical modification; day length; light; carbon dioxide; temperature; water availability

### 4 Understand the harvesting of protected crops

*Harvesting and grading system requirements:* labour requirements; capital cost; running costs; training requirements; environmental issues (washings, waste); mechanisation and handling methods; waste materials and management; health and safety; risk assessment; personal protective equipment (PPE); relevant current legislation

*Harvesting and grading:* market requirements; specifications eg colour, size, stage of development; presentation; packaging; labeling

*Maintaining shelf-life:* storage; cool chain; trolley systems; transport methods

*Markets:* retail; wholesale; multiple; contract; specialist EU standards; plant passports; accreditation schemes; relevant current legislation

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Be able to plan and manage the growth and development of protected crops	1.1 plan crop management for a given protected crop to meet given requirements 1.2 select appropriate crop protection for given crops 1.3 supervise others in the establishment of a given protected crop 1.4 manage the growth of protected crops to meet given requirements 1.5 supervise others in the harvesting of protected crops to meet given requirements
LO2 Understand the planning of protected crops	2.1 explain factors that affect the planning of a given protected crop 2.2 examine the properties and the techniques of protected structures available
LO3 Understand the management of protected crops	3.1 explain the factors that affect the management for a given protected crop 3.2 review the uses of computerised environmental control systems in protected crop systems 3.3 compare production techniques and financial returns 3.4 explain weed, pest and disease control for a protected crop
LO4 Understand the harvesting of protected crops	4.1 review appropriate crop harvesting techniques available for protected crops 4.2 analyse key issues relating to harvesting methods 4.3 explain how the condition of a given protected crop can be affected post harvest

## Guidance

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### Links

This unit links with the following units in this qualification: *Unit 27: Plan and Manage the Growth and Development of Crops*, *Unit 24: Growing Media*, *Unit 28: Plan and Manage the Harvesting, Preparation and Storage of Crops* and *Unit 9: Environmental Management*.

### Essential requirements

It is essential that learners have access to the type and range of crops, machinery and equipment used in protected crop production. Learners require supervised access to horticultural production sites that use commercial, protected crop production methods. These should be large enough and use crops, equipment, tools and materials suitable to meet the needs of the unit. Learner access to units with some form of environmental control is essential.

Learners in employment and studying part time may find their own workplace to be a suitable resource.

Suitable resources for this unit could be provided by the centre farm or nursery, learning resource centres, trade exhibits and local farms and horticultural enterprises to broaden the range of operations that learners can experience.

### Employer engagement and vocational contexts

It is essential that this unit is delivered in an applied and vocational context and work-based experience is also important.

Due to the wide range of structures, protection and environmental control available to growers, this unit will be enhanced by working with employers. Centres are encouraged to develop links with local businesses, manufacturers and suppliers who can support the breadth and application of this unit. Employers can provide real work practical exercises and guest speakers and experts to support the learning experience.



## Unit 30 Business Environment

Unit code: Y/601/0546

Level: 4

Credit value: 15

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- Aim

The aim of this unit is to give learners an understanding of different organisations, the influence of stakeholders and the relationship businesses and the local, national and global environments.

- Unit abstract

This unit allows learners to research the purpose and nature of business organisations and how these operate in ways that allow business objectives to be met. They will investigate the links with business stakeholders.

Businesses operate in an environment shaped by the government, competitors, consumers, suppliers and international factors. Learners will develop their understanding of direct influences on businesses in this environment, for example taxation policies on corporate activities. They will also consider other influences are less clear, such as those from the international arena and those with only an oblique impact on the national business environment.

Learners will explore business markets and how the form and structure of a market influences how organisations behave. Learners will consider how different market structures shape the pricing and output decisions of businesses, as well as other aspects of their behaviour.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the organisational purposes of businesses
- 2 Understand the nature of the national environment in which businesses operate
- 3 Understand the behaviour of organisations in their market environment
- 4 Be able to assess the significance of global factors that shape national business activities.

## Unit content

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### 1 Understand the organisational purposes of businesses

*Types of organisation:* type eg private company, public company, government, voluntary organisation, cooperative, charitable; sector (primary, secondary, tertiary)

*Purposes:* mission; vision; aims; objectives; goals; values; profits; market share; growth; return on capital employed (ROCE); sales; service level; customer satisfaction; corporate responsibility; ethical issues

*Stakeholder expectations:* owners; customers; suppliers; employees; debtors; creditors; financial institutions (banks, mortgage lenders, credit factors); environmental groups; government agencies (central government, local authorities); trade unions

*Responsibilities of organisations:* stakeholder interests; conflict of expectations; power, influence matrix; satisfying stakeholder objectives; legal responsibilities eg consumer legislation, employee legislation, equal opportunities and anti-discriminatory legislation, environmental legislation, health and safety legislation; ethical issues eg environment, fair trade, global warming, charter compliance eg Banking Code

### 2 Understand the nature of the national environment in which businesses operate

*Economic systems:* allocation of scarce resources; effective use of resources; type of economic system eg command, free enterprise, mixed, transitional

*The UK economy:* size (gross domestic product, gross national product); structure; population; labour force; growth; inflation; balance of payments; balance of trade; exchange rates; trading partners; public finances (revenues, expenditure); taxation; government borrowing; business behaviour eg investment, objectives, risk awareness; cost of capital; consumer behaviour; propensity to save; propensity to spend; tastes and preferences

*Government policy:* economic goals; fiscal policy: control of aggregate demand; central and local government spending; Public Sector Net Borrowing (PSNB) and Public Sector Net Cash Requirement (PSNCR); euro convergence criteria, monetary policy; interest rates; quantitative easing; private finance initiative (PFI); competition policy (up-to-date legislation including Competition Act 1998, Enterprise Act 2002); Competition Commission, Office of Fair Trading; Directorate General for Competition); European Commission; sector regulators eg Ofgem, Ofwat, Civil Aviation Authority; Companies Acts; regional policy; industrial policy; enterprise strategy; training and skills policy

### 3 Understand the behaviour of organisations in their market environment

*Market types:* perfect competition, monopoly, monopolistic competition, oligopoly, duopoly; competitive advantage, strategies adopted by firms; regulation of competition

*Market forces and organisational responses:* supply and demand, elasticity of demand; elasticity of supply; customer perceptions and actions, pricing decisions; cost and output decisions; economies of scale, the short run; the long run, multi-national and transnational corporations; joint ventures, outsourcing; core markets; labour market trends; employee skills, technology; innovation; research and development; core competences

*Business and cultural environments:* business environment evaluation (political, economic, social, technical, legal, environmental); cultural environment, cultural web; wider issues relevant to organisations eg biodiversity, health and social inclusion, ethical considerations, sustainability, social equality and diversity

### 4 Be able to assess the significance of global factors that shape national business activities

*Global factors:* international trade and the UK economy; market opportunities; global growth; protectionism; World Trade Organization (WTO); emerging markets (BRIC economies – Brazil, Russia, India, China)

*Impact on UK organisations:* business, competition, growth, employment, education, economics and finance, employment, environment, science and technology, regional; labour movement; workforce skills; exchange rates; trading blocs eg monetary unions, common markets; customs unions, free trade areas; labour costs; trade duties; levies; tariffs; customs dues; taxation regimes; international competitiveness; international business environment (political, economic, social, technical, legal, environmental); investment incentives; cost of capital; commodity prices; intellectual property; climate change eg Kyoto Protocol, Rio Earth Summit; developing world poverty; the group of 20 (G-20); global financial stability

*EU policies:* membership; business regulations and their incorporation into UK law; policies eg agriculture

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Understand the organisational purposes of businesses	1.1 identify the purposes of different types of organisation 1.2 describe the extent to which an organisation meets the objectives of different stakeholders 1.3 explain the responsibilities of an organisation and strategies employed to meet them
LO2 Understand the nature of the national environment in which businesses operate	2.1 explain how economic systems attempt to allocate resources effectively 2.2 assess the impact of fiscal and monetary policy on business organisations and their activities 2.3 evaluate the impact of competition policy and other regulatory mechanisms on the activities of a selected organisation
LO3 Understand the behaviour of organisations in their market environment	3.1 explain how market structures determine the pricing and output decisions of businesses 3.2 illustrate the way in which market forces shape organisational responses using a range of examples 3.3 judge how the business and cultural environments shape the behaviour of a selected organisation
LO4 Be able to assess the significance of global factors that shape national business activities	4.1 discuss the significance of international trade to UK business organisations 4.2 analyse the impact of global factors on UK business organisations 4.3 evaluate the impact of policies of the European Union on UK business organisations

## Guidance

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### Links

This unit links with many other units in the specification for example *Unit 2: Work-based Experience*, *Unit 4: Enterprise and Financial Management for Land-based Industries*, *Unit 5: Human Resource Management* and *Unit 31: Small Business Enterprise*.

### Essential requirements

Learners must keep up to date with issues that may influence business behaviour within the land-based sector. They must be encouraged to engage in regular research using a variety of sources, for example reading quality newspapers and trade journals, watching news and current affairs programmes on the television, paying attention to international trade and global factors that impact on UK businesses.

Sufficient time must be built into the teaching schedule to allow learners to research current issues.

### Employer engagement and vocational contexts

Centres can develop links with local employers. Many businesses look to employ learners when they finish their programmes of study and may provide information about the business environment in which they operate. They will have a view about the impact of governmental and EU factors that shape how they behave. Guest speakers can offer an insight into these factors.

Many learners are, or have been, employed and will be able to draw on their experience of employment. They will have had experience of the nature of the business environment and the ways in which organisations respond to and determine future responsive strategies.



## Unit 31: Small Business Enterprise

Unit code: H/601/1098

Level: 5

Credit value: 15

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- Aim

The aim of this unit is to give learners the opportunity to develop skills in change management, reviewing and improving of the performance of a small business enterprise.

- Unit abstract

This unit examines the factors influencing the development and expansion of small business enterprise. It draws together many of the topics covered in business and also in other HN units and allows learners to apply these skills to the small business environment.

The unit is appropriate for learners who are/or plan to become involved in small business enterprises.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to investigate the performance of a selected small business enterprise
- 2 Be able to propose changes to improve management and business performance
- 3 Be able to revise business objectives and plans to incorporate proposed changes
- 4 Be able to examine the impact of change management on the operations of the business.

## Unit content

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### 1 Be able to investigate the performance of a selected small business enterprise

*Business profile:* vision, goals, components, objectives, strategies and business processes, internal and external factors affecting business performance, performance measures, constraints and restrictions on business, responsibilities and liabilities of owner-managers

*Business performance:* skills audit; self-evaluation/comparisons with similar sized businesses in the same or similar industry and geographical area, comparisons with industry averages; comparisons – financial, production, marketing, sales, human resources, use of technology

*Business strengths and weaknesses:* overall effectiveness and business performance review, products/services, marketing, sales, production, finances, human resource efficiency, management effectiveness; use ratios, SWOT analysis, budget information, market research results, business image, business reports

*Management of employees:* employment policies; employment initiatives eg Investors in People; employee performance appraisal process; flexible working eg employment of part-time and temporary staff, teleworking, homeworking, job sharing, zero hours contracts, annual hours, staggered hours, compressed hours; equal opportunities within the workplace; discrimination (forms, legislation against)

### 2 Be able to propose changes to improve management and business performance

*Problem-solving actions:* problem solving strategies to overcome identified weaknesses, sources and availability of professional advice, alternative solutions, availability and use of outsourcing for specific functions eg payroll, debt collection, staff development

*Maintaining and strengthening existing business:* maintaining appropriate performance records, building on business strengths, maintaining market share/position, importance of good customer/supplier/adviser relationships

*New opportunities:* identifying areas for expansion eg niche markets and export opportunities where appropriate, research techniques, evaluating projects, assessing project requirements, costing and finding finance for new projects, risk assessment

### 3 Be able to revise business objectives and plans to incorporate proposed changes

*Business objectives:* structure of business objectives, assessment of business objectives in the light of current performance, making changes to business objectives, impact of changes on business plans

*Business plans:* structure of integrated business plans (financial, sales and marketing, production/output, personnel), use of business plans, evaluation of plans against business objectives, incorporating changes to plans, budgeting for changes, preparation of business forecasts

*Action plans:* plans to implement changes, systems to manage, monitor and evaluate changes, performance measures, setting deadlines

**4 Be able to examine the impact of change management on the operations of the business**

*Impact of change:* effects of change on all areas of business – finance, workloads, morale, job roles, physical aspects (eg office space, production methods), use of technology, anticipating possible obstacles/problems

*Management of change:* monitoring effects of change, maintaining systems and records to evaluate impact of change, appropriate revision of plans in response to actual results

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Be able to investigate the performance of a selected small business enterprise	1.1 produce a profile of a selected small business identifying its strengths and weaknesses 1.2 carry out an analysis of the business using comparative measures of performance
LO2 Be able to propose changes to improve management and business performance	2.1 recommend, with justification, appropriate actions to overcome identified weaknesses in the business 2.2 analyse ways in which existing performance could be maintained and strengthened 2.3 recommend, with justification, new areas in which the business could be expanded
LO3 Be able to revise business objectives and plans to incorporate proposed changes	3.1 produce an assessment of existing business objectives and plans 3.2 revise business plans to incorporate appropriate changes 3.3 prepare an action plan to implement the changes
LO4 Be able to examine the impact of change management on the operations of the business	4.1 report on the impact of the proposed changes on the business and its personnel 4.2 plan how the changes will be managed in the business 4.3 monitor improvements in the performance of the business over a given timescale

## Guidance

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### Links

This unit links with many other units in the specification for example *Unit 2: Work-based Experience*, *Unit 4: Enterprise and Financial Management for Land-based Industries*, *Unit 5: Human Resource Management* and *Unit 30: Business Environment*.

### Essential requirements

Learners need to be able to access realistic, contextualised case studies using data from sector-specific enterprises, unless they can access this data from local enterprise and/or their own experience.



## Unit 32: Sustainable Development

Unit code: M/503/1148

Level: 5

Credit value: 15

- Aim

This unit aims to raise learner awareness of sustainable development issues, encourage a sense of responsibility and citizenship, an appreciation of the needs of others both now and in the future, and respect and value for the diversity of life.

- Unit abstract

In this unit learners will study the core themes and issues of sustainable development. It is now commonly accepted that there is a real need to ensure human activities do not cause permanent damage to the environment and that future generations should not be denied resources. Economic and social goals can be achieved in ways that can be supported in the long term by conserving resources, protecting the environment and ensuring human health and welfare.

Those employed in the land-based sector should have a knowledge and understanding of the concept of sustainable development, and an appreciation of the main ways in which it is implemented.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand principles of sustainable development
- 2 Understand the impact of production, trade and biotechnology on diversity
- 3 Understand the concept of citizenship and individual responsibility in the promotion of sustainable development
- 3 Understand the impact of changes towards sustainability.

## Unit content

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### 1 Understand principles of sustainable development

*Principles:* concept of sustainable development (to include the different contexts in which sustainable development can be placed)

*Earth and man:* Gaia evolution; human demographics; agricultural development; the industrial revolution; resource consumption and pollution; development of global and local transport systems

*Inter-dependence:* dynamic nature of generation relationships (with examples to illustrate changes over time and space)

*Values and beliefs:* examples to illustrate different attitudes towards sustainable development and values between different cultural and income groups (to include the balance of power and vested interests)

*Needs and rights:* present imbalance of population and resource usage, locally and globally, the wealth gap between and within countries; measures of standard of living (eg gross national product) and the developing measures of quality of life; the concept of social justice

### 2 Understand the impact of production, trade and biotechnology on diversity

*Evidence:* qualitative and quantitative evidence as indicators of the changes in biological, cultural and economic diversity; local, global

*Impact:* examples to illustrate the impacts of the globalisation of production on biological, cultural and economic diversity; trade and consumption; the dominance of multinational enterprises in decision making

*Technological developments:* the effects on trade and production of change in transport and telecommunications; impacts on cultural and economic diversity; developments in biotechnology and genetic engineering; impacts on biodiversity; genetically modified organism (GMO) debate

*Recent changes:* application of appropriate technology (eg wood-burning stoves and mini-hydro electric power schemes), promotion of local trade (eg farmers' markets in the UK)

### 3 Understand the concept of citizenship and individual responsibility in the promotion of sustainable development

*Stewardship:* illustrative examples to promote an understanding of the term, need for individual as well as collective responsibility; Local Agenda 21 and the development of the slogan 'think global act local'

*Active citizenship:* need for individual participation, the contribution of voluntary personal controls; use of resources towards sustainable development; the value and process of collective decision making; ecological footprints

*Social justice and equity:* contrasting examples of different values and beliefs on behaviour and lifestyles; the need to promote sustainable lifestyles; the need for personal changes in lifestyles and habits to promote sustainable behaviour in the home/workplace/centre; the ethical arguments for promoting sustainable development

### 4 Understand the impact of changes towards sustainability

*Pressure groups:* the role of pressure groups in promoting change (eg Greenpeace); the use of renewable materials; ethical investments and fair trade

*Sustainable production:* sustainable production methods in forestry and woodland products; less intensive agricultural systems; organic production; resource minimisation in industry and commerce

*Legislation and policies:* regulations to promote waste minimisation and a more sustainable use of resources eg packaging regulations, the landfill tax, environmental taxation, eco-labelling, incentives to reuse and recycle, Local Agenda 21

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand principles of sustainable development	1.1 examine the main sustainable development principles 1.2 summarise the different interpretations of the concept of sustainable development 1.3 evaluate the need to address both inter-generational and intra-generational equity 1.4 discuss the debate between individual and collective interests
LO2 Understand the impact of production, trade and biotechnology on diversity	2.1 evaluate the evidence that indicates global production and trade has had an impact on biological, cultural and economic diversity 2.2 examine the impact of the globalisation of production and consumption on biological, cultural and economic diversity 2.3 evaluate the implications of recent trends towards localisation of economic activity in the promotion of diversity 2.4 assess the impact of biotechnology on biodiversity
LO3 Understand the concept of citizenship and individual responsibility in the promotion of sustainable development	3.1 examine the concept of stewardship relating this to selected examples 3.2 compare values on ethical issues related to sustainable development 3.4 evaluate the policies and attitudes of a local authority or place of work/study to citizenship and individual responsibility
LO4 Understand the impact of changes towards sustainability	4.1 assess the importance of pressure groups in promoting sustainable change 4.2 discuss the effectiveness of recent legislation introduced to promote a more sustainable use of resources 4.3 evaluate recent changes to a production system to promote sustainable development 4.4 critically assess lifestyle and behaviour in relation to own eco-footprint

## Guidance

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### Links

This unit can be integrated into all Higher National qualifications to give learners knowledge and understanding of sustainable development. This unit has been written in a generic format to allow application in a wide range of subject areas.

### Essential requirements

Access to a well-resourced library, the internet and quality newspapers, is essential. Information from the local authority, local groups involved in sustainable development activities and the Local Agenda 21 will be essential. Visits and relevant external speakers will enhance tutor and learner knowledge.

### Employer engagement and vocational contexts

Delivery of this unit would be enhanced by employer engagement, for example, local organisations, such as environmental consultants. Learners could, for example, meet with employers from the industry to learn about current issues and trends in the sector. Sustained links with groups may support other units as well as work placement opportunities. A talk from a representative of the Environment Agency would help learners to understand how the environmental sector responds to change and the impact of changes on the sector.



## Unit 33: Research Methods for Land-based Industries

Unit code: A/503/1153

Level: 4

Credit value: 15

- Aim

This unit introduces learners to methodologies used when carrying out research. Learners will develop knowledge of the range of available information sources and the practical skills to plan a piece of research.

- Unit abstract

The ability to successfully formulate research questions and collate data for analysis in an attempt to answer them, are vital skills for learners working in this programme area. Understanding the concepts in this unit will help the learners to develop with these skills.

Learners will be introduced to different forms of data and how they can both generate or access it from existing sources. Several of the major analytical and descriptive techniques used to interpret the resulting data are then utilised to help interpret it. Once learners have developed these skills, research topics applicable to their subject area and interests can be considered in more detail.

How to plan, conduct, interpret and present the resulting findings (together with their significance) from research projects are all addressed in this unit. Learners will gain important skills and knowledge preparation to help them undertake their own research in their studies or future careers.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to collect and interpret data and information in a land-based industry
- 2 Be able to plan research in a land-based industry
- 3 Be able to review data from a range of sources in a land-based industry
- 4 Be able to present findings appropriately.

## Unit content

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### 1 Be able to collect and interpret data and information for a land-based industry

*Nature of data:* primary and secondary data; qualitative; quantitative; objective; subjective; accuracy; precision; errors; significance; reliability

*Data collection:* probability sampling eg random, systematic, stratified, clustered; non-probability sampling eg convenience, voluntary, quota; purpose eg event sampling, time sampling

*Data analysis:* descriptive statistics eg proportions, percentages, ratios, range; inferential statistics to assess the significance of results using chi-squared and Student's t-Tests

*Simple interrelationships:* correlation

*Complex relationships:* multivariate analysis

### 2 Be able to plan research in a land-based industry

*Research a subject-specific research title:* preliminary review of sources of information; discussion with tutors; agree research aims; research objectives; hypotheses and research title; appropriate size and nature of research

*Programme of work:* outline of methodology and resources; proposed analysis and interpretation; regular progress reviews; appropriate and achievable target dates set; flexible approach within framework

### 3 Be able to review data from a range of sources for a land-based industry

*Existing data:* literature; accessing professional expertise eg verbal questioning, email, letters; related studies; historical data; current data; introductory texts; published and unpublished work; popular media eg television, radio, newspapers; computer-based sources eg CD ROM, internet; multimedia eg DVD, video, slides, audio tape; abstracts; reports; journals

### 4 Be able to present findings appropriately

*Critical review:* discussion of opposing views in an informed and balanced manner; all views are referenced accurately; discussion of methodologies and content; suggested sources of error and improvement of methodology

*Suitable format:* oral; visual and written; professional presentation; appropriate level for audience eg peer group, tutors; style appropriate to audience and research; scientific conventions followed

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Be able to collect and interpret data and information in a land-based industry	1.1 explain the nature of research data 1.2 determine sources of error in data collection 1.3 carry out a range of data collection techniques 1.4 analyse simple data using descriptive and inferential statistical techniques
LO2 Be able to plan research in a land-based industry	2.1 determine appropriate sources of information and advice 2.2 plan resource requirements, methodology and analysis 2.3 agree research aims, objectives and title with an appropriate authority 2.4 submit work proposals with appropriate and achievable target dates
LO3 Be able to review data from a range of sources in a land-based industry	3.1 critically review appropriate existing data from a range of sources
LO4 Be able to present findings appropriately	4.1 present report findings using appropriate media 4.2 prepare a summary of findings suitable for display to a given audience

## Guidance

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### Links

The knowledge and skills within the unit would also be of value to any learner wishing to continue their higher education or seek to progress into a managerial level career.

This unit links with all units that require any degree of literature review, data handling or presentation skills. It may, therefore, be considered as a means of developing learners' study skills at an early stage in the programme.

### Essential requirements

As this unit has a high degree of directed study, a well-resourced library or learning resource centre is essential. Access to multimedia provision and the internet will enable learners to access diverse information sources and to recognise the strengths and weaknesses of all data sources.

Learners will require input from suitably qualified staff which may necessitate cross-curricular tutoring. Tutor time is therefore an essential resource. It is not anticipated, or expected, that learners have unlimited access to tutor support, but sufficient time should be made available to ensure that learners receive support in developing their skill base.

### Employer engagement and vocational contexts

The data collection, analysis and presentation skills developed in this unit will benefit learners in their studies and careers. Using these skills and knowledge will enable learners to successfully undertake research in their chosen subject-specific areas.

## Unit 34: Land-based Business Planning

Unit code: L/503/1092

Level: 4

Credit value: 15

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- Aim

This unit aims to develop learner understanding of how to plan for a new business in order to seek and develop new business opportunities. Learners will develop their ability to investigate and present resources and new opportunities.

- Unit abstract

This unit takes learners through a process which investigates the skills needed to plan for and develop new land-based business enterprises. This will involve investigating the legal and financial implications and review resource requirements.

The unit will give learners an opportunity to identify and evaluate opportunities for a real or theoretical new land-based business. Learners will explore a marketing strategy and produce and present a business plan to an appropriate audience.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to research new land-based business opportunities
- 2 Understand outcomes of land-based business research
- 3 Understand the principles and practices of marketing for business
- 4 Be able to plan a land-based business.

## Unit content

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### 1 Be able to research new land-based business opportunities

*Analysis:* strengths, weaknesses, opportunities and threats (SWOT) analysis; other tools to assess opportunities eg political, economic, social and technology (PEST) analysis

*Research:* market research; primary and secondary data; customer needs; market (size, supply and demand)

### 2 Understand outcomes of land-based business research

*Legal implications:* socio-economic and legal environment; planning permissions

*Resources:* physical; premises; equipment; human

*Financial implications:* financial environment/preparation of budgets; sources of finance; costs eg legal, marketing, resources; pricing policy

*Evaluation:* criteria; decision-making process; customers (requirements, buyer behaviour, branding)

### 3 Understand the principles and practices of marketing for business

*Marketing:* role; definitions; marketing mix; marketing objectives (SMART); market entry; acquisition franchising; product, place, price, promotion; market segmentation, marketing plan

### 4 Be able to plan a land-based business

*Plan:* setting the objectives; identify stakeholders; components of business plans; controlling and evaluating business plans; presenting business plans to interested parties

## Learning outcomes and assessment criteria

Learning outcomes  On successful completion of this unit a learner will:	Assessment criteria for pass  The learner can:
LO1 Be able to research new land-based business opportunities	1.1 use research techniques to identify appropriate business opportunities including information on: <ul style="list-style-type: none"> <li>• customers</li> <li>• market</li> <li>• physical requirements</li> <li>• financial requirements</li> <li>• legal requirements</li> </ul> 1.2 undertake an appropriate SWOT investigation
LO2 Understand outcomes of land-based business research	2.1 evaluate business strengths, weaknesses, opportunities and threats identified against given criteria 2.2 recommend suitable new business actions 2.3 justify recommendations of new business actions 2.4 evaluate legal implications of a selected new land-based business 2.5 analyse the financial requirements of a selected new land-based business 2.6 examine the resources needed for a selected new land-based business
LO3 Understand the principles and practices of marketing for business	3.1 explain the role of marketing within a given land-based business 3.2 discuss a marketing plan prepared for a new or existing land-based business enterprise
LO4 Be able to plan a land-based business	4.1 set objectives and components for a selected business enterprise 4.2 set criteria for the control and evaluation of a business plan 4.3 present a business plan to an appropriate audience

## Guidance

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### Links

This unit links with the following in this qualification:

- *Unit 3: Project Management for Land-based Industries*
- *Unit 30: Business Environment*
- *Unit 31: Small Business Enterprise*
- *Unit 33: Research Methods for Land-based Industries.*

### Essential requirements

It is essential that learners produce evidence of an actual case study for a given business in relation to researching new business opportunities and marketing plans, and relate the business plan to a named land-based business enterprise.

### Employer engagement and vocational contexts

Learning outcomes 2, 3 and 4 all relate to actual businesses so it will be necessary to have engagement with an existing business, or businesses for research and analysis, or be involved in the planning process and implementation of an actual business venture.

Additional visits to existing land-based industries and projects would broaden learners' scope and understanding.

## Unit 35: Event Management for Land-based Industries

Unit code: R/503/1093

Level: 4

Credit value: 15

- **Aim**

This unit focuses on effective and efficient event management. It aims to develop learners' ability to analyse the potential of existing facilities and plan a suitable event for the location. They will be involved in all stages of event organisation, from initial planning to the final review.

- **Unit abstract**

This unit covers the management, promotion and marketing of events and investigates legislation that applies to organising of events. Learners will plan each stage of an event. They will evaluate the suitability of a specific facility to hold an event, identify the type of event appropriate for the facility and consider technical, resource and staff requirements. Through the practical application of underpinning knowledge, the unit will develop learners' team-building skills and leadership qualities.

- **Learning outcomes**

**On successful completion of this unit a learner will:**

- 1 Be able to analyse the potential of event facilities
- 2 Be able to plan and manage an event
- 3 Be able to prepare marketing for an event
- 4 Be able to comply with relevant legislation and best practice for event organisation.

## Unit content

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### 1 Be able to analyse the potential of event facilities

*Strengths, weaknesses, opportunities and threats (SWOT analysis):* location; range; standard of facilities; suitability for different events and/or competitions; reputation; capacity; demand for local, regional, national events in various disciplines/classes

*Availability:* under utilisation and untapped potential; need for market research

*Staff requirements:* skills profile of available individuals; need for specialists and/or officials; constraints eg planning restrictions, local competition

### 2 Be able to plan and manage an event

*Requirements for chosen event:* facilities; labour; resources and equipment; technical planning and organisation; construction and distribution of schedules; organising teams for selected tasks; setting and meeting objectives; timescales; work distribution

*Preparation of facilities:* efficiency and safety; manning the event on the day; technical aspects; supporting activities; financial aspects; post-event review and evaluation including assessment of own and group's performance

### 3 Be able to prepare marketing for an event

*Marketing strategy:* production of a promotional plan; target audience; budget allocation

*Advertising:* definition; purpose; objectives; different techniques eg press, radio, television, posters, word of mouth; analysis of success; customer response

*Sponsorship:* advantages and disadvantages; involvement of sponsors in event eg schedules, rosettes, prizes, trade stands

### 4 Be able to comply with relevant legislation and best practice for event organisation

*Technical requirements:* rules; regulations; expected standards; customer care; competitors; officials; spectators; workers; health and safety requirements; risk assessments; COSHH analysis; legislative implications; requirements for trained personnel eg first aiders, paramedics, doctors

*Legal:* current, relevant domestic and European legislation eg Health and Safety at Work Act 1974; accident report forms; RIDDOR; rules on personal protective equipment; appointment of health and safety officer; hazard analysis; risk minimisation

*Evaluation:* factors contributing to success

## Learning outcomes and assessment criteria

Learning outcomes  On successful completion of this unit a learner will:	Assessment criteria for pass  The learner can:
LO1 Be able to analyse the potential of event facilities	1.1 perform a SWOT analysis for a particular facility 1.2 identify an appropriate event to be organised at a particular facility 1.3 evaluate the technical, resource and staff requirements for the event 1.4 estimate the commercial return to be achieved from the event
LO2 Be able to plan and manage an event	2.1 plan an event to meet prescribed objectives 2.2 prioritise work and allocate workloads within a set timescale effectively 2.3 work as a member of a team managing the event 2.4 evaluate the success of the event in the context of stated objectives
LO3 Be able to prepare marketing for an event	3.1 develop a marketing strategy for a specific event 3.2 produce a promotional plan in the context of event objectives and budget allocation 3.3 select appropriate advertising techniques 3.4 analyse the success of advertising carried out 3.5 research sponsorship opportunities available to the organisers of an event
LO4 Be able to comply with relevant legislation and best practice for event organisation	4.1 comply with the technical regulations and expected standards for an event 4.2 provide appropriate standards of customer care at an event 4.3 recognise requirements of health and safety legislation in the context of event organisation 4.4 undertake the necessary actions to comply with legislative requirements

## Guidance

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### Links

This unit links with:

- *Unit 3: Project Management for Land-based Industries*
- *Unit 31: Small Business Enterprise.*

### Essential requirements

Learners must be involved in the complete organisation of at least one event, including all aspects of pre- and post-event administration. This includes evaluating a particular facility for an event, access to financial records and the event budget, participation in all aspects of marketing, and meeting any legislative or technical requirements.

Access to the facilities and technical equipment needed to host the event where is also required.

### Employer engagement and vocational contexts

Delivery of this unit would be enhanced through engagement with event professionals. Organisers of different types of events could give guest lectures or host visits to their own events. This would give learners a frame of reference and enhance their learning experience.

## Unit 36: Mechanisation for Land-based Industries

Unit code: Y/503/1094

Level: 5

Credit value: 15

- **Aim**

This unit aims to develop understanding of and practical skills in the use of machinery and equipment in a range of land-based activities.

- **Unit abstract**

This unit introduces learners to the application of machinery and equipment in a range of land-based activities. It is designed to be as flexible as possible and to provide a basis for further study of specialised mechanisation operations.

The emphasis throughout is on providing sufficient technical knowledge to enable learners to critically analyse machinery and equipment performance, select machinery and equipment according to specified circumstances and prepare a plan for an appropriate mechanised operation.

Learner will also learn about the costs associated with the running of machinery and equipment.

- **Learning outcomes**

**On successful completion of this unit a learner will:**

- 1 Understand the application of power to land-based processes
- 2 Understand machinery and equipment selection and performance
- 3 Be able to plan and evaluate mechanised operations
- 4 Be able to cost land-based machinery and equipment.

## Unit content

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### 1 Understand the application of power to land-based processes

*Sources of power and transmission:* internal combustion engines; associated power transmission elements; electrical systems and hydraulics

*Power transmission elements:* gearboxes, drive-shafts, belts, chains and clutches; electric and hydraulic motors and their associated components

*Application of power to agriculture and horticulture operations:* tractors and associated systems; fixed and mobile power-driven equipment and machinery; performance measures including power, torque, efficiency

*Alternative energy sources:* solar, wind, micro-hydro; combined heat and power (CHP) to include anaerobic digestion, bio-diesel, bio-mass; alternatives to fossil fuels

### 2 Understand machinery and equipment selection and performance

*Equipment:* to suit the specific industry sector; criteria used in the selection of machinery and equipment

*Soil-engaging and crop-production machinery:* primary cultivators, ploughs, locally used harrows and cultivators (including powered equipment); seed drills and transplanters, as appropriate to the locality; fertiliser and pesticide application machinery; fixed and mobile equipment used in glasshouses and nurseries

*Mechanisation of livestock production:* milk production equipment; forage harvesting; forage and concentrate feed handling; mixing and dispensing equipment; livestock waste-handling equipment

*Performance criteria:* eg power, power to weight ratio, work rates, ease of use, driver/user comfort, compatibility with other equipment

*Equipment selection:* performance required; selection factors eg performance, ability of dealer, dealer proximity, specification, similarity to other equipment owned, size and dimensions, compatibility

### 3 Be able to plan and evaluate mechanised operations

*Operations:* crop and livestock enterprises, planning, complete production cycle, 'stubble-to-stubble' in the case of combinable crops

*Training needs analysis:* training requirements for particular operations from a technical and a legislative perspective, improvement, revision, planning objectives

*Evaluation, review and revision:* identification of requirements; performance; work rates eg spot, seasonal and overall; capacity; cost; ease of operation; complexity; effect on other operations; efficiencies; comparison of actual performance to required; possible re-evaluation of requirements

#### 4 Be able to cost land-based machinery and equipment

*Costs:* fixed and variable; running costs; indirect costs

*Depreciation methods:* straight line, declining balance, decremental; identifying applicable tax avoidance measures

*Costing methodology for machinery and equipment:* per hour; per hectare basis; or other relevant unit of operation

*Cost elements:* depreciation, relative to equipment type; interest charges; insurance and tax where applicable; operating costs; individual cost elements to be aggregated appropriately to determine complete operational costs

## Learning outcomes and assessment criteria

Learning outcomes  On successful completion of this unit a learner will:	Assessment criteria for pass  The learner can:
LO1 Understand the application of power to land-based processes	1.1 compare alternative options available for motive power 1.2 analyse the performance of motive power sources as applied to a specific application 1.3 explain the application of electric or hydraulic motors 1.4 analyse alternative sources of energy available for fixed and mobile equipment
LO2 Understand machinery and equipment selection and performance	2.1 discuss the range of equipment available for the mechanised operations of a given enterprise 2.2 analyse the performance of machinery and equipment for specific relevant enterprises 2.3 justify selection of, suitable machinery or equipment for the above enterprises
LO3 Be able to plan and evaluate mechanised operations	3.1 produce a schedule of mechanised operations 3.2 determine the training needs of given machine operators 3.3 evaluate mechanised operations within a particular enterprise 3.4 review a mechanised operation against the objectives set in the planning stage 3.5 revise the plans on the basis of the review
LO4 Be able to cost land-based machinery and equipment	4.1 determine the elements of cost in land-based machinery 4.2 use appropriate methods to determine the cost of depreciation of land-based machinery 4.3 analyse other elements of land-based machinery fixed costs 4.4 report on the operating costs of land-based machinery and equipment 4.5 determine the realistic cost of a land-based machine

## Guidance

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### Links

This unit links with crop production units, as well as to units covering habitat management, restoration and repair. An understanding of the requirements of production systems is essential to analysing mechanisation needs.

### Essential requirements

It is essential that learners have access to the type and range of machinery and equipment that is relevant to their particular programme. For example, if the programme is designed with a livestock bias in a grass and maize silage producing area then learners need access to this type of equipment, both statically and whilst in operation. Learners in employment and studying part-time may find their own workplace to be a suitable resource.

Suitable resources could be provided by the centre farm, learning resource centres, trade exhibits and local farms to broaden the range of operations that can experience.

### Employer engagement and vocational contexts

It is essential that this unit is delivered in an applied and vocational context and work based experience will also be important. The unit will be enhanced by contact with employers. Centres are encouraged to develop links with local businesses, manufacturers and machinery dealers as appropriate. Employers not only can provide real work practical exercises and guest speakers and experts to support the learning experience.



## Unit 37: Land Use Issues and Regulation

Unit code: D/503/1095

Level: 5

Credit value: 15

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- Aim

This unit aims to develop learner understanding of land management issues including the juxtaposition of competing land uses and the strengths and weaknesses of different land management approaches.

- Unit abstract

This unit focuses on the current types and systems of land use and how these are affected by a range of factors. Land use patterns, practices and problems are key features of understanding how land is managed. Learners will develop an understanding of the need for land use regulation and how this is managed. They will evaluate the state's role in managing land use, along with contemporary changes to the regulatory system. Why might these be happening? How much of our land use is dictated by state involvement? Land use is closely tied in with sustainability – how do these tie together? Is the current system of land use sustainable and could changes be made to improve land use sustainability? The concept of integrated land use will also be considered.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand current land management
- 2 Understand the nature and extent of current land use regulations
- 3 Understand the success of contemporary adjustments to land use regulations
- 4 Understand sustainable land use management.

## Unit content

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### 1 Understand current land management

*Land management types:* exploitative, protective, productive

*Land use patterns:* factors affecting land use eg climate, topography, soils, population, infrastructure, historical/cultural

*Land use practices and problems:* factors affecting land use practices eg legislation, financial; problems eg pollution, waste, noise, conflicts with other land uses, effects on habitats/wildlife, effects on people

### 2 Understand the nature and extent of current land use regulations

*Regulation:* structure of system; bodies involved in regulation; need for regulation; types of regulation affecting land use eg planning laws and guidance, protective designations (National Park, Sites of Special Scientific Interest, Areas of Outstanding Natural Beauty etc)

*State intervention:* reasons for state intervention in land use; current policies regarding reduction or increase in state intervention; impact of state intervention

### 3 Understanding the success of contemporary adjustments to land use regulations

*Contemporary adjustments:* current adjustments being considered or enacted; predicted success or otherwise of adjustments; reasons for adjustments

*Integrated land use regulation/strategy:* definition; key features; factors leading to success; possible problems

### 4 Understand sustainable land use management

*Sustainable development:* definition; key principles; relation to land management

*Sustainability of current land use management:* case for/against the sustainability of current land use; changes to land use systems to improve sustainability

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Understand current land management	1.1 explain factors influencing management of given exploited, protected and productive land uses 1.2 analyse current practices and problems related to a specific land use
LO2 Understand the nature and extent of current land use regulations	2.1 evaluate the need for land use regulation 2.2 examine the need for state intervention in land use 2.3 analyse the impact of state intervention
LO3 Understand the success of contemporary adjustments to land use regulations	3.1 justify the rationale behind contemporary adjustments to land use planning 3.2 discuss the concept of integrated land use 3.3 evaluate the success of given integrated land use strategies
LO4 Understand sustainable land use management	4.1 explain how the principles of sustainable development can relate to land use management 4.2 critically evaluate the sustainability of current land use management 4.3 suggest appropriate adjustments to given land use systems to improve sustainability

## Guidance

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### Links

This unit builds on knowledge gained in *Unit 11: Understanding Land Use and Environmental Issues* from the BTEC Level 3 Diploma in Countryside Management. It will also build on underpinning knowledge in the Edexcel Level 3 Work-based Diploma in Environmental Conservation.

### Essential requirements

Learners need access to the internet resources and written texts and journals. The use of 'real' sites, either as remote or direct access, for case studies will be invaluable.

### Employer engagement and vocational contexts

Delivery of the unit would be enhanced through links with professionals engaged in land management of any type, for example farmers, foresters, or conservation site managers.

## Unit 38: Build and Maintain Effective Customer Relations

Unit code: T/503/1099

Level: 4

Credit value: 15

- Aim

The aim of this unit is to develop learners' awareness of the importance of customer relations within an organisation, and the wider impact that this has on the success of the organisation. The unit explores promotion and maintenance of customer relations and how to monitor the effectiveness of customer relations within the organisation.

- Unit abstract

In this unit learners will develop understanding of and a practical ability in providing effective customer service. Building and developing effective customer relations is a vital aspect of customer service. Strong customer relations help any organisation to identify and understand their customers' needs and expectations, and encourage a way of working that is based on partnership and mutual trust.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to promote effective customer relations
- 2 Understand how to maintain effective customer relations
- 3 Understand how to monitor customer relations within an organisation.

## Unit content

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### 1 Be able to promote effective customer relations

*Customers:* type and number of customers/clients; two-way communication; expectations of organisation and customers

*Building relations:* long term; short term; promoting loyalty; importance of good customer relations

*Communication:* negotiation skills; dealing with dissatisfied customers; agreeing solutions; diffusing situations; importance of communication to the organisation and customer; individual roles and responsibilities and communication of these roles/ responsibilities to customer;

*Market research:* gathering information regarding customer needs and wants; how to gather market research eg questionnaires, telephone calls, letters, face to face surveying

### 2 Understand how to maintain effective customer relations

*Prioritising customers:* needs analysis; timing of service; organisation of priority and non-priority customers; identifying needy and relaxed customers

*Communication skills and methods:* dealing with complaints; advantages and disadvantages of different communication methods; how to promote the organisation through customer relations

*Establishing successful customer relations:* assessing whether expectations are being met; long- and short-term relations; new and existing customers; differences between these customers; benefits of long-term customer relations; compromising with customers at an acceptable level to the organisation

*Negotiation skills:* building rapport and confidence in own abilities; empowering self and organisation through customer service; accepting criticism from customers

### 3 Understand how to monitor customer relations within an organisation

*Customer satisfaction surveys:* how to carry out market research; most effective ways of gathering honest information from customers; feedback; data analysis; presentation of the data to peer groups and managers; success against benchmarks

*Exceeding customer expectations:* proposing changes; reasons for changes; how changes affect expectations; importance of exceeding expectations

*Recommending improvements:* reviewing customer satisfaction surveys; obtaining data; reviewing and comparing data to expectations; proposing and communicating changes to others; reasons for surveying and carrying out market research

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Be able to promote effective customer relations	1.1 determine customer groups for the chosen activity and their individual needs 1.2 communicate effectively with different customer groups 1.3 use effective negotiation skills within an organisation 1.4 deal effectively with dissatisfied customers 1.5 manage the collection and use of market research to gauge levels of customer satisfaction
LO2 Understand how to maintain effective customer relations	2.1 prioritise customer groups in terms of the attention they require 2.2 evaluate communication skills used in the sector 2.3 discuss how to establish customer relations with new or returning customers 2.4 examine negotiation skills used to maintain effective customer relations 2.5 explain appropriate methods of dealing with dissatisfied customers
LO3 Understand how to monitor customer relations within an organisation	3.1 evaluate methods of monitoring customer satisfaction 3.2 analyse methods of using influence and authority to meet or exceed customer satisfaction 3.3 explain how to maintain a long-term customer relationship 3.4 recommend appropriate improvements to customer relations within an organisation

## Guidance

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### Links

This unit introduces learners to building and maintaining effective customer relations and links to the following units:

- *Unit 3: Project Management for Land-based Industries.*
- *Unit 30: Business Environment*

### Essential requirements

It is essential that learners experience a real or simulated working environment (for example vocational work experience) to practise their customer service skills. Learners also need access to the internet and up-to-date literature such as text books and professional journals to enable them to research relevant material.

### Employer engagement and vocational contexts

Learners would benefit from being involved in real-life customer service positions in their chosen sector. It is important that learners are given the opportunity to identify and understand their target market's expectations, and how to maintain and exceed these expectations to make a strategic contribution to the organisation.

Learners would benefit from visits to or guest lecturers from large or small organisations to describe how they promote customer service and give examples of poor customer service that they have witnessed within their or another organisation. Good and poor examples of customer service are available on the internet, and these make good learning and teaching tools.

## Unit 39: Health and Safety in the Land-based Workplace

Unit code: D/503/1100

Level: 4

Credit value: 15

### ● Aim

This unit aims to develop learner understanding about their responsibilities in ensuring the health and safety of the land-based workplace and the people within it.

### ● Unit abstract

Health and safety is an essential consideration for all people working within the land-based sector. In this unit learners will develop an understanding of the importance of monitoring the implementation of health and safety legislation and policies within a land-based setting on a regular basis.

Learners will gain an understanding of the implications of relevant legislation for their own role and for the implementation of policies and systems in their workplace. The importance of record keeping, monitoring and reviewing health and safety policies and procedures will also be covered.

This unit should be contextualised, where possible, to an appropriate setting relevant to the learner's workplace within the land-based sector.

### ● Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand how health and safety legislation is implemented in a land-based workplace
- 2 Understand how health and safety requirements impact on a land-based workplace
- 3 Understand the monitoring and review of health and safety in a land-based workplace.

## Unit content

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### 1 Understand how health and safety legislation is implemented in a land-based workplace

*Concept of risk, safety and security:* minimum risk, zero risk; risk for employees, customers, general public, visitors, trespassers; public liability; hazard; accident prevention; first aid; security; machinery, equipment and implements; animals; plants; substances; risk and COSHH assessments; safe codes of practice; equipment; premises; storage; National Occupational Standards

*Systems, policies and procedures for communicating information:* exemplar pro forma; training; organisational culture; use of different media; exchange of information; record keeping; enforcement; compliance

*Responsibilities for management of health and safety:* organisational responsibilities (employers, employees including casual and fractional staff, external agencies, contractors, sub-contractors, external suppliers and service providers); monitoring and evaluating processes; auditing; inspecting the workplace; management structure and representation

*Legislative requirements:* current legislation, regulations and codes of practice relevant to health and safety in a land-based industry setting eg Health and Safety at Work Act 1974, Health and Safety (First Aid) Regulations 1981, Management of Health and Safety Regulations 1999, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995, Control of Substances Hazardous to Health 2002, Manual Handling Operations Regulations 1992, Food Safety Act 1990, Food Safety (General Food Hygiene) Regulations 1995, Workplace (Health, Safety and Welfare) Regulations 1992, Disability Discrimination Act 1995, Food and Environment Act (FEPA) 1985; Health and Welfare at Work (Control of Vibration) Regulations 2006; Working at Height Regulations 2005; Control of Noise at Work Regulations 2005; Provision and Use of Work Equipment Regulations 1998; Health and Safety (Consultation with Employees) Regulations 1996, Pressure Systems Safety Regulations 2000, Lifting Operations and Lifting Equipment Regulations 1998

*Training and implementation:* pesticide storage and use; machinery including chainsaws, brushcutters, diggers, ground maintenance machinery; manual handling; poisonous and hazardous plants; risk assessments; safe working practices; induction training; management and supervisor training including IOSH and NEBOSH; provision of personal protective equipment

### 2 Understand how health and safety requirements impact on a land-based workplace

*Workplace planning:* static and mobile workplaces and teams; meeting business needs; ensuring safety; principles of good practice; maintenance and monitoring procedures; staff training

*Dilemmas:* risk-benefit analysis; risk to self and others; resource implications; differing priorities between stakeholders; differences in priorities within permanent and temporary workplaces

*Implications of non-compliance:* financial; legal; moral; physical; health; reputation

### 3 Understand the monitoring and review of health and safety in a land-based workplace

*Monitor and review:* active and reactive monitoring; audit of risks; review of practice; learning from experience; updating and implementation of policies and procedures; health surveillance; consultation

*Positive health and safety culture:* individuals; teams; managers; organisational levels

*Own contributions:* responsibilities; compliance; training; practices; interactions with individuals, groups, agencies, contractors and sub-contractors

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand how health and safety legislation is implemented in a land-based workplace	1.1 review systems, policies and procedures for communicating information on health and safety in a land-based workplace in accordance with legislative requirements  1.2 assess the responsibilities in a specific land-based workplace for the management of health and safety in relation to organisational structures  1.3 analyse health and safety priorities appropriate for a specific land-based workplace
LO2 Understand how health and safety requirements impact on a land-based workplace	2.1 analyse how information from risk assessment informs planning for individuals and organisational decision making  2.2 analyse the impact of one aspect of health and safety policy on land-based practice  2.3 discuss how dilemmas encountered in relation to implementing systems and policies for health, safety and security may be addressed  2.4 analyse the effect of non-compliance with health and safety legislation in a land-based workplace
LO3 Understand the monitoring and review of health and safety in a land-based workplace	3.1 explain how health and safety policies and practices are monitored and reviewed  3.2 analyse the effectiveness of health and safety policies and practices in the workplace in promoting a positive, healthy and safe culture  3.3 evaluate own contributions to ensuring the health and safety needs of individuals

## Guidance

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### Links

This unit links with all other units in the qualification as health and safety key component of them.

### Essential requirements

Learner's evaluative accounts of one aspect of health and safety in the workplace must be validated. This could be a witness statement from a workplace supervisor, or an observation record from the assessor.

Learners must be given the opportunity to carry out a risk assessment within the workplace.

Ideally, this would be in a setting relevant to their occupational sector, but if this is not possible a simulation will suffice. Access to IT, internet facilities, library resources, including occupational magazines, is also required.

### Employer engagement and vocational contexts

Visiting speakers and health and safety specialists would help learners to understand legislative requirements and how they are managed – especially for learners undertaking a simulated risk assessment. Work placements within learners' chosen fields are recommended. This will enable them to undertake risk assessments within an industrial setting and give them scope for further research and investigation.



## Unit 40: Waste Management

Unit code: K/503/1102

Level: 5

Credit value: 15

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- Aim

This unit aims to develop understanding of the growing problems associated with waste production and disposal in a developed society. Learners will quantify and characterise different types of waste and design and implement waste stream management systems to minimise the environmental impact of waste disposal.

- Unit abstract

Identification of waste disposal methods which minimise the impact on the environment, and the effective management of this process are essential within all land-based sectors. In this unit learners will develop an understanding of waste stream management, and its effective use, when looking at strategies to dispose of a range of different hazardous and non-hazardous waste. Learners will also be able to recognise waste origins and the effect waste on the environment and methods which can be implemented to minimise the impact on the environment and implement a sustainable waste stream management policy.

This unit should be contextualised, where possible, to an appropriate setting relevant to learners' workplaces or chosen professions within the land-based sector.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand waste origins and types
- 2 Understand the principles and components of an effective waste stream management policy
- 3 Understand the environmental and financial impacts of waste management
- 4 Understand how a sustainable waste stream management system can minimise the impact on the environment and maximise the profitability of a business
- 5 Be able to plan, implement and evaluate a waste management policy.

## Unit content

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### 1 Understand waste origins and types

*Types of waste:* hazardous; non-hazardous; biodegradable; non-biodegradable; recyclable

*Waste stream classification:* commercial and industrial; construction and demolition; municipal; solid, organic, hazardous, problematic

*Lifestyle:* population growth; disposable society (consumerism, waste production); environmental impact; changing consumer priorities; national and local government policies and strategies; industrial development and legacy, wealth; health hazards

*Industrial sources:* extraction; manufacturing; processing; power generation; cooling; machine and vehicle emissions; demolition; maintenance regimes

*Domestic sources:* household and garden waste; sewage

*Rural sources:* manure/slurry; silage effluent; pesticide and fertiliser run-off/drift; agrochemical containers; trading estates; abattoirs (organic wastes, carcasses); oil and sewage spills; emissions from smoky fires; land-based machinery and rural traffic

*Land:* toxic and persistent chemicals; organic and inorganic wastes eg heavy metals, asbestos, dioxins; non-toxic and biodegradable materials

*Water:* oil waste; sewage; floodwater risks; point and diffuse discharges; contamination of river silt; heavy metals; suspended and soluble contaminants; mining discharges

*Air:* smokestacks; particulates; carbon gases; acidic gases (oxides of sulphur and nitrogen), ozone, carcinogens, exhaust gases, open fires; propellants eg CFCs, noise and light pollution

### 2 Understand the principles and components of an effective waste stream management policy

*Waste stream management:* policy statement; policy objectives; application of policy; organisation and management.

*Waste management action plan:* waste reduction; reuse; recycling; incentives

*Evaluation:* limits of waste disposal routines; principle of best practicable environmental option (BPEO)

*Responsibility:* eg European Union regulations and directives, The Commission's environmental Fifth action program 'Towards Sustainability' (OJC138 17.5.93), European Environmental Agency, directives on Air, Water, Land waste disposal, UK Waste Management Strategy, central government policy/legislation (EPA 1990, EA 1995), Department of Transport, local government, Environment Agency, Health and Safety Executive, waste disposal agencies, water companies, commercial operations

*Land:* landfill location and design; collection and transport; provision for gases and leachate; after use of sites

*Water:* non-solid and semi-solid collection and transport; sewerage infrastructure; separation of clean and grey water; treatment plants; limits of safe discharge; discharge pricing; marine disposal

*Air:* smokestacks and scrubbers; catalytic converters; lead-free petrol; clean air zones; onshore and offshore incineration plants

*Community involvement:* separation at collection sites; factory and household collections of hazardous materials; reduction/recycling/reusing

### 3 Understand the environmental and financial impacts of waste management

*Natural renewal:* geological and biological cycles, interruption and contamination

*Ecology:* persistent and cumulative contaminants, case studies, monitoring, toxicity levels, biological contamination and diseases

*Land:* industrial legacy of toxic materials, landfill and spoil contamination

*Water:* effects of discharge on marine and freshwater life (point and diffuse sources), eutrophication, acidification, indicator organisms, standards for surface and groundwater, thermal pollution

*Air:* standards, smog and photochemical smog, global warming and ozone depletion

*Health and safety:* respiratory illness, asbestosis, short- and long-term effects, safety of community and workforce in waste industry, carcinogenic effect, case studies, emergency procedures, compensation

*Communication:* written and verbal contracts, business and domestic waste management policies, marketing, training and induction

*Financial:* profit, non-profit, publicity, incentives, grants, fines, marketing

### 4 Understand how a sustainable waste stream management system can minimise the impact on the environment and maximise the profitability of a business

*Sustainability:* reduction, prevention, re-use, energy recovery, disposal

*Waste management:* conservation, natural resources, prevention of emission of CHG, protecting health, protecting ecosystems

*Regulation:* statutory controls, international agreements, post-Rio and Kyoto developments, legislative protection of workers, waste taxation

*Enforcement:* government departments, Environment Agency, Health and Safety Executive, penalties for illegal waste disposal and unsafe practices, 'polluter pays' principle

*Repair:* land reclamation methods, use of tolerant plants and microbial techniques, marine and freshwater clean-up operations, removal and containment strategies, cost-benefit analysis of prevention and clean-up

*Reduction:* waste reduction culture at home and work, increased recycling/repairing/reusing, incentives and penalties, clean technologies, insulation and heat recycling, reed bed filtration

**5 Be able to plan, implement and evaluate a waste management policy**

*Establishment:* methods of implementation; roles and responsibilities

*Communication:* written and verbal contracts; business and domestic waste management policies; methods of communication to employees, stakeholders, customers (marketing, training and induction)

*Financial:* profit; non-profit; publicity; incentives; grants; fines; marketing

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Understand waste origins and types	1.1 examine the origin of different waste types 1.2 explain the classification of different waste types
LO2 Understand the principles and components of an effective waste stream management policy	2.1 examine the principles and components of an effective waste stream management policy 2.2 explain the laws, government directives and incentive schemes relating to the management of waste 2.3 evaluate the economic and environmental constraints of waste disposal 2.4 discuss methods of disposal to land, water and air and how this can be reduced
LO3 Understand the environmental and financial impacts of waste management	3.1 assess the effects of waste materials on land, water and air systems and the short-term and long-term effects on health and safety 3.2 explain short-term and long-term financial implications for waste management 3.3 analyse communication methods used and their effectiveness
LO4 Understand how a sustainable waste stream management system can minimise the impact on the environment and maximise the profitability of a business	4.1 analyse local and national issues likely to impact on sustainable waste management activities 4.2 examine sustainable waste management and assess how each element of this affects the profitability of a business 4.3 explain methods used to monitor waste stream management and ensure that relevant legislation and guidance are adhered to 4.4 summarise the role of legislation and persuasion and how waste control is enforced.
LO5 Be able to plan, implement and evaluate a waste management policy	5.1 establish a waste stream management policy 5.2 communicate policy to those involved with its implementation 5.3 advise stakeholders and customers on the benefits of the policy

## Guidance

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### Links

This unit is closely linked to *Unit 37: Land Use Issues and Regulation*, *Unit 32: Sustainable Development* and *Unit 51: Principles of Ecology*.

### Essential requirements

Learners must have the opportunity to carry out a workplace waste management evaluation. Ideally, this would be in a setting relevant to their occupational sector, but if this is not possible a simulation will suffice. Learners will also need access to IT and internet facilities, and library resources including occupational magazines.

### Employer engagement and vocational contexts

The involvement of local authorities will help centres to arrange visits and guest speakers. Established contacts should be able to keep staff and learners in touch with new developments, particularly aspects of law and sustainability.

Work placements within learners' chosen fields are recommended. These will enable them to undertake risk assessments within an industrial setting and give them scope for further research and investigation.

## Unit 41: Develop and Implement Plans for the Storage and Disposal of Inorganic Waste

Unit code: F/503/1106

Level: 4

Credit value: 15

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- Aim

This unit aims to develop learner awareness of the impact of inorganic waste on enterprises and the environment and their ability to manage the processes of inorganic waste storage and disposal.

- Unit abstract

This unit introduces learners to the current issues, trends and management around inorganic waste storage and disposal, and the associated problems that all industries and enterprises face.

The unit has a theoretical and a relevant practical content. Learners can fully experience, through case studies, observation and research, the legislative framework and its impact on industry. Learners will study the management of waste storage and disposal in relevant enterprises and at the same time and develop their knowledge and understanding of particular issues within their chosen industry.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the impact of inorganic waste
- 2 Be able to manage the storage of inorganic waste
- 3 Understand the methods of inorganic waste disposal
- 4 Be able to manage the disposal of inorganic waste.

## Unit content

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### 1 Understand the impact of inorganic waste

*Categorisation of inorganic waste:* types of inorganic waste (eg hazardous, non-hazardous, solids, liquids, chemical products, machinery and workshop wastes)

*Environmental impact of inorganic waste:* examples of inorganic production (eg fertilisers, agrochemicals, vehicles, construction); impact on the environment (eg energy use, resource use such as water, pollution); impact on health and safety; storage and disposal methods; current UK legislation and government strategies

### 2 Be able to manage the storage of inorganic waste

*Storage of inorganic waste:* review current legislation relating to inorganic waste storage; enterprise audit of inorganic waste storage; review planning methods; record keeping; costs to the enterprise (eg present, future, how to minimise); staff training (eg health and safety issues, risk assessments, skill updating)

### 3 Understand the methods of inorganic waste disposal

*Methods of disposal:* review current methods; transportation

*Legislative issues:* current health and safety issues; risk assessments; records and record keeping; future trends

### 4 Be able to manage the disposal of inorganic waste

*Inorganic waste disposal management:* review of current enterprise plan; waste disposal audit; record keeping; costs to the enterprise; staff updating and communication

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand the impact of inorganic waste	1.1 categorise the types of inorganic waste 1.2 assess the effects of the production of inorganic waste on the environment 1.3 evaluate the disposal methods of inorganic waste 1.4 examine legislation and codes of practice relevant to the storage of inorganic waste
LO2 Be able to manage the storage of inorganic waste	2.1 justify storage planning for inorganic waste 2.2 effectively manage the storage of inorganic waste 2.3 ensure effective communication with personnel involved in the storage of inorganic waste 2.4 evaluate the storage of inorganic waste 2.5 complete appropriate waste storage records accurately
LO3 Understand methods of inorganic waste disposal	3.1 evaluate methods of inorganic waste disposal 3.2 explain how to manage the appropriate disposal of inorganic waste 3.3 examine the documentation required for disposal of inorganic waste 3.4 explain the stakeholders/authorities involved in the disposal of inorganic waste
LO4 Be able to manage the disposal of inorganic waste	4.1 justify planning for inorganic waste disposal 4.2 effectively manage the disposal of inorganic waste 4.3 ensure effective communication with personnel involved in inorganic waste disposal 4.4 evaluate the disposal of inorganic waste carried out 4.5 complete appropriate waste storage records accurately

## Guidance

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### Links

This unit gives learners an opportunity to develop a broad knowledge and understanding of the problems associated with inorganic waste storage and disposal. The unit links with units where the problems of inorganic waste storage and disposal are covered.

### Essential requirements

A broad selection of enterprises should be chosen so that learners can appreciate the common problems that industry managers and employers face. In-depth studies and research learning will form part of the experience. Tutors should select enterprises where learners can observe issues relating to the storage and disposal of inorganic waste so they can analyse, interpret and evaluate current industry practices. It is essential that the impact on the environment of producing inorganic products is emphasised throughout.

Learners need to be familiar with the relevant legislation before they consider the learning outcomes that relate to the management of waste storage and disposal.

### Employer engagement and vocational contexts

Delivery of this unit will involve employers and managers of enterprises who carry out inorganic waste storage and disposal. Tutors should select a number of different enterprises such as farms, chemical and manufacturing companies, recycle centres and land-fill sites. Learners need to be made aware of the broad nature of the problem of inorganic waste and how to manage it and its impact on the environment.

Tutors should, if possible, include members of local and/or national government agencies in the programme of study. This will highlight the background legislation and any plans that may impact on society.

## Unit 42: Professional Garden Design Practice

Unit code: L/503/1108

Level: 4

Credit value: 15

- **Aim**

This unit aims to develop learners understanding of how to cost a design, of professional standards and bodies, and of contract administration and contract law.

- **Unit abstract**

This unit introduces learners to contractual requirements and problems in relation to garden design to develop an awareness of the legal developments and changes that impact on the garden design industry.

Learners will consider design brief development, production timetables, costing of a design, designer and legal fees, budgetary preparation, cost analysis and client consultation.

In this unit learners have the opportunity to develop a clear understanding of the role and importance of professional standards and ethics within a garden design practice.

- **Learning outcomes**

**On successful completion of this unit a learner will:**

- 1 Be able to quantify and cost the development of a garden design
- 2 Understand client and site requirements
- 3 Understand the legal and regulatory framework related to garden design
- 4 Understand the importance of the professional bodies, their charters, ethics and standards.

## Unit content

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### 1 Be able to quantify and cost the development of a garden design

*Development:* labour costs, material costs, unit rates, selection of material and cost analysis

*Production:* bills of quantities, detailed specifications, labour resources schedules, design cost bands, percentage fees, time charges, lump sum fees

### 2 Understand client and site requirements

*Interpretation:* clients requirements through the brief, site plans, analysis and evaluation of design proposals, constraints and opportunities within material selection and the cost implication

*Development:* apply problem-solving skills in a range of settings, designing for those with disabilities, presentation and communication skills

### 3 Understand the legal and regulatory framework related to garden design

*Legal framework:* applicable laws and regulations to consider; contract law; consumer protection; copyright

*Regulatory framework:* statutory regulations, structure of planning system within the UK, planning permission, tree preservation orders

*Impact of legislation and regulations:* purpose of key legislation and regulations; health and safety; data protection; planning law; national and local level

### 4 Understand the importance of the professional bodies, their charters, ethics and standards

*Professional bodies:* landscape architects, architects and civil engineers, technical support staff, structural engineers, contractors, planning officers and building regulation offices

*Business ethics:* benefits of, responsibility, employment ethics, ethics of advertising, green issues in business, sustainability, accountability, business conduct, community involvement

*Ethical theory:* reason for ethics; overlap between law and ethics, human rights, marketplace/consumers and workplace/employees

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Be able to quantify and cost the development of a garden design	1.1 use appropriate costing methods in the selection of materials for a design brief 1.2 justify components detailed within a design specification 1.3 use standard methods in the production of a bill of quantities
LO2 Understand client and site requirements	2.1 analyse the requirements of a given client 2.3 assess feedback on design and specification from relevant parties 2.4 justify solutions to site-specific requirements
LO3 Understand the legal and regulatory framework related to garden design	3.1 explain contract legislation relevant to the garden designer 3.2 examine statutory regulations in relation to the landscape design and consultation process
LO4 Understand the importance of professional bodies, their charters, ethics and standards	4.1 examine the nature and purpose of the relevant professional bodies involved within the garden design process 4.2 analyse ethical issues faced by the garden designers

## Guidance

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### Links

This unit is closely linked to other units in this qualification, these include:

- *Unit 12: Garden Design Principles*
- *Unit 44: Historical Influence in Garden Design*
- *Unit 48: Landscape Design Process*
- *Unit 49: Planting Design.*

### Essential requirements

Learners must be introduced, at an early stage, to vocationally-based legal textbooks on contract documentation and planning law. This will enable them to study the legal and regulatory framework via real examples and show them the effects of landmark cases within the garden design and landscape construction industry. Learners must be encouraged to keep up to date with current cases that affect the garden design and landscape sector through quality newspapers, journals and the media. As this unit requires data research, analysis and the application of various principles, the production of a written case study, preferably of a live project, would provide the focus for assessment.

### Employer engagement and vocational contexts

Delivery of this unit would be enhanced by employer engagement, for example, a legal adviser, local designers, contractors, planning officer, local authority staff within planning or legal department. Links with professional bodies and organisation in the landscape sector may support other units as well as work placement opportunities. Learners would benefit from visiting a law court and talking to officials about the role of the courts. Tutors could also encourage learners to become student members of professional organisations such as the British Association for Landscape Industries.

## Unit 43: Major Integrated Garden Design Project

Unit code: R/503/1157

Level: 5

Credit value: 30

- Aim

To consolidate in a single garden design project the knowledge and skills gained in previous units.

- Unit abstract

This unit will build upon and consolidate the techniques and skills learned in previous units, developing the learner's understanding of how the nature of garden design combines technical, theoretical, business, and design skills. The project will provide a framework for the learner to demonstrate their knowledge and understanding of the comprehensive nature of design and will draw on the knowledge and skills gained in previous areas of study including historical precedent, compositional design principles, plant knowledge, materials and construction, graphic communication techniques, and business discipline.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand site conditions and clients brief
- 2 Be able to produce various appropriate design solutions to fulfil the client brief
- 3 Be able to produce presentational quality design drawings to communicate the preferred design option
- 4 Be able to produce a programme of works from inception to completion
- 5 Understand the principles of a programme of works.

## Unit content

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### 1 Understand site conditions and client brief

*Site conditions:* comprehensive site survey and analysis drawings

*Visual material:* eg mood boards, examples of previous work in the form of a port folio, photo montages

*Statutory legislation:* eg planning permission, rights of access, tree preservation orders.

### 2 Be able to produce various appropriate design solutions to fulfil the client brief

*Various design solutions:* production of concept designs, further developing the skills inherent in garden design such as compositional design principles, imaginative use of materials and construction techniques, historical precedent, and plant knowledge, as studied in previous units.

*Design options:* 2-dimensional media such as sketches, plans, elevations, and projections; 3 dimensional media such as scale models

### 3 Be able to produce presentational quality design drawings to communicate the preferred design option

*Communicate:* recognise the use of drawings for different purposes, such as presentation plans and sketches for client and hard landscaping / setting out drawings for contractor

### 4 Be able to produce a programme of works from inception to completion

*Programme of work:* detailing all stages of work from site clearance and preparation, to construction of hard landscaping, topsoiling and planting

*Procurement:* procurement options such as tender procedure, contractor negotiation, and client self-build

### 5 Understand the principles of a programme of works

*Costs:* production of a Bill of Quantities

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand site conditions and client brief	1.1 comprehensively analyse the requirements of a given client 1.2 ensure full exploitation of the site potential 1.3 analyse the techniques of various garden designers relevant to the project 1.4 explain the relevance of selected garden designers to the project 1.5 effectively use visual material during consultation with the client 1.6 explain the relevance of legislation to the project
LO2 Be able to produce various appropriate design solutions to fulfil the client brief	2.1 produce a range of varied design options demonstrating knowledge of design principles to achieve the client brief 2.2 determine the strengths and weaknesses of each design option 2.3 present suitable design options to the client using appropriate media
LO3 Be able to produce presentational quality design drawings to communicate the preferred design option	3.1 produce presentational quality design drawings 3.2 use appropriate technical detailing in the production of design specification 3.3 demonstrate appropriate horticultural and plant knowledge in the production of detailed planting plans
LO4 Be able to produce a programme of works from inception to completion	4.1 plan the programme of work in the construction of a garden project 4.2 report all costs relating to each stage of the project 4.3 plan relevant options available to procure the design and cost evaluation techniques required
LO5 Understand the principles of a programme of works	5.1 explain the programme of work in the construction of a garden 5.2 examine all costs relating to each stage of the project

## Guidance

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### Links

This unit builds upon, within a single garden design project, the foundation of knowledge and practical skills studied in previous units. These include:

- *Unit 8: Plant Selection and Establishment*
- *Unit 12: Garden Design Principles*
- *Unit 15: Hard Landscape Principles and Practice*
- *Unit 30: Business Environment*
- *Unit 44: Historical Influence in Garden Design*
- *Unit 47: Advanced Garden Design.*

Learners must also be encouraged to keep abreast with the very latest news within garden design and the landscape sector via magazines and the media.

### Essential requirements

To facilitate this unit, it is essential that learners acquire a client and garden site. Although the building of the garden is out with the remit of this unit, the project up to pre-tender stage will be treated as a live project.

### Employer engagement and vocational contexts

The delivery of this unit would be enhanced by educational visits to art galleries, botanical gardens, art and sculpture exhibitions, trade fairs relevant to garden planning and construction, plant nurseries, hard landscaping material suppliers, and suppliers of garden ornaments and lighting such as salvage yards.

Learners will be encouraged to participate in professionally recognised garden shows, such as Chelsea Flower show, Garden show Ireland, and Hampden Court Flower Show, as exhibitors in the design and construction of a show garden, individually or collaboratively. This will forge links with the garden design industry, and help to launch their careers as Garden Designers.

Opportunities should be created to visit well designed local gardens as well as 'Show gardens' such as the Chelsea Flower Show

Sustained links with professional garden design organisations may provide work placement opportunities. Learners will be encouraged to become student members of related professional organisations such as the 'Society of Garden Designers' and will thereby benefit from events including workshops, lectures, and visits run by such an organisation.

## Unit 44: Historical Influence in Garden Design

Unit code: R/503/1109

Level: 5

Credit value: 15

- Aim

This unit aims to develop learner understanding of the history of garden design and the influential figures who made a major contribution to the form we know today. Learners will gain an appreciation that garden design is an evolving discipline whose modern application depends on its historical origins.

- Unit abstract

In this unit learners will look back in time at the influential garden designers of the 18th, 19th and 20th centuries. They will investigate the designer's individual contribution to the development of garden design, from their own era to the modern day.

Learners will develop an understanding of the social, economic and political factors that have affected garden design and recognise where attitudes have changed, identifying the main causes. The unit also covers major influences on English landscape design and the styles developed in response to them.

Learners will also be investigate the modern technology used in garden design and understand its impact and current relevant legislation.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand influential figures and styles in the history of garden design
- 2 Understand effects of social, economic and political factors on the development of garden design
- 3 Understand the impact of the English landscape movement on garden design
- 4 Understand impacts of modern technology on garden design.

## Unit content

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### 1 Understand influential figures and styles in the history of garden design

*Garden design:* major styles; Britain and Europe from the classical period to the present day; influential figures from the 18th, 19th and 20th centuries

*Comparison of styles:* existing gardens and associated features; influence of style on later designers

### 2 Understand effects of social, economic and political factors on the development of garden design

*Social:* history of 18th, 19th and 20th centuries; influence of 'the grand tour'; changing working classes; career development; change in attitude towards home ownership; influence of overseas influences eg French, Dutch, Italian, Chinese, Japanese, Islamic, Arabic, Asian

*Economic and political:* attitudes towards disposable income; impact of media on design and expectations; exploration and evaluation of relevant media influences (TV, printed media and gardening personalities, garden shows/exhibitions, art and sculpture on contemporary garden design)

### 3 Understand the impact of the English landscape movement on garden design

*Impact:* William Kent; Capability Brown; Charles Bridgman

*Styles:* development of styles; origins in antiquity; legacy of their designs today

### 4 Understand impacts of modern technology on garden design

*Technology:* construction technology; design technology; maintenance technology and equipment; costs; health and safety; training and current legislation

*Impact:* manipulation of the environment

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Understand influential figures and styles in the history of garden design	1.1 explain the development of the discipline of garden design 1.2 critically analyse existing gardens according to their styles, features and design influences
LO2 Understand effects of social, economic and political factors on the development of garden design	2.1 explain the influence of social, economic and political factors on the development of garden design 2.2 evaluate the role of the media in modern garden design
LO3 Understand the impact of the English landscape movement on garden design	3.1 explain the origins of the English landscape movement 3.2 discuss the styles associated with the English landscape movement 3.3 evaluate the legacy of the English landscape movement in modern garden design
LO4 Understand impacts of modern technology on garden design	4.1 discuss the range of technology available to garden designers today 4.2 evaluate the advantages and disadvantages of modern technology for garden design

## Guidance

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### Links

This unit enables learners to develop an understanding of the historical influences of garden design and links with the following units in this qualification:

- *Unit 7: Plant Environmental Adaptation and Physiology*
- *Unit 11: Horticultural Technology*
- *Unit 12: Garden Design Principles*
- *Unit 23: Management of Historic Parks and Gardens*
- *Unit 48: Landscape Design Process*
- *Unit 49: Planting Design.*

### Essential requirements

Learners need access to a range of publications, DVD, CD ROMs relevant to garden design.

### Employer engagement and vocational contexts

Delivery of this unit would be enhanced by employer engagement, for example by working with employers such as local parks, gardens and historically relevant properties. It will be helpful for learners to visit a range of historical gardens, where possible, to enable them to study their design.

Local landscapers or head gardeners who work on Royal Estates or for National Trust properties could be invited as guest speakers which will give learners the opportunity to ask relevant questions. Links with organisations may support other units as well as work placement opportunities.

## Unit 45: Graphic Skills for Garden Designers

Unit code: K/503/1116

Level: 5

Credit value: 15

- Aim

This unit aims to develop learner's graphic presentation skills and their appreciation of the role of 2-dimensional and 3-dimensional drawings within the garden design process.

- Unit abstract

In this unit learners will and develop a wide range of graphic skills to facilitate the drawing of site survey and analysis plans as well as scaled 2-dimensional and 3-dimensional presentation plans to the professional standard used within the garden design industry. Learners will also evaluate the role of computer technology in the modern garden design process.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to prepare 2-d plan drawings
- 2 Be able to prepare 3-d graphic presentations
- 3 Be able to apply the techniques of rendering to enhance drawing presentation
- 4 Understand the role of computer technology in the modern garden design process.

## Unit content

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### 1 Be able to prepare 2-d plan drawings

*Preparation:* apply a wide range of graphic techniques to include the selective use of various line thickness within the whole drawing as in walls, boundaries, windows, doors, steps, changes in level, texture and text; accurate visual and written communication on paper including 'key' and 'title block'

*2-dimensional plan drawings:* site survey plans, site analysis plans, concept plans, hard and soft landscaping plans, final presentation plans

*Scale and paper size:* best choice of scale appropriate to the dimensions of the site, appropriate choice of paper size to accommodate the scale

### 2 Be able to prepare 3-d graphic presentations

*3-dimensional graphic presentations:* cross sections and elevations from 2-dimensional drawings of garden plans, axonometric projections from 2-dimensional features eg ramps, steps, summer houses, water features, raised beds; one-point and two-point perspective drawings to illustrate design proposals, free-hand images, sketching on site, inclusion of drawings in a design diary; use of sketchbooks, design diaries and moodboards

### 3 Be able to apply the techniques of rendering to enhance drawing presentation

*Techniques of rendering:* appropriate line thickness, black and white hatching, toning; use of colour and shadow; choice of media to include drawing pens, pencils, coloured pencils, water colour paints and pastels

### 4 Understand the role of computer technology in the modern garden design process

*Computer technology:* digital imaging, photomontage and computer software eg AutoCAD, Vector works, SketchUp; use of digital cameras, relevant apps

*Role of computers:* comparison of different computer-aided designs with manual graphic techniques; use of digital image and photomontage; range of software relevant to garden design; role of the internet

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Be able to prepare 2-d plan drawings	1.1 prepare survey and analysis plans using site data information 1.2 demonstrate appropriate use of paper size 1.3 prepare the follow-up concept plan using the appropriate graphic techniques 1.4 produce final presentation plans
LO2 Be able to produce 3-d graphic presentations	2.1 produce cross-sections and elevations 2.2 create axonometric projections from 2-dimensional proposed garden plans 2.3 create one-point and two-point perspective drawings 2.4 produce free hand images
LO3 Be able to apply the techniques of rendering to enhance drawing presentation	3.1 use appropriate line thickness in drawing presentations 3.2 render a drawing with both black and white hatching and colour 3.3 alter proportions through the use of colour and shadow
LO4 Understand the role of computer technology in the modern garden design process	4.1 compare the use of computer-aided designs with manual graphic techniques 4.2 explain in detail the use of digital image and photomontage 4.3 evaluate the range of computer software available to garden designers

## Guidance

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### Links

This unit introduces learners to the skills and practices of the professional garden designer and links with other units in this qualification such as:

- *Unit 8: Plant Selection and Establishment*
- *Unit 12: Garden Design Principles*
- *Unit 15: Hard Landscape Principles and Practice*
- *Unit 30: Business Environment*
- *Unit 44: Historical Influence in Garden Design.*

### Essential requirements

Learners need access to professional drawing equipment and materials including:

- good quality drawing board, paper, and a range of drawing media such as pens, pencils, pastels and water colours
- a range of computer software for garden designers
- a range of carefully briefed assignments to enable learners to practise their graphic skills.

### Employer engagement and vocational contexts

Learners would benefit from work study days in the design studios of local garden design practices to observe how plans are drawn up in the workplace by hand or by using computer-aided technology.

Delivery of the unit would be enhanced by day or weekend workshops led by guest professional designers who could bring in samples of their own drawings as well as demonstrate their own personal styles in graphics and rendering.

Sustained links with professional garden design organisations may support other units as well as work-placement opportunities.

Learners should also be encouraged to become student members of related professional organisations such as the Society of Garden Designers so they can benefit from events including workshops, these organisations run.

## Unit 46: Garden Styles and their Influence

Unit code: M/503/1117

Level: 4

Credit value: 10

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- Aim

This unit aims to develop understanding of garden styles and how they have been influenced by past and present trends in fashion, art and culture.

- Unit abstract

In this unit learners will learn about the nature of historical and present-day modern garden styles. They will explore how historical garden styles have influenced present day design and examines the manner in which style is influenced by trends in fashion, art and culture. Learners will look at the unique design skills and styles of some contemporary garden designers.

Learners will also apply a range and a blend of styles to their own design work.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand historical garden styles and their influence on present day garden design
- 2 Understand modern garden design styles and the design skills of the designers who created them
- 3 Understand how trends in fashion, art and culture have influenced garden styles
- 4 Be able to use and blend different styles in the process of garden design.

## Unit content

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**1 Understand historical garden styles and their influence on present day garden design**

*Historical influences:* to include Greek, Roman, Islamic, Renaissance (Italian and French), oriental

*Garden design style:* design concept, garden layout, use of hard and soft landscaping

**2 Understand modern garden design styles and the design skills of the designers who have created them**

*Modern garden design:* from the 1930s to the present day

*Design skills:* the designer's philosophy, design concept, and how designs are realised through the use of hard and soft landscaping

**3 Understand how trends in fashion, art and culture have influenced garden styles**

*Fashion:* the popular ideas of the time

*Art:* painting, sculpture, architecture, literature and poetry

*Culture:* shared values, beliefs, attitudes of the period

**4 Be able to use and blend different styles in the process of garden design.**

*Use:* creation of a reference compendium (digital or sketchbook) and moodboards of different styles and blends of style demonstrating how they can assist in the design process

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand historical garden styles and their influence in present day garden design	1.1 analyse historical garden styles according to the design concept, layout and hard and soft landscaping features  1.2 evaluate the impact of these styles on present day garden design
LO2 Understand modern garden design styles and the design skills of the designers who created them	2.1 analyse a range of modern garden design styles  2.2 examine the individual garden styles of contemporary influential garden designers
LO3 Understand how trends in fashion, art and culture have influenced garden styles	3.1 evaluate how trends in fashion, art and culture have influenced garden styles from the past to the present day  3.2 explain the influence of these factors on a given design
LO4 Be able to use and blend different styles in the process of garden design	4.1 justify the selection of appropriate garden styles  4.2 source a variety of appropriate images  4.3 create innovative mood boards  4.4 use and blend different styles imaginatively in the process of garden design

## Guidance

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### Links

This unit will help develop learners to appreciate garden style and introduce them to the skills and practices of the professional garden designer. It links with the following units in this qualification:

- *Unit 12: Garden Design Principles*
- *Unit 15: Hard Landscape Principles and Practice*
- *Unit 30: Business Environment*
- *Unit 44: Historical Influence in Garden Design*
- *Unit 45: Graphic Skills for Garden Designers.*

### Essential requirements

Learners need access to professional drawing equipment and materials including:

- a good quality drawing board, paper, and a range of drawing media such as pens, pencils, pastels and water colours
- access to a range of relevant books, DVDs and arranged garden visits.

### Employer engagement and vocational contexts

Learners would benefit from work study days in the design studios of local garden design practices to observe how designers use and blend garden styles within their drawings.

Delivery of the unit would be enhanced by day or weekend workshops led by guest professional designers who could bring samples of their own drawings as well as demonstrate how they create their own personal styles.

Learners should be encouraged to become student members of relevant professional organisations such as the Society of Garden Designers so they can benefit from events including workshops these organisations run.

## Unit 47: Advanced Garden Design

Unit code: T/503/1118

Level: 4

Credit value: 10

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- Aim

This unit aims to develop learner understanding of a wide range of garden design ideas including the use of 'specialism' within garden design.

- Unit abstract

This unit will give learners an understanding and appreciation of a wide range of garden design which will promote original thought processes and produce creative, aesthetic and functional garden design skills. Learners will be encouraged to experiment with garden design ideas to create their own 'specialism'/personal style and signature. Learners will also examine the role of specialism as a means of gaining recognition as a designer and at the particular role that specialism has in the marketplace.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to develop garden design ideas
- 2 Understand the development of design ideas
- 3 Be able to develop 'specialism' within garden design
- 4 Understand the role of specialism within garden design.

## Unit content

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### 1 Be able to develop garden design ideas

*Development:* development of original ideas through exploration of art, science and the media eg books, magazines, internet, collection visits

*Application:* application of design ideas adhering to design principles eg context, pattern, shape, scale, proportion, masses and voids, dynamics and appropriate choice of hard materials and plants

### 2 Understand the development of design ideas

*Development of garden design:* individual research into the work and styles of key recognised/international designers from concept stage to the final design and finish

*Design ideas:* concept layout; choice of hard materials and plants; garden features eg water, lighting, sculpture, furniture and others

### 3 Be able to develop 'specialism' within garden design

*'Specialism' development:* creation and pursuit of personal style/signature using design concepts, layout, choice of hard materials, choice of plants and planting style, art, sculptor and designed artefacts

### 4 Understand the role of specialism within garden design

*Role of specialism:* how designers have used specialism to market their work; establishment as an able designer and gain of recognition and prestige

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Be able to develop garden design ideas	1.1 use appropriate sources to explore design ideas 1.2 create innovative ideas for garden designs/personal design styles, to include function, materials and choice of location 1.3 develop design ideas from initial concept through to end product and finish 1.4 demonstrate adherence to design brief, schedule, deadline and budget 1.5 work individually and collaboratively when developing design ideas
LO2 Understand the development of design ideas	2.1 critically examine the design of a range of garden features 2.2 justify the choice of design 2.3 explain the development of a design idea from initial concept through to end product and finish
LO3 Be able to develop 'specialism' within garden design	3.1 develop a specialism within garden design. 3.2 demonstrate the integration of the specialism within a specific design
LO4 Understand the role of specialism in garden design	4.1 explain the role of specialism in the marketplace 4.2 analyse modern and future trends in garden design related to the specialism of your choice 4.3 evaluate the role played by other professional bodies in the marketplace linked to the chosen specialism

## Guidance

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### Links

This unit introduces learners to design ideas/specialism/personal style and how they are developed in the garden design process. The role of 'specialism' as a marketing tool is explored. The unit links with the following units in this qualification:

- *Unit 12: Garden Design Principles*
- *Unit 15: Hard Landscape Principles and Practice*
- *Unit 30: Business Environment*
- *Unit 44: Historical Influence in Garden Design.*

### Essential requirements

Learners should have opportunities to explore a wide range of original design ideas.

### Employer engagement and vocational contexts

Delivery of the unit would be enhanced by visits to art galleries/art colleges/science museums and exhibitions. Learners have opportunities to visit well-designed local gardens as well as 'show gardens' such as the Chelsea Flower Show. These visits will help learners to developing their own personal style/specialism.

Sustained links with professional garden design organisations may support other units as well as work placement opportunities.

Learners should be encouraged to become student members of related professional organisations such as the Society of Garden Designers and so they can from events including workshops these organisation runs.

## Unit 48: Landscape Design Process

Unit code: F/503/1123

Level: 5

Credit value: 15

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- Aim

This unit aims to develop learners understanding of the landscape design process. Learners will research inspirational and conceptual ideas to encourage and develop their design intentions.

- Unit abstract

In this unit enables learners will develop their design and presentation skills. They will learn how space can be manipulated to enhance the visual experience of a garden or landscape and how the use of planting materials, water and 3-dimensional art can create visual effects. Learners will also develop a range of graphic techniques which they can use to communicate their conceptual and design ideas effectively.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to demonstrate scale and spatial awareness in the landscape design process
- 2 Understand the use of water and sculpture in private and public spaces
- 3 Understand the use of plant mass to create spaces within landscape designs
- 4 Be able to use appropriate methods to communicate design ideas and atmosphere.

## Unit content

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### 1 Be able to demonstrate scale and spatial awareness in the landscape design process

*Design principles:* definition of scale and proportion; application of the principles of scale and proportion within a landscape; effect of the wider external landscape on scale and proportion; appropriate use of scale in landscape graphics – master plans, planting plans, construction detail plans

*Spatial awareness:* division of spaces; manipulating masses and voids; visual containment eg closed views, framed views, filtered views; focal points; vistas

*Steps in the design process:* materials and design; safety and accessibility; graphic presentation in 2– and 3– dimensional presentations

### 2 Understand the use of water and sculpture in private and public spaces

*Water features:* natural features eg ponds, streams; legal considerations when altering the flow of natural watercourses; formal water features; informal water features; wildlife ponds; raised ponds; slick pools; moving water eg rills, waterfalls, fountains; context and setting of water features

*Health and safety:* public safety; safety implications of power supplies; environmental impact of water features

*Sculpture:* styles; context and setting; permanent and temporary exhibition; sculpture gardens; public safety; security

### 3 Understand the use of plant mass to create spaces within landscape designs

*Planting philosophy:* context and mood; plant layers; formal plantings; informal plantings; naturalistic plantings; changes over time

*Enclosure of space:* plant density; plant form; effect of seasonality

*Plant function:* ornamental groups; specimen plants; functional plantings eg manipulation of desire lines

*Practical considerations:* site; soil; climate; microclimate; poisonous and dangerous plants

### 4 Be able to use appropriate methods to communicate design ideas and atmosphere

*Methods of communicating ideas:* concept drawings; plan views – master plan, planting plan, hard landscaping detail plans; elevations and cross sections; 3-dimensional projections; photomontages

*Graphic and technical skills:* drawing techniques; using computer-aided design (CAD); choice of appropriate scales; use of symbols for hard and soft landscaping; lettering form and style; paper sizes; layouts; colouring techniques

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Be able to demonstrate scale and spatial awareness in the landscape design process	1.1 plan designs of an appropriate scale 1.2 demonstrate appropriate use of scale and spatial awareness in a landscape design 1.3 incorporate steps into a landscape design: <ul style="list-style-type: none"> <li>• specify materials</li> <li>• address safety/accessibility issues</li> <li>• produce drawings in 2- and 3- dimensions</li> </ul> 1.4 prepare appropriate construction drawings for a flight of steps
LO2 Understand the use of water and sculptures in private and public spaces	2.1 examine the use of water features in landscape design 2.2 review the use of sculptures in landscape design 2.3 explain health and safety measures incorporated in design 2.4 justify the use of design features selected
LO3 Understand the use of plant mass to create spaces within landscape designs	3.1 examine the use of trees and shrubs to create outdoor spaces in landscape designs 3.2 justify the use of trees and shrubs as structural materials in landscape designs 3.3 examine the use of plants to create outdoor spaces in landscape designs
LO4 Be able to use appropriate methods to communicate design ideas and atmosphere	4.1 demonstrate appropriate use of graphic and technical skills: <ul style="list-style-type: none"> <li>• selection of appropriate skills</li> <li>• valid choice of scales</li> <li>• correct use of symbols, lettering and style</li> <li>• appropriate paper size</li> </ul> 4.2 produce cross sections, elevations and 3-dimensional projections 4.3 use colour in designs created effectively

## Guidance

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### Links

This unit links with the following units:

- *Unit 12: Garden Design Principles*
- *Unit 15: Hard Landscape Principles and Practice*
- *Unit 49: Planting Design.*

This unit also links with the Horticulture National Occupational Standards:

- CU85: Design landscape areas and specify materials and components
- CU91: Assess the characteristics of sites.

### Essential requirements

Learners need access to a drawing studio equipped with drawing boards, graphical equipment, printing facilities and CAD.

Appropriate textbooks and journals on the topic of landscape design, both in the UK and abroad, must be available for learners.

### Employer engagement and vocational contexts

Learners will benefit from links with design practices and professional designers. Every opportunity should be taken to visit designed landscapes to explore how the various components and features have been used in practice. Visits to 'live' sites, where there may be an opportunity to speak with designers and contractors, will be especially instructive. Learners will also benefit from discussing their own work with professional designers who could be invited as guest speakers.

Learners should be encouraged to attend seminars, conferences and shows relating to landscape and garden design to keep up to date with the latest developments within the sector.

## Unit 49: Planting Design

Unit code: L/503/1125

Level: 4

Credit value: 15

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- Aim

This unit aims to develop learner understanding of the principles of planting design. Learners will carry out practical management of the planning the plant selection and design attributes of plants and consider how to use them to the best effect.

- Unit abstract

In this unit will allow learners to develop their plant knowledge and design skills. Learners will develop their ideas on the use of plants for design, studying form, texture, colour and habit.

The unit also covers at the roles and characteristics of plants. Learners will build on their knowledge to understand how site conditions and location affect planting and how to ensure their designs are successful.

With this knowledge will be able to supervisor others, select appropriate plants and apply design principles to their selection in a range conditions and locations. Learners will prepare and manage professional planting plans and communicate effectively with their clients.

Learners will prepare professional plant schedules and specifications linked to their planting plans, including full costings, relevant information and the correct use of nomenclature.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the use of plant form, texture, colour and habit in planting design
- 2 Understand roles played by plants
- 3 Be able to manage the preparation of professional planting plans
- 4 Be able to manage the production of professional plant schedules and specifications.

## Unit content

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### 1 Understand the use of plant form, texture, colour and habit in planting design

*Plant form:* trees; shrubs; conifers; climbers; herbaceous plants

*Textures:* coarse; medium; fine

*Colour:* colour wheel; emotional response; colour schemes; harmonising; contrasting; antagonistic

*Habit:* size; shape; orientation; unity; justification of selection

### 2 Understand roles played by plants

*Characteristics of plants:* roles; site conditions; location eg urban, suburban, rural, coastal; public; private; commercial; domestic

*Roles:* structural; ornamental; ground cover; focal point; functional planting

### 3 Be able to manage the preparation of professional planting plans

*Preparation:* supervising other professionals eg staff, contractors, suppliers, surveyors

*Selecting appropriate plants:* soil; aspect; use; function; correct use of nomenclature

*Apply design principles to plant selection:* unity; harmony; contrast; form; texture; colour; planting distances

*Communication to client:* eg graphics, notations, elevation, sketches, pictures, photographs, planting plan

### 4 Be able to manage the production of professional plant schedules and specifications

*Specifications:* detailed; full costing; plants; trees; shrubs; herbaceous plants; correct use of nomenclature

*Schedule:* detailed; full costing; specifications; correct use of nomenclature; quantities; specific information/remarks

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand the use of plant form, texture, colour and habit in planting design	1.1 select appropriate plants that show unity, harmony and contrast of form, texture, colour and habit 1.2 explain how form, texture, colour and habit show unity, harmony and contrast 1.3 justify the selection of plants in given designs
LO2 Understand roles played by plants	2.1 manage the selection of plants which have characteristics appropriate for: <ul style="list-style-type: none"> <li>• the role</li> <li>• the site conditions</li> <li>• the location</li> </ul> 2.2 discuss the structural, ornamental, ground cover, focal point and functional use of selected plants
LO3 Be able to manage the preparation of professional planting plans	3.1 supervise others in the preparation of professional planting plans covering: <ul style="list-style-type: none"> <li>• selection of correct scale</li> <li>• use of appropriate planting distances</li> <li>• compliance with up-to-date nomenclature</li> <li>• demonstration of design principles</li> <li>• communication of plan visually to the client</li> </ul>
LO4 Be able to manage the production of professional plant schedules and specifications	4.1 produce a detailed, fully costed specification for trees, shrubs and herbaceous plants 4.2 produce a detailed plant schedule

## Guidance

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### Links

This unit develops understanding of plant selection and establishment and links with the following units in this qualification:

- *Unit 7: Plant Environmental Adaptation and Physiology*
- *Unit 8: Plant Selection and Establishment*
- *Unit 16: Public Horticulture*
- *Unit 19: Plant Health and Environmental Relationships*
- *Unit 23: Management of Historic Parks and Gardens*
- *Unit 44: Historical Influence in Garden Design.*

### Essential requirements

Learners need access to a wide range of plant textbooks, journals and magazines to keep up to date with current issues and trends in the sector.

Practical drawing exercises, outside and inside, should be used to reinforce planting design principles, as well as examples of plans, planting specifications and schedules.

It is important for learners to have access to grounds and gardens to relate theory to practice. By linking units, learners will experience working with plants first hand and develop their understanding of the unit.

### Employer engagement and vocational contexts

Delivery of this unit would be enhanced through employer engagement, for example visits to a variety of parks and gardens where learners could study the use of a wide range of plants. Links with employers may support other units as well as work placement opportunities.

Guest speakers from local garden design companies could give learners first-hand information and share examples of their work.

## Unit 50: Contract Documentation and Management for Land-based Industries

Unit code: Y/503/1127

Level: 5

Credit value: 15

### ● Aim

This unit aims to develop learner understanding of the process of preparing contract documentation. It follows the industry standard model and learners will develop skills in initiating and overseeing tendering and the construction process.

### ● Unit abstract

An understanding of contract documentation and management for land-based industries is essential for anyone considering a career within this area. In this unit learners will develop an understanding of the importance of the process and procedures involved in contracting and tendering, and also of the documentation required within a land-based setting.

Learners will gain a clear understanding of the contract/tendering process and of the roles which are involved including the client/contractor relationship within land-based projects and the role and implementation of policies and systems in their own workplace. The importance of record keeping, monitoring and reviewing health and safety policies and procedures will also be considered. Learners will have the opportunity to prepare contract documentation for all stages of land-based project work, from both a client and contractor perspective which will include industry standard and quality control management and implementation.

This unit should be contextualised, where possible, to an appropriate setting relevant to learners' interests within the land-based sector.

### ● Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand types of contract and the associated documentation required for land-based projects
- 2 Understand how works are specified in contracts
- 3 Understand provisions of the contract documents required for land-based projects
- 4 Be able to apply the contract documents to all stages of land-based project work.

## Unit content

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### 1 Understand types of contract and the associated documentation required for land-based projects

*Types of contract common in land-based industries:* management contracts; cost plus; approximate quantities; lump sum; design build; package deals; relative impacts of contract types within land-based sector

*Contract documentation:* schedule of works; specification; preliminaries; bills of quantities; schedules of rates; conditions of contract; standard form of agreement; letter of invitation; instructions to tenderers; form of tender; variation orders; interim certificates; final certificates; plans and drawings; application of documents in given land-based scenarios

### 2 Understand how works are specified in contracts

*Specification:* passing to the contractor information on quality and type of materials; standards of workmanship; use of drawings; clarity of wording; correct use of technical language; British and European Standards; Common Arrangement of Work Sections (CAWS); governing and professional body guidance; budget and financial constraints

*Preliminaries:* general definitions; health and safety; working rules and general organisation of the contract; sheds; storage; general standards of work and behaviour; insurance; disposal of waste; access; programme of work; supervision; nominated contractors and suppliers; notices and fees

*Work breakdown structure document (WBSD):* nature and design of flow progress or activity charts; resource levels; client quality assurance procedure; timescales; cost control methodology

*Legislation and associated bodies:* current relevant legislation and codes of practice eg law of tort and law of contract, Health and Safety at Work Act 1974, Food and Environment Protection Act (FEPA) 1985, Control of Substances Hazardous to Health (COSHH), Provision and Use of Work Equipment Regulations (PUWER) 1998, Construction (Design and Management) (CDM) Regulations 1994, Town and Country Planning Act 1990; risk assessment; role of the Health and Safety Executive; building regulations; role of the planning department of the local authority; Highways Act 1980; listed buildings

### 3 Understand provisions of the contract documents required for land-based projects

*Construction projects:* client brief; investigation stage; design stage; production of documentation and estimates; tender stage; selection of contractors; awarding of contract; construction; practical completion and handover; defects liability; maintenance; final certification; potential disputes (scenarios, rise, resolution)

*Maintenance projects:* assess demand; policies and standards; financial constraints; preparation of documents; tender stage; selection of contractors; award contract; maintenance stage and payments; review of contract; renewal/re-tender of contract; potential disputes (scenarios, rise, resolution)

**4 Be able to apply the contract documents to all stages of land-based project work**

*Standard process:* to contract out work, advertising media for the invitation to tender

*Contracting and tendering:* legal implications; identification of initial decision to tender; identification of standard documents and plans; selection of suitable tenders; process of awarding contract

*Monitoring:* definition of work plan and monitoring process

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand types of contract and the associated documentation required for land-based projects	1.1 examine the impact of common types of contract used in a land-based industry  1.2 explain the application of contract documents used in a land-based industry  1.2 explain the relationship between contract documents relevant to a given work-related scenario
LO2 Understand how works are specified in contracts	2.1 review the standards and quality of specification writing within a land-based sector  2.2 explain the use of work breakdown structure in a selected contract  2.3 discuss clause content of a specification for major work sections  2.4 discuss the importance of legislation and associated bodies relevant to contract documentation
LO3 Understand provisions of the contract documents required for land-based projects	3.1 compare the purpose and use of different contract documents  3.2 analyse the relationship of different contract documents  3.3 explain stages of tendering related to a given work-related scenario  3.3 explain how disputes arise and how they can be resolved
LO4 Be able to apply the contract documents to all stages of land-based project work	4.1 prepare a complete specification for a given land-based project  4.2 produce valid specification clauses to communicate design information to members of the project team  4.3 prepare a work plan which can be used for contract monitoring

## Guidance

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### Links

This unit links with *Unit 17: Landscape and Garden Maintenance*, *Unit 57: Golf Course Planning* and *Unit 53: Construction and Maintenance of Sports Turf Surfaces*.

### Essential requirements

Learners require access to IT and internet facilities and library resources including trade magazines. Learners need an opportunity to use real contract documentation which should ideally be linked to visits and guest speakers.

### Employer engagement and vocational contexts

There should be liaison with local authorities and contractors – they could supply guest speakers. Where possible, this unit should be linked to live projects and visits should be arranged to both construction and maintenance contracts.

It is anticipated that centres will have contact with local authorities within their area and also with local contractors. Governing and professional bodies within the chosen land-based sector should be contacted to recommend speakers and experts from within the local area.



## Unit 51: Principles of Ecology

Unit code: M/503/1215

Level: 4

Credit value: 15

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- Aim

The aim of this unit is for learners to understand concepts that underpin all aspects of environmental work, from the commercial exploitation of individual species to the management of whole habitats. The mechanisms of evolution and the implications of this are considered and applied throughout delivery of the unit.

- Unit abstract

In this unit learners will develop an understanding of the essential background of evolution that forms the framework for all modern biology. Learners can apply their understanding to the interrelationships between living organisms and their environments. The factors controlling the distribution of and changes in populations are also considered and related to habitat formation and management.

Learners will have the opportunity to investigate a range of different habitat types practically and use their understanding to predict how these may change. They will also evaluate the techniques used to manage a range of ecosystems.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the mechanisms and ecological implications of evolution
- 2 Understand factors affecting the distribution of populations
- 3 Understand mechanisms governing fluctuations and stability within populations
- 4 Be able to predict temporal changes in plant and animal communities in named terrestrial and aquatic ecosystems.

## Unit content

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### 1 Understand the mechanisms and ecological implications of evolution

*Mechanisms:* natural selection (progressive/directional); stabilising; selection pressure; other kinds of selection eg species, group, kin, sexual, individual, artificial; alternative explanations of the evidence for evolution eg punctuated equilibrium, selfish gene theory

*Ecological implications:* adaptations (anatomical, physiological, morphological and behavioural); speciation; optimality and evolutionary stable strategies; coevolution; symbiotic relationships; species extinction; genetic extinction; population genetics; biodiversity; symbiotic relationships (parasitism, commensalism, mutualism)

### 2 Understand factors affecting the distribution of populations

*Distribution:* geographic; zonation; regular; random; clumped; temporal eg diurnal, crepuscular and nocturnal communities

*Factors:* competition; predation; tolerance of abiotic environments eg stenotopic and eurytopic organisms; acclimation; dormancy; adaptation; physiological and behavioural homeostasis; historical eg evidence of geographical changes – pollen record, geology, fossil record; human eg disruption of migratory paths, culling, hunting, breeding programmes, predator control, introductions; dispersal eg limited or developed powers of dispersal

### 3 Understand mechanisms governing fluctuations and stability within populations

*Dynamics:* life tables; age distributions; demographics; geometric and logistic growth curves; carrying capacity;  $r$  selection;  $K$  selection

*Mechanisms:* climate and seasonality; productivity and energy relationships; biological rhythms; symbiosis; predation; competition; reproductive value; natural regulation eg density dependent and independent factors

### 4 Be able to predict temporal changes in plant and animal communities in named terrestrial and aquatic ecosystems

*Temporal changes:* investigation of a range of communities and the successional stages observed; primary and secondary succession; late successional; arrested; sub-climax; climax

*Explanatory mechanisms for temporal changes:* facilitation model; inhibition model; tolerance model

*Manipulation of ecosystems:* drainage; flooding; burning; grazing; species introduction

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Understand the mechanisms and ecological implications of evolution	1.1 explain the mechanisms of evolution in a given context 1.2 evaluate how organisms adapt to their environment 1.3 evaluate the importance of population genetics in the conservation of biodiversity
LO2 Understand factors affecting the distribution of populations	2.1 explain the distribution of named plant and animal species and populations 2.2 explain the factors influencing the distribution of named plant and animal species
LO3 Understand mechanisms governing fluctuations and stability within populations	3.1 examine the population dynamics of named populations 3.2 analyse the factors influencing the numbers and demographics of named populations
LO4 Be able to predict temporal changes in plant and animal communities in named terrestrial and aquatic ecosystems	4.1 examine climax and sub-climax communities in given terrestrial and aquatic ecosystems 4.2 predict temporal changes in named communities 4.3 recommend valid strategies to manage named sub-climax communities

## Guidance

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### Links

An understanding and appreciation of ecology is key to recognising why governments need to follow a more sustainable path to development. This unit links with *Unit 32: Sustainable Development*, and also with broader government and international policies and protocols.

### Essential requirements

Learners must have access to a range of habitats to investigate and contrast, in particular, study visits will enable more detailed investigations.

In addition, equipment for monitoring populations of both plants and animals should be available for learners to use.

Learners will need access to library resources, and a number of multimedia resources should be available to support ecological study.

### Employer engagement and vocational contexts

Learners could be introduced to a variety of professionals for example ecologists, country and park rangers, gamekeepers etc, either as guest speakers or on off-site visits to different establishments. This will broaden their depth of knowledge, enhance and contextualise their learning experience. Relating the unit content to the work of organisations such as wildlife trusts (the County Trusts in England and Wales and the Scottish Wildlife Trust), the Royal Society for the Protection of Birds (RSPB) and the Worldwide Fund for Nature (WWF) will strengthen the vocational relevance.

Visits to museums with a broad range of natural history specimens would promote a greater understanding of evolution and biodiversity and would introduce learners to heritage-based professions.

## Unit 52: Quality and Performance Standards for Turf

Unit code: Y/503/1130

Level: 5

Credit value: 15

- Aim

The aim of this unit is to develop learner understanding of the range and complexity of current, accepted methodology relating to turf quality and performance standards.

- Unit abstract

Turf, especially sports pitches needs to be constructed to a minimum quality standard so it can survive and flourish when used for sport or on a recreational ground. A consortium was established to set these standards – the Sports Turf Research Institute, the National Playing Fields Association and the Institute of Groundsmanship. Learners will explore the recommended standards which are the minimum for the construction and maintenance of natural grass pitches. They will consider how and why recommendations for grass cover, weed coverage, surface and drainage are used. It is recognised that performance and quality standards need to be developed for the future and learners will investigate this. This is an important area of sports horticulture and organisations such as the Football Association use these standards to improve and regenerate over 1000 pitches and fields across the UK since 2003. Other organisations that use these quality recommendations include golf clubs, football clubs and rugby grounds.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the historical rationale behind turf quality and performance standards
- 2 Understand turf quality and performance standards
- 3 Understand the methodology involved in measuring quality and performance of natural turf surfaces
- 4 Be able to investigate quality and performance for natural turf surfaces.

## Unit content

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### 1 Understand the historical rationale behind turf quality and performance standards

*Standards:* the need for performance and quality standards; historical development; national and international recognition; organisations involved in developing standards; organisations that follow the standards; social benefits eg social inclusion, community involvement, community safety, healthy living

### 2 Understand turf quality and performance standards

*Current Standards:* for a range of turf surfaces eg rugby pitches, football pitches, golf courses; measurable limits for performance and quality eg sward height, hardness, water infiltration, evenness, slope and ground cover; relationship with maintenance operations

### 3 Understand the methodology involved in measuring quality and performance of natural turf surfaces

*Equipment:* range available; specification for equipment use

*Data:* relationship of data/results to environmental factors, recording techniques, mapping techniques; reporting data eg to governing bodies eg the FA's regional facility development managers, the RFU's rugby development managers; mapping results

### 4 Be able to investigate quality and performance for natural turf surfaces

*Investigation:* testing equipment; set-up and operation; data recording; recommendations; action planning eg quality and performance improvement, maintenance, future use, links to local authority, links to Sport England, local strategic partnerships

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand the historical rationale behind turf quality and performance standards	1.1 explain the need for performance and quality standards for turf related to selected sports sites  1.2 examine the development of recognised national and international quality and performance standards for turf
LO2 Understand turf quality and performance standards	2.1 examine the standards required for a range of turf surfaces  2.2 explain the use of measurable standards that apply to turf surfaces in relation to selected sites  2.3 evaluate turf quality in given sites
LO3 Understand the methodology involved in measuring quality and performance of natural turf surfaces	3.1 evaluate the range of equipment available for testing sports turf surfaces  3.2 explain the methodology of recording data relating to quality and performance  3.3 explain how results are mapped and conclusions relating to quality and performance are determined
LO4 Be able to investigate quality and performance for natural turf surfaces	4.1 demonstrate the use of testing equipment on a sports turf surface  4.2 record data about the quality and performance of the turf surface  4.3 make justified recommendations to maintain that quality and performance  4.4 plan to maintain and/or improve the quality and performance of the turf surface

## Guidance

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### Links

This unit can be linked to a number of units within this qualification. Other units that have a common theme or also cover ideas in this unit are *Unit 1: Principles of Plant and Soil Science*, *Unit 2: Work-based Experience* (a work experience placement at a sports ground), *Unit 3: Project Management for Land based Industries* (taking part in a Sport England project or similar),

**Unit 33: Research Methods for Land-based Industries** (investigation into turf mixes etc), *Unit 22: Golf Course Design Principles*, *Unit 53: Design and Construction of Sports Turf Surfaces*, *Unit 54: Mechanisation Management – Turf* and *Unit 57: Golf Course Planning*.

### Essential requirements

Learners should have access to sufficient library resources for example, soil science and groundsmanship textbooks. It is essential that learners can relate the concepts learned to practice. Theory sessions must be backed up by practical work in sports grounds and parks, and professional and community sports clubs with grounds keeping staff, where appropriate. It is not sufficient to spend an afternoon on a field trip. Facilities should be available for the duration of the investigation. Practical work must be carried out in appropriately equipped environments for example with soil-testing facilities, data-logging equipment and equipment for the study of turf characteristics.

### Employer engagement and vocational contexts

Learners would benefit from access to a working environment. This can be achieved by creating links with local businesses or charitable organisations who may even benefit from taking on learners. Local sports clubs and community projects are great sources of information and are often keen to share their knowledge. Business education alliances can also be useful and charitable organisations can often provide guest speakers to give lectures as well as demonstrations for example, Sport England.

## Unit 53: Construction and Maintenance of Sports Turf Surfaces

Unit code: K/503/1262

Level: 4

Credit value: 15

- Aim

This unit introduces learners to the range and complexity of sports turf surfaces. Learners will develop sufficient understanding and experience to become involved in managing this provision.

- Unit abstract

This unit focuses on the construction and maintenance of a broad range of sports turf surfaces. Learners will investigate the relationship between the requirements of a variety of sporting activities and the specification of surface construction and maintenance. Learners will prepare comprehensive turf maintenance programmes for a variety of playing surfaces including resource requirements and costs.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand types of turf surfaces
- 2 Understand construction specifications for natural turf surfaces
- 3 Understand drainage systems available for sports turf surfaces
- 4 Be able to prepare sports turf surface maintenance regimes.

## Unit content

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### 1 Understand types of turf surfaces

*Definition of types of turf surfaces:* winter sports; summer sports; physical requirements of winter and summer sports surfaces; integration of winter and summer sports surfaces

*Turf surfaces:* physical characteristics; uses; suitable grass species eg *Lolium perenne*, *Agrostis* spp., *Festuca rubra rubra*, *Festuca rubra commutata*, *Poa pratensis* and *Phleum pratense*; mixtures for fine turf, high quality coarse turf and hard wearing mixes

*Intended use of turf surfaces:* proposed level of competition eg professional, junior, mixed ability; frequency of use; availability of resources for construction and maintenance eg physical, financial, management; impact of local sporting traditions eg stall ball and other regional sports

### 2 Understand construction specifications for natural turf surfaces

*Range of surfaces:* winter sports; summer sports; effect of the intended level of competition; effects of physical constraints on construction eg climate, topography, soil type; effects of financial constraints eg capital costs, maintenance costs

*Construction specifications:* nature of materials used; dimension of construction layers; cost of raw materials; construction costs; cost benefits in relation to intended level and frequency of use; managing environmental impacts of construction

### 3 Understand drainage systems available for sports turf surfaces

*Construction:* system patterns and designs; relation of system patterns and designs to the demands of surface dynamics; effect of physical conditions on design eg soil type, topography, climate; materials used for drainage systems; relative dimensions of materials used for drainage systems

*Calculation for drainage:* required response; depth of drains; fall of drains; spacing of drains; pipe size; improvement or replacement costs; cost benefit of replacement or improvement

### 4 Be able to prepare sports turf surface maintenance regimes

*Maintenance regimes:* winter sports; summer sports; demands of the user and the surface in relation to maintenance requirements; maintenance costs; effects of inadequate maintenance on turf surfaces

*Capital bid:* range of machinery and equipment; capital costs; related costs eg staff training; financial protocols eg budgeted and non-budgeted bids, approved suppliers

## Learning outcomes and assessment criteria

Learning outcomes <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass <b>The learner can:</b>
LO1 Understand types of turf surfaces	1.1 compare the different types of natural turf surface 1.2 examine the characteristics of fine turf surfaces 1.3 explain how the type of surface relates to the intended use of the surface
LO2 Understand construction specifications for natural turf surfaces	2.1 examine construction specifications for a range of natural turf surfaces 2.2 evaluate the materials needed for the construction of a new specified sports turf surface
LO3 Understand drainage systems available for sports turf surfaces	3.1 evaluate the range of drainage systems available for use on turf surfaces 3.2 examine the drainage spacing, pipe size and cost for replacement/improvement of the drainage system for an existing sports turf surface
LO4 Be able to prepare sports turf surface maintenance regimes	4.1 prepare 12-month maintenance requirements for a range of sports turf surfaces 4.2 prepare a capital purchase bid outlining the machinery and equipment required for a specified sports turf surface maintenance regime

## Guidance

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### Links

This unit links with the following units in this qualification:

- *Unit 22: Golf Course Design Principles*
- *Unit 52: Quality and Performance Standards for Turf*
- *Unit 54: Mechanisation Management – Turf.*

### Essential requirements

To fully benefit from this unit, learners will need to understand of the principles and practices of professional turf care. Learners should have access to up-to-date information on the construction and care of sports turf surfaces. This should include promotional literature and machine operation manuals, reviews such as those available in the relevant trade and professional journals and texts on the full range of sports turf surface construction and maintenance techniques. Learners also need access to a variety of turf surfaces for winter and summer sports designed to be used at different levels of competition.

### Employer engagement and vocational contexts

Learners are required to base their work within an industrial context and delivery of this unit would be enhanced by the engagement and cooperation of turf care professionals. Visits to sports facilities, trade shows and manufacturers of and dealers in turf care equipment will enable learners to investigate the range of techniques and equipment available to the turf maintenance industry.

Learners will also benefit from links with professional bodies such as the Institute of Groundmanship (IoG) and the British and International Golf Greenkeepers' Association (BIGGA).

## Unit 54: Mechanisation Management – Turf

Unit code: H/503/1132

Level: 4

Credit value: 10

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- Aim

This unit introduces learners to the range of machinery available to the sports turf industry. Learners will evaluate the machinery and make an informed selection to meet the requirements of a range of turf care operations.

- Unit abstract

In a highly mechanised industry, the selection of appropriate, cost effective equipment is an important part of the management role. In this unit learners will make informed choices when evaluating and selecting turf maintenance machinery. Learners will explore the mechanical principals of engines and power units and evaluate a variety of power units and power transfer systems. They will compare a range of ride-on, pedestrian and hand-held powered equipment focusing on the technical and financial aspects of the evaluation and selection processes.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to report on tractors and machinery
- 2 Understand capital purchase bidding
- 3 Understand mechanical principles of machinery.

## Unit content

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### 1 Be able to report on tractors and machinery

*Range of tractors and power units:* classification and applications eg 4 wheeled, 2 wheeled, mini-tractors, ride-on equipment; power ratings

*Range of machinery:* pedestrian-controlled machinery; hand-held machinery

*Suitability for use:* suitability for turf maintenance operations, primary and secondary uses; legal and regulatory requirements governing choice of equipment; health, safety and environmental implications; operative training implications

*Costs:* capital costs; running and maintenance costs; depreciation; cost effectiveness

### 2 Understand capital purchase bidding

*Financial packages:* sources of finance; evaluation of available financial packages; suitability of respective packages over the range of machinery

*Capital purchase bid:* roles and responsibilities of a finance committee; financial protocols eg budgeted and non-budgeted bids, approved suppliers; relevant documentation eg product specifications, cost/benefit analyses, purchasing orders and contracts

### 3 Understand mechanical principles of machinery

*Types of power unit:* mechanical operating principles of 2-stroke, 4-stroke and diesel engines, advantages and constraints of each; cooling systems; lubrication systems

*Power transmission systems:* range of transmission systems; appropriate application of each system; bearings; clutches; drive shafts

*Associated systems:* power systems eg electrical, hydraulic and compressed air systems

*Control systems:* steering and manoeuvring systems; braking systems; wheel and tyres for use on grass and non-grass surfaces

*Operator systems:* health and safety features; operator comfort eg vibration reduction; lights

## Learning outcomes and assessment criteria

Learning outcomes  On successful completion of this unit a learner will:	Assessment criteria for pass  The learner can:
LO1 Be able to report on tractors and machinery	1.1 compare the range of pedestrian and hand-held machinery available for turf maintenance 1.2 compare the range of tractors and power units available for turf maintenance 1.3 research costs and financial packages for machinery and equipment for a given situation 1.4 evaluate the range of machinery and equipment both in terms of cost and suitability
LO2 Understand capital purchase bidding	2.1 justify recommendations for purchase based on research 2.2 evaluate given capital purchase bids
LO3 Understand mechanical principles of machinery	3.1 examine the mechanical principles of petrol and diesel engines 3.2 assess the range of engine types, power ranges and power transfer systems available for turf maintenance machinery

## Guidance

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### Links

This unit links with the following units in this qualification:

- *Unit 11: Horticultural Technology*
- *Unit 53: Construction and Maintenance of Sports Turf Surfaces.*

### Essential requirements

To benefit fully from this unit, learners needed to understand of the principles and practices of professional turf care. Learners should have access to up-to-date information on the full range of powered turf-care equipment. This should include company promotional literature, machine operation manuals and trade reviews such as those available in the relevant trade and professional journals.

Practical experience of operating of powered turf care equipment and access to workshop facilities are also desirable.

### Employer engagement and vocational contexts

Learners are required to base their work in an industrial context and delivery of this unit would be enhanced by the engagement and cooperation of turf-care professionals. Visits to manufacturers, dealerships and trade shows will enable learners to investigate the range of machinery available to the turf maintenance industry. Site visits to inspect different turf maintenance operations will also enable learners to discuss the machinery requirements and preferences with professionals.

Learners will also benefit from links with professional bodies such as the Institute of Groundmanship (IoG) and the British and International Golf Greenkeepers' Association (BIGGA).

## Unit 55: Grassland Management

Unit code: K/503/1133

Level: 4

Credit value: 15

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- Aim

This unit aims to develop knowledge of how to assess the suitability of grassland for different uses and improve any inadequacies. The unit also gives learners an overview of forage production and the routine maintenance of grassland.

- Unit abstract

This unit focuses on the management of grassland, one of the prime components of the British landscape. Learners will learn how to identify and assess different types of grassland, evaluate their potential and make recommendations for their improvement. They will also explore practical aspects of grassland management and improvement and investigate the production of forage crops.

This unit will be of particular interest to learners working within the heritage and conservation sectors where grazing is the preferred grassland management technique.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the contribution of different plant species in a variety of sward types
- 2 Understand factors contributing to sward quality
- 3 Be able to improve grassland quality
- 4 Understand techniques used in producing conserved forages suitable for a selected animal species.

## Unit content

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### 1 Understand the contribution of different plant species in a variety of sward types

*Plants and plant communities:* different sward types eg permanent, temporary, ley; desirable and undesirable plants; field identification of grasses and forbs

*Pattern of grass growth:* seasonality; environmental influences on growth patterns; implications of growth patterns on forage production

*Seed mixtures:* composition; factors influencing the choice of seed mixture eg intended use, soil type, climate, local ecology; seed provenance

### 2 Understand factors contributing to sward quality

*Soil properties:* soil texture; soil structure; organic matter content; pH and nutrient status; drainage potential; field techniques for assessing soil properties

*Age of grasses:* structural alterations occurring as grass matures; grass digestibility and nutrient content

*Stocking rates and densities:* for different swards; for different animal species; impact of different animal species eg defecating habits, grazing habits; reasons for adjusting rates and densities; environmental impacts

### 3 Be able to improve grassland quality

*Evaluation of swards:* sampling techniques eg sward density, soil texture, soil nutrient status; conditions leading to deterioration; methods to calculate sward productivity

*Sward improvement:* implications of renovation, rejuvenation or replacement of swards; methods for improving soil nutrient status and drainage potential; costs of improvement, environmental impacts of improvement; legislative constraints eg Sites of Special Scientific Interest, heritage sites

*Fertiliser use:* planning fertiliser programmes; cost/benefit of fertiliser use; types of fertilisers; application techniques; timing of applications; environmental and sustainability considerations of fertiliser use

*Drainage:* need for drainage, methods determining drainage requirements; suitability of drainage systems eg mole drains, pipe drains, ditches; cost/benefit of drainage; drainage management planning; environmental impact of drainage operations

*Pasture management programme:* objectives of sward management; management techniques eg zero grazing, rotation, use of electric fencing; assessing the environmental impact of programmes

**4 Understand techniques used in producing conserved forages suitable for a selected animal species**

*Comparison of forages:* types of forage eg hay, silage; evaluation of types eg nutrient values, cost/benefits, storage potential

*Production methods:* techniques and equipment; production costs; environmental impacts

*Factors affecting forage quality:* nutrient losses during production; storage potential

## Learning outcomes and assessment criteria

Learning outcomes  On successful completion of this unit a learner will:	Assessment criteria for pass  The learner can:
LO1 Understand the contribution of different plant species in a variety of sward types	1.1 compare different sward types 1.2 categorise key plant species identified 1.3 differentiate between desirable and undesirable plants 1.4 explain the pattern of grass growth throughout the year 1.5 explain the use of specific seed mixtures for different situations
LO2 Understand factors contributing to sward quality	2.1 evaluate the influence of soil on sward quality 2.2 examine the structural changes that take place in plants as they mature 2.3 examine the nutrient value and digestibility of grass at different stages of growth 2.4 compare stocking densities with reference to different animal species and sward condition 2.5 explain the effects that grazing animals have on grassland condition
LO3 Be able to improve grassland quality	3.1 evaluate the condition of a given sward 3.2 propose a plan of improvement including soil analysis, fertiliser and drainage requirements 3.3 assess financial and environmental implications of action 3.4 assess any limitations imposed by current legislation 3.5 plan a grazing management programme
LO4 Understand techniques used in producing conserved forages suitable for a selected animal species	4.1 discuss the relative merits of producing different forage types 4.2 explain the production of common forages for a selected animal species 4.3 determine the costs involved in forage production

## Guidance

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### Links

This unit links with the following units in this qualification:

- *Unit 1: Principles of Plant and Soil Science*
- *Unit 23: Management of Historic Parks and Gardens.*

### Essential requirements

Learners need access to different sites where forage is produced to compare different sward types and qualities, and to understand the practical implications of sward management and improvement operations.

In order to carry out practical activities, learners will need access to equipment to assess sward density, plant species, soil texture, drainage potential and soil pH.

Learners should have access to relevant, up-to-date texts, journals, papers and legislation relating to grassland improvement, management and conservation.

### Employer engagement and vocational contexts

Learners will gain most from this unit where the centre has established links with people and organisations responsible for the management of different swards under different regimes. Managers could include local graziers, smallholders, managers or owners of country estates, urban farms and national organisations such as the National Trust.

Learners will also benefit from links with professional organisations such as the National Farmers Union, the British Grassland Society and the local smallholders association.



## Unit 56: Non-Grass Playing Surfaces

Unit code: T/503/1135

Level: 5

Credit value: 15

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- **Aim**

This unit aims to develop learner understanding of the range and complexity of non-grass sports surface facilities.

- **Unit abstract**

Non-grass playing surfaces provide quality playing surfaces for a range of sports. In this unit learners will learn about the range and complexity of these types of surfaces and their use. The effectiveness of these surfaces depends on planning and developing suitable maintenance programmes and can only be achieved if managers, supervisors and grounds staff have detailed knowledge of the construction and maintenance requirements of artificial sports surfaces. Learners will evaluate the value of these surfaces compared to traditional grass ones and, therefore, to consider the advantages and disadvantages of these sports surfaces in relation to cost, maintenance regimes and life expectancy.

- **Learning outcomes**

**On successful completion of this unit a learner will:**

- 1 Understand the range of artificial surfaces available for sport
- 2 Understand the construction specifications for a range of artificial surfaces
- 3 Understand advantages and disadvantages of synthetic sports surfaces
- 4 Understand the performance standards of artificial surfaces with those for natural turf surfaces.

## Unit content

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### 1 Understand the range of artificial surfaces available for sport

*Range:* outdoor sports surfaces, indoor sports surfaces

*Sports facilities:* football; cricket; hockey; bowls; tennis; athletics; basketball; volleyball; rugby; horse racing; tennis; multi-use

*Materials:* nature of materials used in construction; variations between manufacturers; variations between similar systems

*Surface types:* acrylic surfaces; resin based; all weather macadam; artificial sand-filled; polymeric; third generation artificial grass; grand slam clay; rubber fibre; rubber; timber; linoleum; vinyl

### 2 Understand the construction specifications for a range of artificial surfaces

*Materials used:* dynamics of materials used, characteristics of materials used, dynamic interactions between layers of systems currently available, health and safety considerations

*Unit costs:* for construction of commonly used systems, for operation of commonly used systems, maintenance considerations

*Quality standards:* British and European standards, Sports and Play Construction Association (SAPCA), Institute of Groundsmanship (IOG), England and Wales Cricket Board, Football Association, International Association of Athletics Federation (IAAF), Federation Internationale de Football Association (FIFA), other sports governing bodies

### 3 Understand advantages and disadvantages of synthetic sports surfaces

*Systems:* advantages and disadvantages of commonly used systems, comparison of synthetic surfaces with turf surfaces

*Considerations:* demands of provider and user, initial cost, maintenance and renovation, amount of use, types of use, seasonal requirements, quality of play, aesthetic value, health and safety including related sports injuries, governing body recommendations, income and revenue

#### 4 Understand the performance standards of artificial surfaces with those for natural turf surfaces

*Turf Performance Quality Standards:* herbage, pests and diseases, profile, presentational quality, playing quality

*Artificial sports surface Performance Quality Standards:* tensile strength, shock absorbance, reaction, durability

*Performance tests:* vertical ball rebound, angle ball rebound, ball roll, shock absorption, rotational resistance, linear friction, stud deceleration

*Quality standards:* British and European standards, Sports and Play Construction Association (SAPCA), sports governing bodies, Sports Turf Research Institute (STRI); Institute of Groundsmanship (IOG), Institute of Leisure and Amenity Management (ILAM)

## Learning outcomes and assessment criteria

Learning outcomes  On successful completion of this unit a learner will:	Assessment criteria for pass  The learner can:
LO1 Understand the range of artificial surfaces available for sport	1.1 examine the range of artificial surfaces available for sports activities 1.2 compare manufacturer's specifications for sport surfaces 1.3 evaluate variations in given sport surfaces
LO2 Understand the construction specifications for a range of artificial surfaces	2.1 explain the construction specifications for indoor and outdoor sport surfaces 2.2 evaluate the cost of providing and operating indoor and outdoor sports surfaces
LO3 Understand advantages and disadvantages of synthetic sports surfaces	3.1 compare the benefits or otherwise of synthetic surfaces and turf surfaces 3.2 justify the use of synthetic sport surfaces in given contexts
LO4 Understand the performance standards of artificial surfaces with those for natural turf surfaces	4.1 examine the potential for unified standards of performance against those for natural turf surfaces 4.2 illustrate the likely future role of artificial surfaces in sport

## Guidance

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### Links

This unit links with:

- *Unit 52: Quality and Performance Standards for Turf*
- *Unit 53: Construction and Maintenance of Sports Turf Surfaces.*

### Essential requirements

Learners need access to manufacturers' literature relating to surface specifications, a range of artificial surfaces and sporting facilities, IT facilities including the internet, a well-resourced library or learning centre and specialist maintenance and construction machinery.

### Employer engagement and vocational contexts

To deliver this unit it is essential that centres have close links with sports facilities with a range of artificial sports surfaces, so that visits can be arranged, work placements organised and guest lecturers utilised.

Centres also need to create and develop links with governing bodies and professional organisations who could provide guest speakers, technical information and workshops and learners should be encouraged to join as student members.



## Unit 57: Golf Course Planning

Unit code: A/503/1136

Level: 4

Credit value: 15

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- Aim

This unit aims to develop learner understanding of the criteria and methodology used in the process of planning a new golf course and enables practical exploration of the process to establish its viability.

- Unit abstract

Golf continues to be a popular past time and the demand for good quality and innovative golf courses has increased. This has resulted in the development of a number of new courses and existing golf courses being re-designed to meet user needs. This unit is essential for anybody going into golf course design or management as it enables learners to develop an understanding of the criteria and methodology used in the process of planning a new golf course and enables exploration of the process to establish its viability.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Be able to investigate planning policies and the process of application for golf courses
- 2 Understand usage, demand and income of a golf course development
- 3 Be able to assess the type and scale of a golf course development
- 4 Understand the importance of facility design, construction and management in the viability of a golf course development.

## Unit content

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### 1 Be able to investigate planning policies and the process of application for golf courses

*Policies:* national and local planning policies

*Planning:* range of assessments and surveys to be undertaken, appraisals and other considerations including the physical elements of the site land area, topography, soils, geology, vegetation, drainage and water availability; legislative requirements and constraints including environmental restrictions surrounding land use, public access, rights of way, safety issues and considerations local infrastructure and location of services

### 2 Understand usage, demand and income of a golf course development

*Methodology:* to determine participation and demand, financial implications, legislative requirements and constraints

*Participation and demand:* target groups, market requirements; user analysis; research and marketing groups

*Financial implications:* initial golf course construction costs; fee structure; maintenance and running costs; source of funding

*Legislative requirements and constraints:* environmental legislation; health and safety legislation; industry specific legislation; planning constraints affecting usage and opening

### 3 Be able to assess the type and scale of a golf course development

*Traditional types of courses:* links; parkland; heathland

*Innovative types of courses:* desert; sand; snow

*Scale of development:* small; medium; large

*Resource requirements:* capital; revenue; physical; human; appropriate to customer demand; legal requirements; health and safety considerations

### 4 Understand the importance of facility design, construction and management in the viability of a golf course development

*Facility design:* golf course layout; development styles; landscape character; clubhouse; shop; maintenance facilities; road and infrastructure layout

*Planning development:* marketing studies; site suitability studies; conceptual designs; final golf layout plans

*Construction requirements:* capital; tender process; contract management; timescale; legislative requirements including health and safety and environmental considerations

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Be able to investigate planning policies and the process of application for golf courses	1.1 report accurately on local and national planning policies relating to golf course developments 1.2 plan the scope and variety of assessments, surveys and appraisals that need to be undertaken 1.3 determine legislative requirements and constraints for planning applications
LO2 Understand usage, demand and income of a golf course development	2.1 explain the methodology used to determine the participation and demand for a new golf course 2.2 review the financial implications of the proposed development
LO3 Be able to assess the type and scale of a golf course development	3.1 report effectively on the type and scale of the development 3.2 calculate the level of resources required to develop and maintain the golf course
LO4 Understand the importance of facility design, construction and management in the viability of a golf course development	4.1 explain the importance of design, construction and management in maintaining the viability of a selected golf course 4.2 examine legal requirements and constraints on the design, construction and operation of a selected golf course

## Guidance

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### Links

This unit has direct links with the following professional bodies and national occupational standards and professional guidance that they oversee and implement: The British and International Golf Greenkeepers Association, European Institute of Golf Course Architects, The Golf, Course Builders Association of America, The American Society of Golf Course Architects, The Royal and Ancient Golf Club of St Andrews, The Sports Turf Research Institute, The United States Golf Association.

This unit links with *Unit 53: Construction and Maintenance of Sports Turf Surfaces*, *Unit 52: Quality and Performance Standards for Turf* and *Unit 54: Mechanisation Management – Turf*. Some links may also be found within *Unit 12: Garden Design Principles*.

### Essential requirements

Learners need access to IT and internet facilities, a well-resourced library and access to a range of different styles of golf course, either through site visits or through multi-media resources.

### Employer engagement and vocational contexts

Centres should have links with a range of golf courses within a 50-mile radius of the centre that learners can visit as part of their studies and that can also be used for work experience for learners which wish to expand their knowledge of this sector. Field trips and visits to golf courses outside the 50 miles should also be included so learners can experience regional differences in how golf courses are planned and designed. Together with this, talks and visits by professionals involved in the planning process should be organised. Centres must establish close links with the British and International Golf Greenkeepers Association and learners should join as student members and also register with the Sports Turf Research Institute to access their resources. Visiting speakers including managers of established facilities and landscape architects would add to the delivery of this unit, enabling learners to question and interact with professionals with current industry experience.

## Unit 58: Turf Irrigation Systems

Unit code: J/503/1138

Level: 4

Credit value: 15

- Aim

This unit aims to develop learner understanding of the range and complexity of turf irrigation systems.

- Unit abstract

This unit focuses on the design and management of efficient and effective irrigation systems for turf. Learners will investigate the principles which underpin the provision of irrigation. They will evaluate the range of available water supplies, assess their suitability for irrigation and learn about the legislative framework governing the supply and use of water for irrigation purposes. Learners will use their understanding of irrigation principles to design and specify an efficient and effective irrigation system for a sports turf facility. Throughout the unit, the emphasis will be on applying environmentally positive and sustainable policies and practices.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the main sources of irrigation water for turf
- 2 Understand the regulations and legislation that govern water abstraction, water storage and storage facilities
- 3 Understand methods used to ensure consistency of water quality and quantity
- 4 Understand design criteria for the installation of a turf irrigation system.

## Unit content

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### 1 Understand the main sources of irrigation water for turf

*Water sources:* natural eg ground water, surface water; bore holes; artificial ponds, lakes and reservoirs; mains water

*Comparison of sources:* constraints, benefits and costs of each supply; sustainable sources

### 2 Understand the regulations and legislation that govern water abstraction, water storage and storage facilities

*Legislation:* legal considerations when altering the flow of natural watercourses; abstraction; water storage; discharge of waste water

*Licensing:* requirements; licensing bodies; types of licence; restrictions eg during droughts

### 3 Understand methods used to ensure consistency of water quality and quantity

*Water quality:* water purity and discharge legislation; crop purity requirements; water-borne hazards and diseases; range of filtration and purification systems; constraints, benefits and costs of systems; sustainable systems

*Water quantity:* assessing quantity available for irrigation; operating pressures of delivery systems; water storage systems; recycling systems; operational implications of using mains water

### 4 Understand design criteria for the installation of a turf irrigation system

*Design criteria:* assessing irrigation need; cost/benefits of irrigation; facility requirements eg range of playing surfaces, level of competition; installation requirements eg site access, timeliness; imposed physical constraints eg soil structure, topography; public safety; safety implications of power supplies and water storage systems; environmental impacts; minimising water use

*Specifications:* supply and storage systems; power supplies and pumps; delivery systems; control systems; labour requirements; assessing operational performance; maintaining operational performance

## Learning outcomes and assessment criteria

Learning outcomes  <b>On successful completion of this unit a learner will:</b>	Assessment criteria for pass  <b>The learner can:</b>
LO1 Understand the main sources of irrigation water for turf	1.1 examine the main sources of irrigation water for turf 1.2 compare the main sources of irrigation water for given situations
LO2 Understand the regulations and legislation that govern water abstraction, water storage and storage facilities	2.1 explain the implications of the regulations and legislation governing the abstraction, storage and discharge of irrigation water 2.2 examine the role of licensing bodies in the control of irrigation water
LO3 Understand methods used to ensure consistency of water quality and quantity	3.1 explain the purity requirements of a range of turf surfaces 3.2 examine the range of bacterial and water-borne hazards associated with irrigation water 3.3 evaluate the range of purification and filtration technology available for irrigation water
LO4 Understand design criteria for the installation of a turf irrigation system	4.1 assess the design criteria for the installation of an irrigation system for a sports turf facility 4.2 determine specifications for the installation and operation of an irrigation system for a sports turf facility

## Guidance

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### Links

This unit links with the following units in this qualification:

- *Unit 22: Golf Course Design Principles*
- *Unit 52: Quality and Performance Standards for Turf*
- *Unit 53: Construction and Maintenance of Sports Turf Surfaces.*

This unit maps with the Horticulture National Occupational Standards:

- L6: Present, maintain and repair sports turf surfaces for play
- L26: Estimate resource requirements and programme work
- F6: Manage the use of physical resource.

### Essential requirements

Learners must have access to up-to-date information on the irrigation of a variety of sports turf surfaces. This should include promotional literature and operation manuals, reviews such as those available in the relevant trade and professional journals and textbooks on the full range of turf irrigation philosophies and techniques. Learners will also need access to facilities where a variety of sports turf surfaces are routinely irrigated.

### Employer engagement and vocational contexts

Learners need to base their work in an industrial context and delivery of this unit would be enhanced by the engagement and cooperation of turf-care professionals. Visits to sports facilities, trade shows and manufacturers and dealers in turf irrigation systems will enable learners to investigate the range of techniques and equipment available to the sector.

Learners will also benefit from links with professional bodies such as the Institute of Groundmanship (IoG) and the British and International Golf Greenkeepers' Association (BIGGA).

## Unit 59: Arboricultural Management

Unit code: K/503/1438

Level: 5

Credit value: 15

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- Aim

This unit aims to develop learners understanding of tree management. Learners will develop their ability to survey trees and understand fundamental practices essential to high quality tree management.

- Unit abstract

Trees deliver a range of tangible social, environmental and economic benefits to our lives. This unit is designed to give the learner an understanding of how high quality arboricultural management can help realise these benefits. Research informed best practice is emphasised throughout the unit as the management of both young and mature trees is researched. Learners will develop their understanding of the criteria essential for tree establishment, skills in tree surveying and assessment and experience of recommending management interventions to meet specific arboricultural needs.

- Learning outcomes

**On successful completion of this unit a learner will:**

- 1 Understand the value of trees
- 2 Understand the process of tree establishment
- 3 Be able to survey trees for a specific purpose
- 4 Understand the practical management of trees

## Unit content

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### 1 Understand the value of trees

*Environmental benefits of trees:* the habitat value of trees; moderation of local climate by trees; the value of trees in reducing urban flooding and sustainable urban drainage systems (SUDS); trees and air quality; the evidence base for the environmental benefits of trees

*Social benefits of trees:* aesthetic value of trees; psychological benefits of trees; community projects involving trees; trees, green infrastructure and public health; the evidence base for the social benefits of trees

*Economic benefits of trees:* direct employment in tree management; products from trees; enhanced landscape character and increased property prices in relation to trees; link between quality landscape character and inward investment; reduced energy bills, prevention of flooding; the evidence base for the economic benefits of trees

### 2 Understand the process of tree establishment

*Tree selection criteria:* species selection for urban trees; application of ecophysiology in tree species selection; ensuring high quality tree stock and tree specification; bare-root, containerised and root-balled trees; tree handling prior to planting

*Tree rooting environment:* assessment of soil conditions; linking available soil volume to potential mature tree size; enhancing soil volume, promoting soil ecology

*Tree planting and aftercare:* best practice in planting; urban tree pits, staking and guying; tree protection; aftercare and maintenance (mulching, irrigation, formative pruning); reducing conflict with urban infrastructure; establishment problems caused by poor planting practice; research informed practice

### 3 Be able to survey trees for a specified purpose

*Collecting and recording tree data:* selection of appropriate tree data to meet required outcomes (species, height, girth, canopy spread, location, proximity to infrastructure); measurement of trees; survey criteria informed by British Standards (BS5837); standard tree survey equipment; recording tree data; use of geographical information systems (GIS) in tree data collection

*Assessment of tree condition:* Visual Tree Analysis (VTA); biological factors associated with tree hazards, biomechanical factors associated with tree hazards; targets; hazard rating systems; chlorophyll fluorescence as an aid to tree assessment

*Using tree data to inform tree management strategies and recommendations:* the value of tree inventories; strategic management of tree populations in the built environment; managing hazardous trees; use of tree data to assess the contribution of tree populations to local ecosystem services; justification of tree management recommendations using tree data

#### 4 Understand the practical management of trees

*The legal framework for arboricultural operations:* health and safety legislation and best practice in relation to tree work; statutory protection of trees (Tree Preservation Orders and Conservation Areas); environmental and habitat protection laws and their impact on arboricultural operations

*Standards for tree work:* British Standard 3998:2010 Tree Work Recommendations; British Standard 5837:2005 Trees in Relation to Construction – Recommendations

*Canopy maintenance:* equipment for canopy maintenance; canopy access and tree climbing techniques; pruning – natural target pruning, crown reductions, crown lifting, crown thinning, deadwood management; support systems (bracing, guying, propping); significance of poor practices such as topping trees, flush cuts and stub cuts; managing trees for habitat; research informed practice

*Managing the rooting environment:* mulching, tree nutrition and fertilisation, managing soil compaction; specialist equipment for soil injection and soil decompaction; soil water relations; tree irrigation; research informed practice

## Learning outcomes and assessment criteria

Learning outcomes  On successful completion of this unit a learner will:	Assessment criteria for pass  The learner can:
LO1 Understand the value of trees	1.1 explain environmental benefits of trees 1.2 explain the social benefits of trees 1.3 explain the economic benefits of trees 1.4 analyse methods which may be used to assess the benefits of trees
LO2 Understand the process of tree establishment	2.1 explain the selection of tree species and stock type suitable for a range of conditions found in built environments 2.2 evaluate the tree rooting environment for a specified location 2.3 outline management approaches which would enhance the rooting environment for young trees 2.4 examine best practice in urban tree establishment
LO3 Be able to survey trees for a specified purpose	3.1 collect and record data relating to trees 3.2 produce a detailed assessment of tree condition 3.3 use tree data to support tree management decisions 3.4 evaluate the use of tree survey equipment
LO4 Understand the practical management of trees	4.1 outline the legal framework for arboricultural operations 4.2 explain the application of British Standards to tree management scenarios 4.3 recommend canopy management to specified trees in a built environment 4.4 recommend arboricultural operations to enhance the rooting environment of an identified tree 4.5 examine how research has informed practice in arboriculture

## Guidance

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### Links

This unit is discrete in its scope and has no pre-requisites. However, learners may be able to apply knowledge gained in *Unit 9: Environmental Management*, *Unit 15: Hard Landscape Principles and Practice* and *Unit 17: Landscape and Garden Maintenance*.

### Essential requirements

Access to a range of trees in urban and peri-urban environments is essential for the delivery of this unit. An extensive arboricultural library supported by electronic resources which facilitate access to primary literature in plant sciences, arboriculture and urban forestry is also essential. Unit tutors must have a higher education qualification in arboriculture and experience of managing trees in urban environments. Specialist arboricultural equipment is highly desirable but excellent vocational links may mitigate the need for a full range of specialist arboricultural equipment.

### Employer engagement and vocational contexts

This unit offers excellent opportunities to engage employers and arboricultural professionals. A field trip to an amenity tree nursery will be valuable. Companies engaged in developing products for urban tree planting, tree health care and other specialist equipment providers enhance learning. Professionals from both local authorities and private practice involved with managing urban trees could also support the delivery of this unit. Learners may also wish to engage with professional bodies and trade associations such as the *Institute of Chartered Foresters*, the *International Society of Arboriculture* and the *Arboricultural Association*.