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Transport Infrastructure Ireland

TII Publications



Guide for the Implementation of Soft Landscape in Towns and Villages on National Roads

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GE General

Technical

About TII

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TII Publications



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1. Introduction

Transport Infrastructure Ireland (TII) produces and manages a wide range of standards and technical documentation related to its areas of responsibility. These, and other publications, are available to users through the TII Publications system website: www.tiipublications.ie

1.1 Purpose of this Guide

This Guide sets out the required approach to the implementation of soft landscape treatments in the following locations within and on the approach to Towns and Villages on National Road Projects and Greenways. This can be referred to as urban transport environments. In rural transport environments along National Roads and Greenways the required approach to the design, delivery and implementation of soft landscape treatments is provided in TII Publication GE-ENV-01102 and GE-ENV-01103.

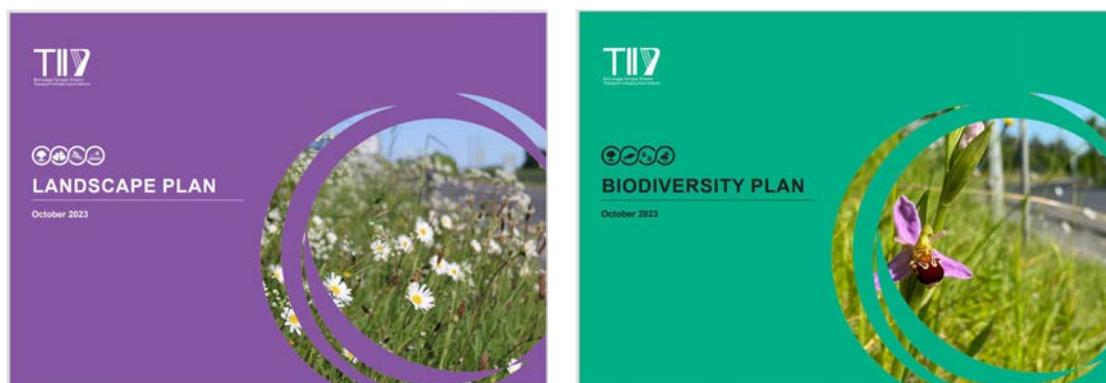
The term 'Soft Landscape' describes the wide range of vegetative elements established and designed within the constructed and semi-natural landscape and the infrastructure required for their establishment.

1.2 Using this Guide

This Guide shall be used in conjunction with and to supplement the information provided in the TII Publications; that is to say the TII Publication Overarching Technical Document (OTD) GE-ENV-03002 Design and Delivery of Soft Landscape Treatments in Urban Transport Environments, (Standards) DN-GEO-03084 The Treatment of Transition Zones to Towns and Villages on National Roads and to complement the Design Manual for Urban Roads and Streets (DMURS). In addition, this document overlaps with a set of complementary design documents including, but not limited to:

- TII Publication (Technical) GE-ENV-01102: A Guide to Landscape Treatments for National Road Schemes in Ireland;
- TII Publication (Technical) GE-ENV-01103: Guidelines on the Implementation of Landscape Treatment on National Road Schemes in Ireland;
- Pollinator-friendly management of Transport Corridors - All Ireland Pollinator Plan, National Biodiversity Data Centre (2019), and;
- All relevant local green infrastructure, landscape, biodiversity, and tree strategies.

In addition to the above documents, this Guide is to be read with TII Landscape Plan and TII Biodiversity Plan. Planning, design and delivery of soft landscape treatments must align with the objectives and actions outlined by these documents.



'TII will develop and maintain transport corridors with cognisance to how they can contribute to the provision of wider ecosystem services, e.g. carbon sequestration, flood management and recreation, particularly within a local and regional context. TII will ensure that our transport corridors achieve maximum benefits across a range of ecosystem services through collaboration with stakeholders and local communities thereby aligning objectives across all spatial scales.' TII Biodiversity Plan 2023

The soft landscape principles and requirements set by this document shall be applied on all new, redesigned, and reallocated roads, streets, greenways and pedestrian spaces in the following four zones, as defined in DN-GEO-03084:

- The Rural Fringe;
- The Transition Zone;
- The Gateway;
- The Centre.

The methodology outlined in this Guide document and the theory of soft landscape treatments are presented in Overarching Technical Document (OTD) GE-ENV-03002. This Guide shall be read in conjunction with the OTD.

This Document sets out the requirements and recommendations for the implementation of soft landscape treatments and it shall be applied throughout all relevant TII Project Stages with the advice of the appropriate professionals and in accordance with the Project Management Guidelines PE-PMG-02041.

This document is intended to be used by a suitably qualified practitioner with appropriate skills (as defined in Section 1.6 of this document). This Guide will also be used by project managers, environmental co-ordinators, designers, and contractors involved in the planning, design, delivery, and maintenance of soft landscape treatments.

The project and design team shall liaise with all relevant parties to agree final outputs and ongoing maintenance regimes when delivering Projects.

1.3 Background and Legislative Framework

The importance of achieving sustainable, functional, safe, characterful, climate resilient and value-adding soft landscape treatments is present in Policy at European and National levels. These policies are reflected in several standards and best practice guidance, which can be used by all collaborators when delivering soft landscape treatments in and around urban transport environments. Key references are outlined below. A summary of these references is also available in the OTD GE-ENV-03002.

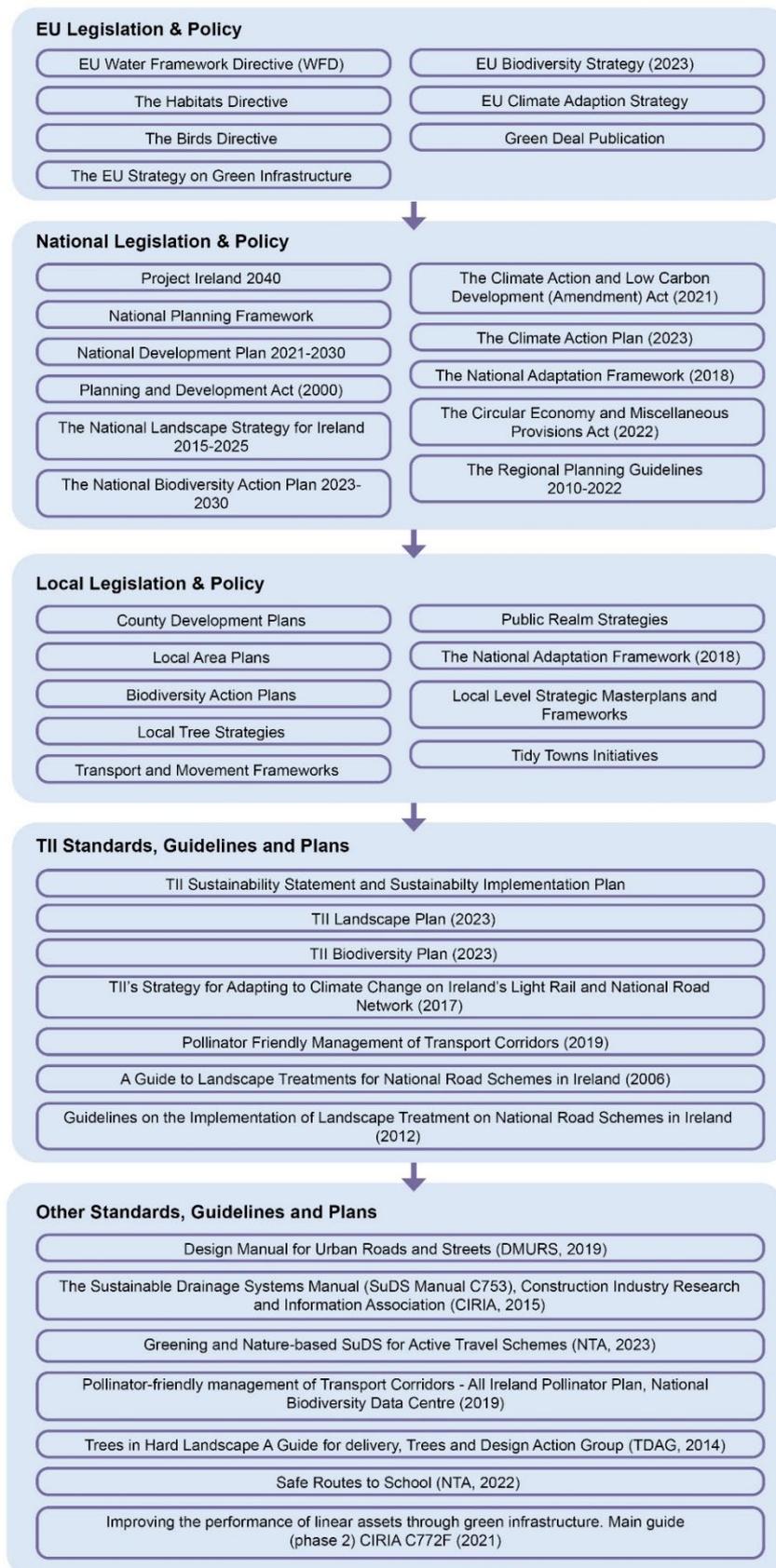


Figure 1.1 - Legislation, statutory guidance, and other key references relevant to soft landscape in urban transport environments.

1.4 The Requirements of a Landscape Professional

Landscape Professionals involved in TII projects concerning the planning, design and delivery of soft landscape treatments in and around transport corridors are required to meet all of the following criteria:

- National Framework of Qualifications (NFQ) Level 8 (or equivalent level) in Landscape Architecture (or equivalent discipline); and / or, a master's degree (NFQ Level 9 (or equivalent) in Landscape Architecture (or equivalent discipline);
- full corporate membership of the Irish Landscape Institute (MILI), or equivalent professional body that represents landscape professionals, and is a member of the International Federation of Landscape Architects; or be eligible for same.
- at least ten years of relevant post-graduate experience as a Landscape Architect.

It is important to note that the minimum number of years' relevant post-graduate experience may change (upwards or downwards) depending on the size, nature, and complexity of the project in question. Furthermore, further criteria must be laid down to specify the post-graduate experience that is considered relevant to the project's context.

It is essential that careful consideration is given to including adequately experienced professionals with the relevant expertise; effective collaboration shall also be enabled to ensure successful implementation of Soft Landscape Treatments.

The Project Manager must therefore document the identified criteria ensuring Landscape Professionals are qualified, competent, and expert.

The professionals to be involved at the early stages of a project should be as instructed by the Project Manager and based on desktop analysis of the potential project area.

1.5 The Role of a Landscape Professional

The Landscape Professional shall provide the following advice and design solutions for the soft landscape design. This includes:

- Streetscape/transport corridor design;
- Public realm layout and design;
- General soft landscape strategy;
- Nature-based Solutions including Sustainable drainage systems (SuDS), and;
- Biodiversity enhancement measures.

The Landscape Professional can deliver outcomes that:

- Contribute to place-making, local identity, and distinctiveness, provide local people with usable places and spaces that positively influence their experience as they are used;
- Contribute positively to climate resilience, sequestering carbon, providing integrated sustainable drainage solutions (SuDS), with a considered approach to circular economy and planted to adhere to current and emerging best practice principles;
- Contribute positively to local ecosystems and supports and encourages biodiversity, and;

- Contributes to the design of a safe environment that performs in partnership with all other urban infrastructure.

The Landscape professional will:

- Ensure initial landscape treatment considerations follow current policy, TII Strategic Programmes and Plans, and County / Local Development Plans as they relate to landscape;
- Ensure that outcomes enabled by soft landscape treatments are highlighted in the project SMART (specific, measurable, achievable, relevant and time-bound) objectives and are maximised at all Project Phases;
- Develop and investigate in further detail the landscape issues and opportunities of the project;
- Input to examination of potential solutions to determine the best outcome for the project;
- Provide inputs to the project design, following the selection of a preferred option, based on both technical and environmental inputs (including the production of an LVIA where required), to a stage where sufficient levels of detail exist to establish land take requirements (if any) and to progress the Project through the statutory processes;
- Compile Planning documentation and participate in the statutory processes as required to ensure that the proposed project is developed in accordance with planning and environmental legislation;
- Compile or input into the compilation of tender documentation;
- Complete all outstanding contractual and residual issues related to the project.

1.6 Multidisciplinary Approach

The implementation of soft landscape cannot happen effectively without the integrated and coordinated consideration of:

- **What happens below ground** – e.g., soil composition and tree pits specification to be coordinated with underground services;
- **What happens above ground** – how planting and trees can be integrated in relation to overhead services, lighting elements, signage, clearance zones and built form;
- **What happens in and around planting** – its relation to water systems, soils, catchments, ecosystems, streets, roads, services, and buildings;
- **What is the relationship between water and planting** – how planting copes with changes in rainfall, and how vegetation can cleanse water and reduce flooding events; and;
- **The impacts** all of the above may have on people and their experiences, as well as the sensitivities and characteristics of a place.

Implementation and establishment of soft landscape treatments in projects can be challenging and shall be achieved through multi-disciplinary collaboration. This collaboration includes TII, the Project Manager, Local Authorities, Engineers (Drainage, Civil, Structural etc.), Environmental Professionals (Arborists, Archaeologists, Ecologists, Hydrologists etc.), social value, and cultural heritage professionals, as well as any other relevant group as dictated by the project and study area characteristics. The composition of the multi-disciplinary team should in fact respond and be tailored to the project's needs.

The early appointment of Environmental Specialists shall be in line with the Project Management Guidelines.

Where appropriate, appointment of Landscape Professionals, Arboriculturists and Ecologists will enable incorporation of best practice into soft landscape treatment projects, as well maximising opportunities positively impacting society as a whole.

Landscape Professionals should, at the direction of the Project Manager, be appointed as part of multidisciplinary teams on all new, redesigned, and reallocated roads, streets, greenways and pedestrian spaces where soft landscape treatments are impacted and / or proposed and where the Landscape Professionals inclusion as part of the project team can help TII deliver on key policy areas as they relate to sustainability, social value, landscape and biodiversity. This includes projects whereby urban transport proposals fall within areas of existing or proposed public realm.

2. Application of Soft Landscape Treatments to TII Projects

This Guide shall be used in conjunction with the TII Publication (Technical) PE-PMG-02041 Project Management Guidelines. Reference should also be made to the Project Manager's Manuals for Major National Roads Projects, Minor National Roads Projects and Greenway Projects (*PE-PMG-02042*, *PE-PMG-02043*, and *PE-PMG-02047*), as appropriate or other relevant project delivery guidance for projects in urban areas along National Roads.

2.1 Project Thresholds

TII's Project Management Guidelines (PMG) apply to the planning, design, development, and construction/implementation of all Minor and Major National Road, Greenway and Public Transport Capital Projects which are funded through TII and/or TII is the Approving Authority unless otherwise instructed by TII.

In general, the PMG do not apply to Projects of less than €5 million. However, TII may apply these guidelines (or sections of these Guidelines) to specific projects with a value of less than €5 million depending on their setting, scale or context. The application of these Guidelines to Projects of less than €5 million in value should be recorded in the Project Execution Plan (PEP) for that Project.

A PEP is a key Project Management document used over the life cycle of a Project to provide a record of Project information, processes and progress and is further defined in the TII Publication (Technical) PE-PMG-02041 Project Management Guidelines.

Further detail of the processes and deliverables outlined in these Guidelines can be found in the relevant Project Manager's Manuals for National Roads.

2.2 Project Phases and Scope of the Landscape Professional

These tasks have been compiled with reference to DN-GEO-03084, which presents typical, all round design process in Figure 3 of the Document.

Where planning projects are proposed by any road authority for a national road project, therefore likely to involve or significantly affect landscape assets or features, the Project Manager shall seek landscape expertise early in the project development, assessment, and design process as they deem appropriate.

The Landscape Professional's inputs and outputs may change from that specified below depending on project characteristics. All inputs shall be as deemed appropriate and as directed by the Project Manager.

Depending on a project size and impact, an Environmental Impact Assessment Report (EIAR) may be required. If EIAR is required, a suitably qualified Landscape Professional shall be appointed to prepare Landscape and Visual Impact Assessment (LVIA) which is a section within the EIAR. LVIA is a separate process to the Landscape Design and it may be the case that the same Landscape Professional may undertake both LVIA and the Landscape Design. Landscape Professional's inputs and outputs described within this Guide relate to Landscape Design only and will depend on a specific project and the direction of a Project Manager. For LVIA Landscape Professional specific outputs refer to PE-ENV-01102.

2.3 Landscape Professional Inputs, Key Soft Landscape Design Tasks and Typical Outputs as required at each TII Project Phase.

2.3.1 Phase 0: Scope and Strategic Assessment

TII Project Phase 0 Scope and Strategic Assessment
Landscape Professional's Input
<ul style="list-style-type: none"> This stage will generally not require the input of a Landscape Professional. However, the Project Manager may seek input from a Landscape Professional at Phase 0: Scope and Pre-Appraisal to ensure the project aligns with current TII Strategic Programmes and Plans with regard to Landscape and Biodiversity. The Project Manager may seek input with regards to any known local landscape issues. This may inform outline opportunities from a local or strategic perspective such as opportunities to enhance landscape, biodiversity or public realm as a result of project works or any reallocation in space long the transport corridor. This may aid the Project Manager in the development of Project Objectives that are environmental/social related or focused and could be local or strategic in nature.

2.3.2 Phase 1: Concept and Feasibility

TII Project Phase 1 Concept and Feasibility
Landscape Professional's Input
<ul style="list-style-type: none"> This stage will generally not require the input of a Landscape Professional. However, the Project Manager may consult a Landscape Professional at Phase 1: Concept and Feasibility, when investigating the feasibility of the project in further detail, with regard to landscape specific issues and opportunities relating to the project and its particular landscape or streetscape setting. If such consultation is required, Landscape Professional may input into the feasibility of the strategic options.
Typical Output
<ul style="list-style-type: none"> As required by Project Manager, Landscape Professional may produce a Landscape Constraints and Opportunities Report or may input into the Project Feasibility Report. <p>Note: The output will vary depending on the specific project and at the direction of the Project Manager.</p>

2.3.3 Phase 2: Options Selection

TII Project Phase 2 Options Selection
Landscape Professionals Input
<ul style="list-style-type: none"> Input into the Multi-Criteria Assessment and / or options selection report (Refer to PE-PAG-02031). Landscape analysis drawings / report including identification of sensitive landscape or area of particular attention with the study area that may need to be considered. Identification of landscape opportunities such as integration with local Green Infrastructure and Ecological network. Input into Project Appraisal Deliverables, if required by Project Manager.

TII Project Phase 2 Options Selection	
Key Soft Landscape Design Tasks	
	<ul style="list-style-type: none"> Examine the landscape context to input into the preferred option selection. Develop Landscape inputs to progress the project through the statutory processes. Develop and document the existing landscape baseline. Refer to PE-ENV-01102 for guidelines on LCA. Review all statutory and non-statutory policy, TII Strategic Programmes and Plans, and County / Local Development Plans as they relate to landscape within the study area. Consider any nearby developments relevant to the landscape environment. Assist in identification of main landscape constraints and opportunities that may affect or benefit the project. Identify any conflicts with existing trees that are to be retained and resolve these with the aim to retain all existing trees and hedgerows, where feasible. Arboricultural assessment of trees may be required to establish the location of the Root Protection Areas. Coordinate with the design team to achieve an environmentally positive and landscape context solution. It is critical that early coordination between the Landscape Professional and road drainage designers is achieved to fully deliver sustainable drainage options. See Section 1.6 for further detail. Note: the relevant project professionals to be liaised with shall be agreed with the Project Manager. If required at this phase, engage with local people, landowners, the local authority, as well as other government and non-governmental organisations as required, to review opportunities and agree approach. Identify outcomes and functions delivered and enabled by soft landscape treatments that can support the Project objectives and Deliverables. This is iterated at all Project Phases.
Typical Output	
	<ul style="list-style-type: none"> Typical output for Phase 2 will vary depending on the specific project, and the scale of the analysis and development. It may include Landscape Character Analysis/Streetscape analysis and Landscape constraints and opportunities analysis in graphic or report form as instructed by the Project Manager.

2.3.4 Phase 3: Design and Environmental Evaluation

TII Project Phase 3 Landscape Design & Evaluation	
Landscape Professional Input	
	<ul style="list-style-type: none"> Provide inputs to the project design, following the selection of a preferred option, based on both technical and environmental inputs (LVIA where required), to a stage where sufficient levels of detail exist to establish land take requirements (if any) and to progress the Project through the statutory processes. Engage in Multidisciplinary collaboration with other design team members to maximise the benefit of the scheme as defined within TII Objectives. This collaboration should include liaison with Project Ecologist/Biodiversity Professionals to maximise opportunities for Biodiversity Enhancement.
Key Soft Landscape Design Tasks	
Design Development	
	<ul style="list-style-type: none"> If Landscape analysis is not carried out in Phase 2, it shall be developed at this design phase.

TII Project Phase 3 | Landscape Design & Evaluation

- Develop outline plans and / or sketch proposals at 1:500 scale and options for soft landscape treatments – including planting strategies, palettes and proposals for ongoing management and maintenance.
- For consultation, develop the selected option's outline soft landscape proposal, integrating it within the wider design strategy. The outline plan may still include options for specific soft landscape treatments to be agreed with the relevant parties.
- SuDS strategy shall be developed in coordination with multidisciplinary team and agreed with TII.
- Ensure maintenance and management actions are considered throughout the design process and are clearly articulated within the drawing package and design statement.
- Proposals shall be in line with key function and value considerations outlined in OTD GE-ENV-03002.
- Stakeholder Engagement
- Stakeholder engagement at this stage can be of a great benefit to the project. If required, Landscape professional may provide sketches and illustrative plans to convey options and different stages of establishment and maturity of proposals (e.g., impact of trees over time).

Detailed Resolution

Contribute to the design, drawings development and the project team meetings to ensure effective multi-disciplinary design solutions are achieved.

- Particular attention should be paid to:
- the Root Protection Areas (RPA's) of existing trees to be retained;
- the SuDS coordination and design development as an integral part of the drainage strategy;
- coordination and design development with relevant design team members to ensure safe and effective integration of soft landscape treatments within existing / proposed utilities;
- recommendations from all environmental studies and assessments being carried out, and;
- feedback from relevant stakeholders, including local population.
- If impacts on RPAs are unavoidable, the Landscape Professional should advise whether an Arboricultural impact Assessment carried out by a competent Arboriculturalist would be required. Refer to OTD GE-ENV-03002 Section 5 for information on surveys.

The Planning package & Statutory Process

Develop drawings to a sufficient level of detail for planning applications and Statutory Processes (1:500 scale).

Produce a Landscape Strategy and input into Project Design or other reports as required by the Project Manager.

Ensure maintenance and management actions are clearly articulated within the drawing package and Landscape Strategy.

The Landscape Professional shall advise on the required location where photomontages are to be produced.

This is to ensure that the views selected, and the planting palette used in the photomontages, are in keeping with the proposed landscape strategy and are effectively showing how the landscape will look in the long term.

Whether an EIAR is applicable to the Project or not, all aspects of the soft landscape design, including maintenance and management plans among others, shall be assessed/reviewed for environmental impacts. Effective coordination with the assessment team (if one is appointed) is required to enable this. The design is likely to require iteration throughout the assessment process.

TII Project Phase 3 Landscape Design & Evaluation
Typical Output
<ul style="list-style-type: none"> • A full set of landscape drawings to an appropriate scale (no less than 1:500). A typical Landscape drawing package includes: <ul style="list-style-type: none"> ○ A general arrangement plan; ○ A soft landscape plan with specification notes as required; ○ A hard landscape plan with specification notes as required; ○ A series of proposed sections, elevations and axonometric drawings as required; ○ A set of soft (and hard) landscape details with specification notes as required. • Indicative soft landscape details to demonstrate how particular treatments are achievable and can be implemented within the site. • Brief outline specification • Sketches, axonometric or digital illustrations to convey the scheme to key stakeholders, as required by Project Manager. • A Landscape Design Report to accompany the planning / Part 8 application. See OTD GE-ENV-03002 Appendix A for sample Landscape Report. • Soft landscape management and maintenance plans and instructions to support short and long-term aims and objectives of the Project. • A Landscape Designer’s Risk Assessment, as required by Project Manager. • Any other deliverables as requested by Project Manager.

2.3.5 Phase 4: Statutory Processes

TII Project Phase 4 Statutory Processes
Landscape Professional’s Input
<ul style="list-style-type: none"> • Compile relevant documentation and participate in presentations to Local Authority or other Statutory Bodies as requested by the Project Manager.
Key Soft Landscape Design Tasks
<ul style="list-style-type: none"> • Supply relevant documentation for Landscape proposals. • As required by or to support the Statutory Processes, participate in planning presentations or Oral Hearing.
Typical Output
<ul style="list-style-type: none"> • As required by Project Manager. <p>Note: The output will vary depending on the specific project and planning process.</p>

2.3.6 Phase 5: Enabling and Procurement

CONSTRUCTION & IMPLEMENTATION (Phases 5 - 6)
<p>TII Project Phase 5 Landscape Detailed Design & Procurement</p> <p>Completion of a successful Statutory Process marks the receipt of a planning decision in favour of the Project. Approval may be received with planning conditions which may also relate to soft landscape treatments.</p>
<p>Landscape Professional's Input:</p>
<ul style="list-style-type: none"> • Input into the compilation of tender documents.
<p>Key Soft Landscape Design Tasks</p>
<ul style="list-style-type: none"> • During this Project Phase, the proposal reaches a stage where all elements within it are fully coordinated and resolved, enabling contractors to price it for construction. • There are three critical parts of the soft landscape construction package which, once the Project contract is awarded to contractor, will form part of that form of contract. These are: <ul style="list-style-type: none"> ○ Detailed soft landscape plans, including construction and planting details; ○ Specification (See Section 3.3); ○ Schedule of Quantities (See OTD GE-ENV-03002 Appendix A for a Soft Landscape Schedule of Quantities' sample). <p>Design Resolution</p> <ul style="list-style-type: none"> • To finalise the three key documents listed above, the Landscape Professional will need to resolve the detailed design and specification of the soft landscape proposal and work together within a multi-disciplinary team to ensure those proposals are fully coordinated. The Landscape Professional, together with the design team, should aim to re-use site materials wherever possible - in line with TII's Standard on Circular economy. The tender documentation produced shall refer to the existing site conditions; it will also specify how soil is to be re-used and improved where possible. • Across all detailed design stages and beyond, the Landscape Professional and design team shall consider the Schedule of Environmental Commitments (National Roads Authority, 2007). <p>Tender Review</p> <ul style="list-style-type: none"> • Landscape Professionals may be involved in the review of tender submissions and must do so in accordance with relevant legislation (Office of Government Procurement, 2022).
<p>Typical Output</p>
<p>A revised set of landscape drawings to an appropriate scale (no less than 1:500).</p> <p>Landscape specification for construction and minimum 36-month maintenance of works.</p> <p>An itemised pricing document, forming the basis of a Schedule of Quantities. Refer to OTD GE-ENV-03002 Appendix A: Sample Schedule of Quantities.</p> <p>Any other deliverables as required by Project Manager.</p> <p>Note: The output will vary depending on the specific project.</p>

2.3.7 Phase 6: Construction and Implementation

TII Project Phase 6 Construction & Implementation
Landscape Professional's Input
Administration and execution of the Main Contract in accordance with the design, specification, relevant standards, and legislation.
Key Soft Landscape Design Tasks
<ul style="list-style-type: none"> • If applicable, the Schedule of Environmental Commitments or planning conditions from the statutory process to be considered across all soft landscape treatment documentation and designs, including the maintenance, management, and end of life plans. • Issue Final Set of Construction drawings. • Meet on-site to agree construction design site layout and amend drawings as required. • Carry out inspections and site monitoring, typically associated with: <ul style="list-style-type: none"> ○ Checking any works associated with existing vegetation and trees to be retained; ○ Setting out of key areas of planting; ○ Inspection of trees, plants, and soil, firstly for specimen trees nursery selection and then once on site; ○ Installation of rain gardens and bioretention tree pits, and; ○ Problem solving to mitigate adverse impact of unexpected existing site utilities in proximity to the tree's root zone; for typical problem solvers see Section 5 in OTD GE-ENV-03002. • Complete all snagging reports. • Issue compliance certifications. • Conduct Maintenance visits and produce Landscape Audit Reports over a three-year establishment period (maintenance period covering the time required by plants to be established). <p>Landscape Audit Reports</p> <p>Together with the contractor, carry-out a joint site audit and inspection during each growing season (June - September). The Landscape Audit report is to quantify the defective plants, maintenance items or any other item needing to be rectified within project area. An Audit Report is to be issued to the client by the Landscape Professional within two weeks of the site audit taking place.</p>
Typical Output
<ul style="list-style-type: none"> • Pre-Tender/Site works: • A set of landscape drawings to an appropriate scale (no less than 1:500). A typical drawing package would include: <ul style="list-style-type: none"> • A general arrangement plan; • A soft landscape plan with specification notes as required; • A hard landscape plan with specification notes as required; • A series of proposed sections, elevations and axonometric drawings as required; • A set of soft (and hard) landscape details with specification notes as required. • Soft Landscape Specifications, including a specified maintenance period and management plan (see OTD GE-ENV-03002 Appendix A).

TII Project Phase 6 Construction & Implementation
<ul style="list-style-type: none"> • An itemised Schedule of Quantities. (See OTD GE-ENV-03002 Appendix A). <p>During Construction & Implementation</p> <ul style="list-style-type: none"> • Site Inspection Reports. • Landscape Audit Reports. • Any other deliverables as required by Project Manager. <p>Note: The output will vary depending on the specific project.</p>

2.3.8 Phase 7: Close Out and Review

TII Project Phase 7 Close Out and Review
Landscape Professional's Input
<ul style="list-style-type: none"> • Complete all outstanding contractual and residual issues relating to the project.
Key Soft Landscape Design Tasks
<ul style="list-style-type: none"> • Carry out and record final inspections. • Complete a defects report. • Issue of final certification. • Produce handover maintenance, management and end-of-life plans for the scheme as required. • Agree and undertake ongoing monitoring and reviews.
Typical Output
<ul style="list-style-type: none"> • A maintenance and long terms management plan, adapted as needs to be following maintenance period. To be handed over to the local authority and any relevant community groups who will have an input into the long terms' maintenance and management of the soft landscape areas. • Any other deliverables as required by Project Manager. <p>Note: The output will vary depending on the specific project.</p>

Project Phases	0	1	2	3	4	5	6	7	
Involvement of Landscape Professional	RECOMMENDED		TO BE CONFIRMED WITH RELEVANT AUTHORITY	MANDATORY					
Stage Outcome		As required by Project Manager, Landscape Professional may produce a Landscape Constraints and Opportunities Report or may input into the Project Feasibility Report.	Typical output for Phase 2 will vary depending on the specific project, and the scale of the analysis and development. It may include Landscape Character Analysis/Streetscape analysis and Landscape constraints and opportunities analysis in graphic or report form as instructed by the Project Manager.	A full set of landscape drawings to an appropriate scale, landscape details, outline specification (see Section 3 in GE-ENV-03001) and Landscape Report to accompany Planning/Part 8 Application (see OTD GE-ENV-03002 Appendix A). Soft Landscape Management and Maintenance Plans (see OTD GE-ENV-03002 Appendix A) Landscape Designer's Risk Assessment, as required by the Project Manager. Any other deliverables as requested by Project Manager.	As required by Project Manager. Note: The output will vary depending on the specific project and at the direction of the Project Manager.	A revised set of landscape drawings to an appropriate scale (no less than 1:500). Landscape specification for construction and minimum 36-month maintenance of works. An itemised pricing document, forming the basis of a Schedule of Quantities (see OTD GE-ENV-03002 Appendix A). Any other deliverables as required by Project Manager. Note: The output will vary depending on the specific project and at the direction of the Project Manager.	Pre-Tender / Site Works: A set of landscape drawings to an appropriate scale. See Section 2 of GE-ENV-03001 for details. Soft Landscape Specifications, including a specified maintenance period and management plan (see OTD GE-ENV-03002 Appendix A). During Construction & Implementation: Site Inspection Reports; Landscape Audit Reports Any other deliverables as required by Project Manager.	A maintenance and long terms management plan, adapted as needs be following maintenance period. To be handed over to the local authority and any relevant community groups who will have an input into the long terms' maintenance and management of the soft landscape areas Any other deliverables as required by Project Manager. Note: The output will vary depending on the specific project and at the direction of the Project Manager.	
Core Tasks <i>During this phase</i>	Project Manager may seek input from a Landscape Professional at Phase 0: Scope and Pre-Appraisal to ensure the project aligns with current TII Strategic Programmes and Plans with regard to Landscape and Biodiversity.	Project Manager may consult a Landscape Professional at Phase 1: Concept and Feasibility, when investigating the feasibility of the project in further detail, with regard to landscape specific issues and opportunities relating to the project and its particular landscape or streetscape setting. If such consultation is required, Landscape Professional may produce a Landscape Constraints and Opportunities Report.	Examine the Landscape Context and develop existing Landscape Baseline. Review all statutory and non-statutory policy including TII Strategic Programmes and Plans, County/Local Development Plans, nearby developments that may be related to the landscape environment. Identify landscape constraints and opportunities including conflicts with the existing trees. Coordinate with the design team to ensure integrated design solutions are achieved. If required, engage with internal and external stakeholders. Identify outcomes and functions delivered and enabled by soft landscape treatments.	Design Development: Landscape Analysis, if not carried out in Phase 2. Develop outline plans / sketch proposals and options for Landscape Treatments and integrate it within the wider design strategy. Drawings shall be appropriate for consultation. Develop SuDS Strategy in coordination with the multidisciplinary team and agreed with TII. Consider Maintenance and Management actions in the design process and clearly articulate these within the drawing package and design statement. If required, be involved in the Stakeholder engagement. Detailed Resolution: Contribute to the design, drawings development and the project team meetings to ensure effective multi-disciplinary design solutions are achieved. Attention should be paid to: Root Protection Areas (RPAs) and SuDS, recommendations from all environmental studies and assessments, feedback from the relevant stakeholders. For Statutory Processes: Produce Landscape Strategy and ensure all maintenance and management actions are clearly articulated. Advise on the required location of photomontages. If EIA/R is applicable, ensure Landscape Design and Maintenance and Management Plans are assessed and reviewed for environmental impacts.	Supply relevant documentation for Landscape proposals. As required by or to support the Statutory Processes, participate in planning presentations or Oral Hearing.	During this Project Phase, the proposal reaches a stage where all elements within it are fully coordinated and resolved, enabling contractors to price it for construction. There are three critical parts of the soft landscape construction package which, once the Project contract is awarded to contractor, will form part of that form of contract. These are: Detailed soft landscape plans, including construction and planting details; Specification (See Section 3.3 GE-ENV-03001); Schedule of Quantities (See OTD GE-ENV-03002 Appendix A). Design Resolution: To finalise the three key documents listed above, the Landscape Professional will need to resolve the detailed design and specification of the soft landscape proposal and work together within a multi-disciplinary team to ensure those proposals are fully coordinated. Across all detailed design stages and beyond, the Landscape Professional and design team shall consider the Schedule of Environmental Commitments (National Roads Authority, 2007) Tender Review: Landscape Professionals may be involved in the review of tender submissions and must do so in accordance with relevant legislation (Office of Government Procurement, 2022).	If applicable, the Schedule of Environmental Commitments or planning conditions from the statutory process to be considered across all soft landscape treatment documentation and designs, including the maintenance, management, and end of life plans. Issue Final Set of Construction drawings. Meet on-site to agree construction design site layout and amend drawings as required. Carry out inspections and site monitoring. See GE-ENV-03001 Section 2 for a list of inspections. Complete all snagging reports. Issue compliance certifications. Conduct Maintenance visits and produce Landscape Audit Reports over a three-year establishment period (maintenance period covering the time required by plants to be established). Landscape Audit Reports: Together with the Contractor, carry-out a joint site audit and inspection during each growing season (June - September).	Carry out and record final inspections. Complete a defects report. Issue of final certification. Produce handover maintenance, management and end-of-life plans for the scheme as required. Agree and undertake ongoing monitoring and reviews.	
Information Exchange <i>During this phase</i>			Internal Stakeholder Engagement Arborist Survey Ecological Studies Existing Utilities	External Stakeholder Engagement Drainage Strategy Lighting Plan Road Layouts					
LVIA/LCA Outputs*	As stated in PE-ENV-01102, Phase 0 and 1 are carried out by the Project Manager.		HIGH LEVEL LCA & LVIA - Baseline Landscape Character and Visual Appraisal. Visual Constraints. For detailed LVIA output follow PE-ENV-01102.	Detailed Level LCA & LVIA - Drafting of Landscape Design Mitigation & Schedule of Commitments. For detailed LVIA output follow PE-ENV-01102.	Implementation of mitigation - Implementation of landscape design mitigation & schedule of commitments. Monitor effectiveness of mitigation. For detailed LVIA output follow PE-ENV-01102.				

* Landscape and Visual Impact Assessment (LVIA) is required within EIA/R. If EIA/R is required, a suitably qualified Landscape Professional will prepare the LVIA. LVIA is a separate process to the Landscape Design and it may be the case that the same Landscape Professional may undertake both LVIA and the Landscape Design. EIA Screening and Scoping will be required to assess if the EIA/R is required and will inform the requirement for the LVIA. Deliverables outlined in the above table refer to the Landscape Design only and will depend on a specific project and the direction of a Project Manager. If LVIA is required, a reference is made separately here to the LVIA outputs for Landscape Professional per each Project Phase. For detail refer to PE-ENV-01102.

Figure 2.1 - Landscape Tasks and Deliverables required at each Project Phase.

3. Landscape Delivery Documentation

Presenting the Landscape Proposals in a way that clearly illustrates the design vision and planting concepts, at the relevant stages of the project, is key to achieving a scheme that is well communicated and understood by all key stakeholders, including community groups, planning authorities or contractors on site. For particular project deliverables relevant to each Project Phase see Section 2 above. Landscape deliverables shall be delivered in both digital and hard copy format as specified by the Project Manager.

Landscape Analysis

Landscape analysis includes identification of sensitive landscape or areas of particular attention within the study area that may need to be considered. Identification of landscape opportunities such as integration with local Green Infrastructure and Ecological network also shall be considered.

- Develop an understanding of the site through an analysis of its context. Use available mapping and GIS tools.
- Develop and document the existing landscape baseline.
- Assist in identification of main landscape elements that may affect or benefit the project.
- Identify any conflicts with existing trees that are to be retained and resolve these with the aim to retain all existing trees and hedgerows, where feasible.

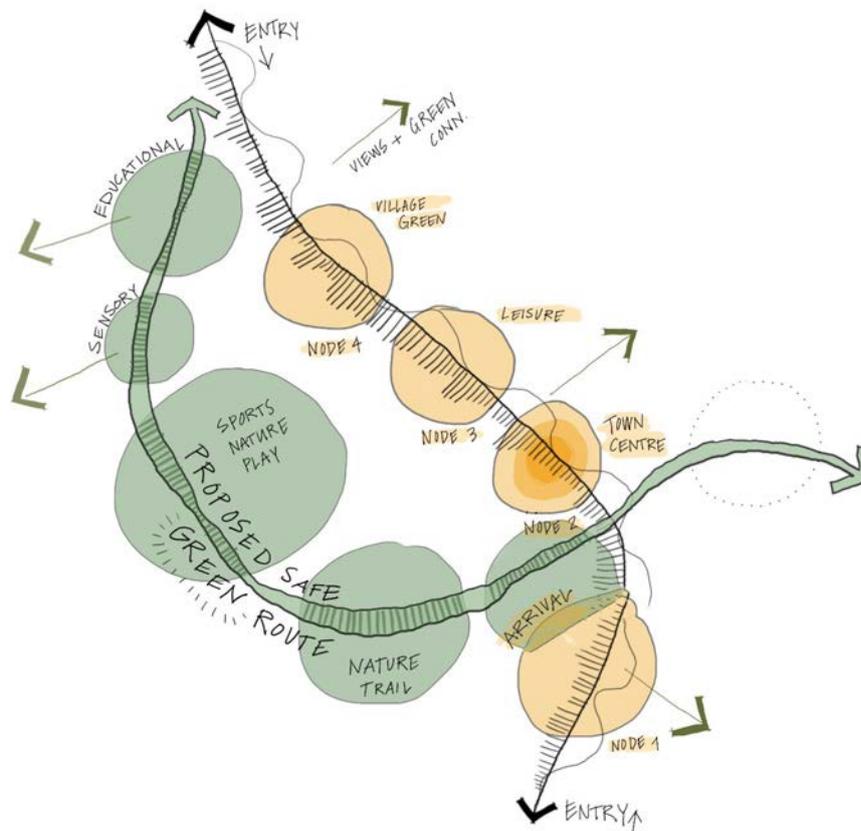


Figure 3.1 - Example of Landscape Concept Sketch

Sketches and Digital Illustrations

At the initial concept design stage or to support public consultations, landscape sketches, axonometric or digital illustrations may be required to convey the scheme to key stakeholders such as local community & business members, council committee members etc. This shall be developed as required by the Project Manager. Sketches and digital illustrations help to envision the key concepts of the design and can be a very effective form of graphic communication. Visualisations are not only a communication tool but can be very helpful for the project team to help develop design ideas and inform the design process. They can be used to demonstrate different design options as the project is being progressed.

See samples of graphics below:



Figure 3.2 - Sample of a conceptual hand drawn sketch based off eye level perspective photograph to represent proposed Soft Landscape Treatments in context of proposed changes to road works. The drawing defines planting within summer season to be able to define indicative tree and shrub planting. Form and character of trees to be defined and indicative typology of low-level planting to be clear.



Figure 3.3 - Sample of schematic photomontage visualisation created in Adobe Photoshop or similar software to define landscape treatments including defining materiality of edging to soft landscape areas and adjacent spaces. Trees foliage colour/crown form and low-level planting form, colour and flowering interest to be represented. Photomontage shows design development from the conceptual hand drawn sketch.



Figure 3.4 - Sample of birds' eye perspective visualisation developed via Adobe Photoshop or similar developed from aerial photography to define layout of soft landscape areas in wider context on road works and surrounding context. Trees foliage colour, crown form and low-level planting form, colour and flowering interest to be represented.



Figure 3.5 - Sample of adult eye view of proposed traffic calming measures developed in Adobe Photoshop or similar based off photo taken during site visit to represent soft landscape treatments of planting areas and care should be taken to accurate representation of the diverse range of local users. Example image represents family, cycling and dog walking due to site being in close proximity to residential areas and local school.



Figure 3.6 - Samples of an artist impression developed in photoshop to convey the project proposal ideas. Soft landscape treatments such as biodiverse rich planting mix / swale planting should be clear and evident. Interfaces between planting and adjacent hard landscape treatments should be clear and vertical edges represented. Seating and other site furniture should be shown. Colour and materiality should be represented correctly.



Figure 3.7 - Before and after of landscape sketches developed in combination of hand drawn sketches overlaid in Adobe Photoshop or similar, demonstrating the landscape treatments in a village/centre used for Pre-planning consultation with local stakeholders.

The ability to represent the landscape or townscape that exists and any proposed changes to it, is an important skill that shall be provided by the Landscape Professional. The careful selection of particular viewpoints can help to address particular concerns specific to the project. Selected viewpoint shall be agreed with the Project manager. They need not be faithful representations when at early concept stages (and as such should be marked clearly as artists impression) but should be appropriate for the circumstances for which they will be used and the intended audience. For further information refer to the UK Landscape Institute Technical Guidance Note 06/19 – Visual representation of development proposals (LI, 2019).

3.1 Landscape Drawings

The set of landscape drawings shall include soft landscape design plans (scale no less than 1:500 with detail), cross sections, details and schedules as required. These shall be developed in appropriate digital format as directed by the project requirements.

If a scheme is being developed in BIM (Building Information Modelling) the landscape professional must be able to coordinate and share digital models with the project team. A typical drawing package shall be agreed with the Project Manager. It shall consist of:

- A general arrangement plan;
- A soft landscape plan with specification notes as required;
- A hard landscape plan as it relates to soft landscape treatments, e.g., tree pits, raingardens etc. with specification notes relating as required;
- A series of proposed sections, elevations and axonometric drawings as required;
- Details on treatment of cut slopes/embankments with clearly indicated proposed final grades and associated vegetative layer shown. Relevant management aims and maintenance actions must be explicitly shown. For example, there may be planting maintenance restrictions in relation to the slope.
- Where applicable, the incorporation of 'green and blue infrastructure' within the street design and clearly show where landscape elements function as part of a Nature-based solution proposal e.g., Tree pits as part of a wider SuDS strategy.
- Boundary treatments drawing indicating soft landscape treatments proposed as part of the scheme's boundary strategy.
- A set of soft (and hard) landscape details with specification notes as required.
- Landscape plan must clearly indicate existing vegetation to be retained, existing vegetation to be removed and any new proposed vegetation. This must align with all Arboriculturist drawings and reports. All retained existing and proposed trees and vegetation types should be annotated with reference to the Guide to Habitats in Ireland (Fossitt, 2000) as appropriate.
- A hedgerow drawing may be required to show the impact of the proposal on existing linear plantings and connectivity is affected or where there are opportunities to improve local ecological connectivity in line with AIPP transport guide.
- All plans shall be annotated, have a well-articulated legend, a clear title block, annotation and notes as required.

All drawings must be developed to appropriate level of detail depending on the Project Phase. Please see Figure 3.9 and Figure 3.10 below.



Figure 3.8 - Sample Landscape Plan at Pre-planning level. Simple way to represent and convey design intentions. Plan should clearly show location of hard and soft elements, tree locations, indicative colour and character of elements should be represented.

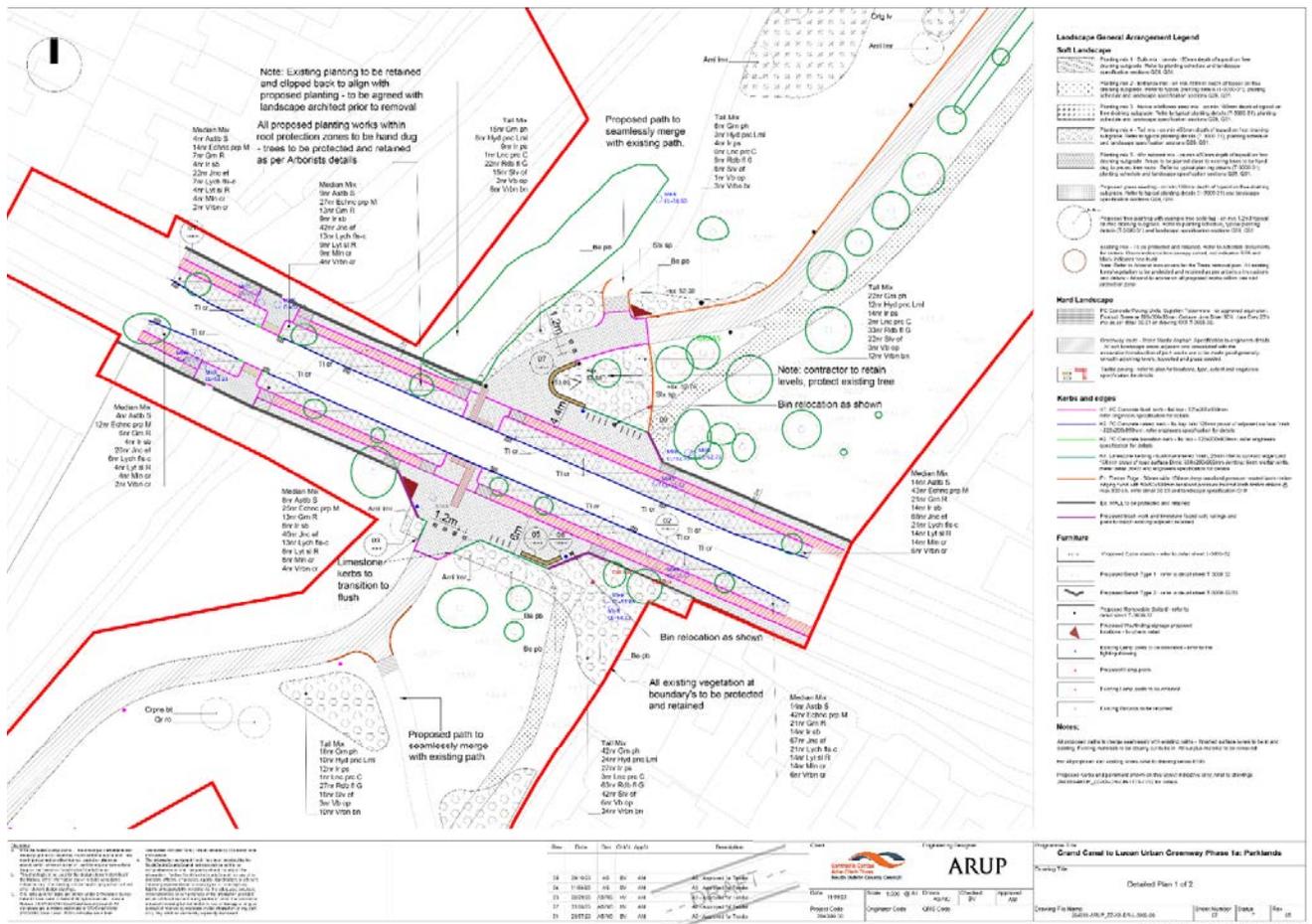


Figure 3.10 - Sample Soft Landscape Plan suitable for Planning submissions/Statutory Processes.

Plans shall include indicative mix and list of proposed planting species and must include:

- References to the planting proposed in the landscape legend;
- Proposed plant spacing as either rate per m2 or centre to centre spacings;
- both Botanical and Common names of plants;
- Plant species and cultivar;
- Plant size proposed, refer to BS 8545:2014;
- Provenance of plants;
- Height at time of planting;
- Number of times the plant has been transplanted;
- Central leader and branch structure e.g., multistem;
- Intended design function, e.g., SuDS, avenue, feature etc.

Soft landscape details shall be included to support the soft landscape plan to demonstrate how proposed treatments can be achieved. These details must be site specific and must reflect the landscape context and conditions.

Note: Details that are not relevant to the site or planting concepts and / or are clearly standard/generic will not be accepted.

3.2 Landscape Report

As outlined in Landscape Professional's Inputs in Section 2, Landscape Report must be provided.

This is a key document that will be used to follow the scheme from the initial concept stages to final management phases and beyond. Landscape Report is a dynamic document that will be altered and refined as the project progresses.

Landscape report is intended to:

- Ensure that the aims and objectives of the landscape proposals are understood and translated throughout the life of the landscape project.
- It will act as a guidance for the years to come. For example, where trees have been planted as part of a SuDS element, this will be clearly communicated in the Landscape report to ensure specific function of the trees in the town / village is retained without impacting services should any changes need to be made.
- It will contain all the soft landscape details specific to the site and the project. For example, information on the size and form of the tree pits will be included and will inform any proposed works in the future.

Landscape report shall be well structured, concise document (10-15 pages) and shall include:

- Details of the soft landscape design vision and planting concepts specific to the project;
- Soft landscape design evolution;
- Details of the overall planting strategy;
- Design development based on site and contextual analysis;
- Key soft landscape concepts and principles, e.g., ecological connectivity, planting for climate resilience, placemaking etc.;
- Compliance and alignment with TII Biodiversity and Landscape Plans, TII Sustainability Implementation Plan, and any other relevant TII Standards or Guidance;
- Landscape Maintenance and Management Plan aims and objectives.

Refer to OTD GE-ENV-03002 Appendix A for a sample Landscape Report.

Each Report will vary depending on the project and its requirements. Landscape Report must be handed over to the relevant Landscape Managers upon project completion and establishment phase.

Note: The Landscape Professional and design team shall have regard to the Schedule of [Environmental] Commitments for all detail design stages and onwards.

3.3 Soft Landscape Specification Requirements

All landscape works related to TII transport corridor landscape treatments require a specification to accompany scheme designs. It will set out the minimum standards for all soft landscape works proposed, so as to meet TII standards and guidance, all relevant British Standards, current environmental and other requirements. The specification will be tailored to each individual project as required, with all landscape treatments proposed covered at the appropriate level of detail. Project specific details will be added as required.

When specifying plants, Landscape Professionals should:

- Have a good understanding of the site and its characteristics.
- Select the right plant for the right place and specify the appropriate growing medium to reduce the plant's stress and therefore risk of any pests or diseases.
- Specify smallest size of plant possible because larger plants are more prone to pests and diseases (within reason given the need to achieve other functions and aims).
- Liaise with nurseries to confirm plant provenance, sizes and stock availability.
- Where imported plant material is considered specify 12 month quarantine within the nursery prior to delivery to the site including audit to prove seed source and propagation technique. Imported species have a greater risk of spreading pests and diseases.
- Always provide an adequate specification and management plan to enforce biosecurity measures.
- Ensure that the design meets local biosecurity policies and check that the specified materials and plants require Plant Passports or APHA notification for imported species.

All landscape specifications must consider sustainability principles. They should emphasize responsible plants and products selection so as to align with TII's sustainability strategies, including circular economy. For example, do many plants come in plastic pots with plastic labels? Can an alternative be considered? Many landscape specifications submitted to TII in the past had not been adapted to current practices and sustainability aims or were not tailored to the specific site conditions. Specifications that are not relevant to the site or responding to the planting strategy or are standard/generic will not be accepted.

'Sustainable specification considers the economic, environmental, ethical and social impacts of a built asset over the entirety of its lifecycle, with an emphasis on sustainable performance at every juncture from asset design to end of life', as shown on The NBS approach to sustainable specification | NBS.

Soft landscape specifications shall include:

- Information related to the notice period for all landscape works to be notified to the landscape clerk of works;
- Clear indication related to the adopted approach in relation to the use of pesticides, herbicides, peat, and imported topsoil across the Project;
- Information over the nationally defined bird nesting season for the area (The National Parks and Wildlife Service, 2016)
- List of injurious weeds species and proposed treatments to be carried out during the Project, in compliance with the relevant legislation;
- Instructions on the selection, delivery, handling, and storage of plants;
- Information over ground preparation in relation to each planting type;
- Growing medium specification;
- Schedule indicating planting time for each plant type;
- Watering schedule indicating application and frequency during establishment, together with applicable restrictions for each type of planting;

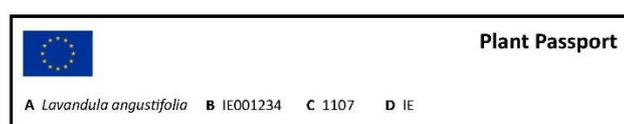
- List of typical inspection visits to be carried out by the Landscape Professional (see Section 2.2);
- Species list to the National Plant Specification;
- Provenance declaration form to accompany all plant material from nursery to site;
- Maintenance and Management Plan (see OTD GE-ENV-03002 Appendix A).

An industry-recognised standard detailed description of planting specifications is covered by BS 3936, enabling the standardisation of plant health, plant size dimensions, containers, and labelling. An outline specification will be required at Stage 4 to inform the statutory process. A detail landscape specification shall be issued at Phase 5 Enabling and Procurement (Tender action evaluation and award).

Biosecurity through Safe Specifications

Landscape Professionals can help safeguard biosecurity through good specification practice. The International Plant Protection Convention (IPPC) provides technical guidance on measures to control plant diseases (Landscape Institute, 2019).

Plant passports are often required for plants specified by Landscape Professionals and therefore they should be familiar with their content and be prepared to review them for compliance. Plant passports have been introduced to minimise the risk of introduction and spread of harmful pests and diseases. Plant health legislation requires all plants sold for planting to have Plant Passports, and all professional plants operators shall be registered with DAFM as required under EU regulations in order to issue plant passports related to all plant material used on landscape projects.



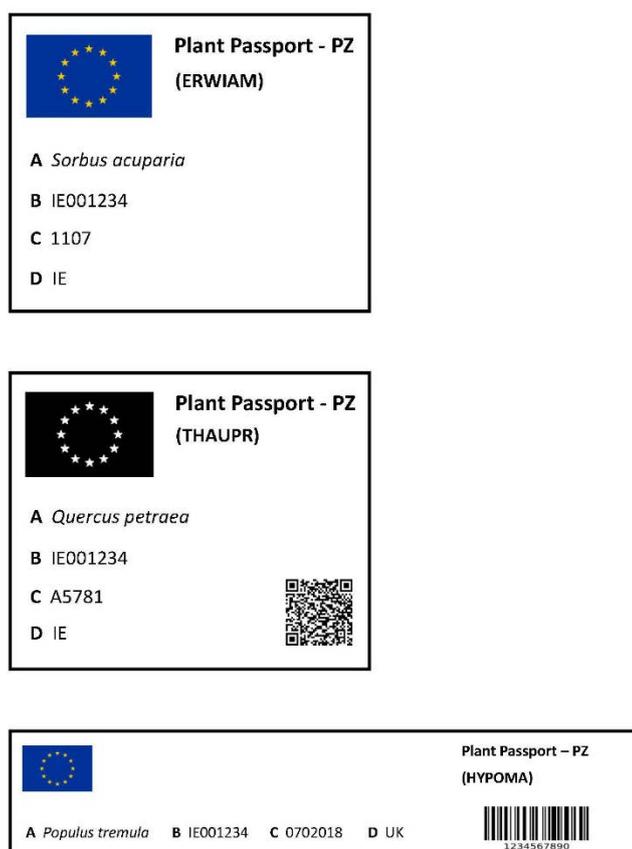


Figure 3.11 - Example of a Plant Passport for Non Protected Zone (left) and Example of a Plant Passport for Protected zone (right) (Government of Ireland, 2019)

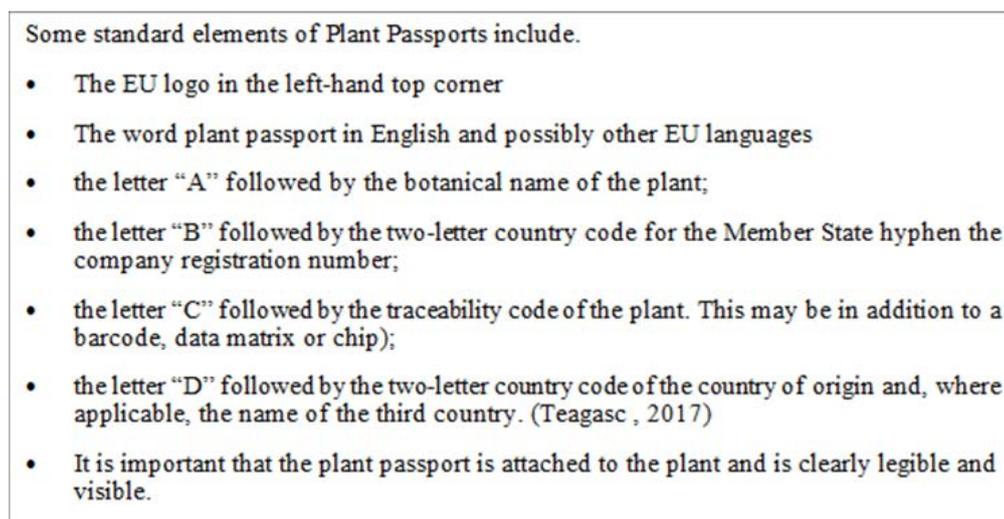


Figure 3.12 - Plant Passport Legend (Government of Ireland, 2019)

Dealing with Invasive Species

Invasive species exist throughout Ireland and can pose a significant risk to semi-natural and planted habitats and schemes. Further details on biosecurity measures and management of invasive species are available on TII publications as outlined below. These documents must be complied with where there is a presence of, or a risk of invasive species occurring:

- TII Publication (Technical) GE-ENV-01105-01 The Management of Invasive Alien Plant Species on National Roads;
- TII Publication (Standard) GE-ENV-01104 The Management of Invasive Alien Species on National Roads;
- Invasive Species Ireland (2012) Horticulture Code of Good Practice to Prevent the Introduction and Spread of Invasive Non-Native Species.

3.3.1 Schedule of Quantities

A measured schedule of quantities to be used for pricing by the Contractor shall be included in the Soft Landscape Delivery Documentation. All items and materials shall be specified by type, British Standards, or supplier.

Note: When naming a specific supplier, the words “or equal and approved” should be included. In this case, it is also essential to add that “approval of the alternate source must be obtained in writing from the specifier”.

This Schedule of Quantities shall be issued at Phase 5 Enabling and Procurement (Tender action evaluation and award).

Refer to OTD GE-ENV-03002 Appendix A for a sample Schedule of Quantities.

3.3.2 Managing Contracts

Inspections and Approvals

All Inspections and Approvals to be done with the oversight of the Landscape Professional and the timing of approvals to be agreed before the plant material arrives on site.

Pre-Start Meeting

When the Contractor has been appointed an initial pre-start meeting shall be arranged between the contractor and all others concerned. This pre-start meeting shall be chaired by the contract administrator and shall establish contract procedures. The Landscape Professional should attend the pre-start meeting.

A clear reporting procedure shall be agreed at the pre-start meeting. This procedure shall identify all relevant roles and reporting procedures including dealing with changes onsite.

At the prestart meeting the Landscape Professional shall detail their level of expectation regarding specific contract items. This may include specific certificates that may be required during construction.

The Landscape Professional should attend site and progress meetings to agree proposed site layouts and inspect and monitor construction works on a regular basis as informed by the notice periods in the landscape specification and as dictated in the contract.

The Landscape Professional shall act on behalf of the client.

The Landscape Professional may be asked to give their opinion on stage payments throughout the contract.

The Landscape Professional shall issue Snagging Reports and Compliance Certifications as required at Phase 6 Construction and Implementation.

The Landscape Professional shall issue a Defects Report and Final Certification at the end of the Defects Liability Period at Phase 7, Close out and Review. Contracts such as the JCLI contract used in the UK, would require the contact details of any supplier and the related documentation, as well as any landscape treatments' maintenance requirements to be included in an Asset Owner's Manual (AOM). It is typical for soft landscape treatments to list in this manual urban furniture such as tree guards and surrounds, off the shelf planters, or signage.

Landscape Audit Reports

The Landscape Professional is to undertake a joint site audit/inspection during each growing season (June- September) with the contractor. An Audit Report is to be issued to the client by the landscape architect within two weeks of the site audit taking place. The site audit report is to quantify any defective plants or maintenance items. Audit reports shall also include items that are to be rectified within the project area.

The contractor shall be obliged to provide photographic proof that items have been rectified to the satisfaction of the Landscape Professional.

3.4 Standard Construction Details

Standard Construction Details (SCDs) related to:

- Planting details for all typologies as outlined in Section 4;
- Tree Pit details;
- SuDS details related to the vegetative layer, and;
- Other relevant treatment and typologies,

have been developed and are referenced throughout this document. With further reference to the placement of soft landscape elements on streets in towns and villages refer to the relevant SCD's as listed below and referenced in OTD GE-ENV-03002.

Standard Construction Detail Sheets	
CC-SCD-03001	Tree in structural soil
CC-SCD-03002	Tree in soil cells
CC-SCD-03003	Tree in soft landscape
CC-SCD-03004	Tree in median
CC-SCD-03005	Tree planting on slope
CC-SCD-03006	Conifer tree planting
CC-SCD-03007	Transplant and orchard tree planting
CC-SCD-03008	Whip / notch planting
CC-SCD-03009	Single hedge planting
CC-SCD-03010	Staggered hedge planting

Standard Construction Detail Sheets	
CC-SCD-03011	Grassed filter strip
CC-SCD-03012	Grassed dry swale
CC-SCD-03013	Grassed wet swale
CC-SCD-03014	Low fertility bioretention in ground planter
CC-SCD-03015	Infiltration basin
CC-SCD-03016	Engineered soil for perennial scheme low fertility planting
CC-SCD-03017	Concrete tree box

4. Overview of Key Soft Landscape Treatments

Proposed national road schemes can have significant effects on the surrounding landscape. Implementation of Soft Landscape Treatments can contribute to functionality, placemaking and identity, as well as performance of places, spaces, streetscapes within and on the approach to Town and Villages on National Roads and Greenways. The term 'Soft Landscape' describes the wide range of vegetative elements established and designed within the constructed and semi-natural landscape and the infrastructure required for their establishment.

Objectives of the Soft Landscape Treatments in transport corridors are:

- Enriching a Place and its Characteristics;
- Communities, Health and Wellbeing;
- Climate Resilience and Sustainable Soft Landscape Design;
- Biodiversity Positive Landscape Design.

A detailed description and explanation of function and value of soft landscape treatments in urban transport corridors is provided in OTD GE-ENV-03002.

This Guide presents soft landscape treatments according to their height. Four main categories of soft landscape treatments have been established, further broken down into sub-categories, which are from here on referred to as typologies.

The four main categories of soft landscape treatments and their associated typologies are:

- **Trees and the Canopy Layer**
Typologies:
Specimen trees (feature trees or ash groves, avenues etc);
Woodlands;
Fruit and nut trees.
- **Hedges and the Shrub Layer**
Typologies:
Hedgerows;
Shrub planting;
Climbers.
- **Perennials and Bulbs**
Typologies:
Perennials;
Bulbs
Ornamental grasses.
- **Verges and the Field Layer**
Typologies:
Lawns;
Semi-natural grasslands;

Ornamental meadows.

The other two main categories of soft landscape elements and their associated typologies referred to in this Guide are:

- **Sustainable Drainage Elements (SuDS).**
- **Vegetation associated with Structures.**

Typologies:

Green walls;

Raised planters.

Roundabouts

Green roofs (intensive / extensive)

Technical requirements related to these Soft Landscape Treatments are detailed in Section 5 of this Document.

5. Soft Landscape Treatments – Technical Requirements

This section sets out:

- General Species Selection Requirements;
- Timing of Landscape Works;
- Technical guidance for each landscape treatment outlined in Section 4;
- Technical guidance for each landscape element outlined in Section 4;

Soft landscape treatments and typologies covered in this Guide are following categorisation outlined in Section 4.

5.1 General Species Selection Requirements

General Species Selection Requirements

Species choice is vital to the success of any planting scheme. Where suitable ecological and site conditions exist, natural recolonisation should be considered as the most appropriate and cost-effective treatment adjacent to protected areas and sites of local ecological importance. Species selection must be informed by local conditions e.g., to promote the use of species present locally to support local habitat connectivity.

Planting and soft landscape treatments must be designed to support intended;

- Uses, placemaking functions and sensory impacts e.g. screening, play, (see Section 3 in OTD GE-ENV-03002);
- Community & health’s benefits and functions;
- Climate resilience benefits and functions;
- Biodiversity benefits and functions.

Soft landscape treatments must be considered at all relevant project phases to ensure their function and value is maximised and that the intended project aims and objectives are satisfied.

In addition, the proposals of new soft landscape treatments shall consider site factors and management requirements, including the elements shown in the Table 5.1.

Table 5.1 - Site factors and maintenance and management requirements to be considered when proposing planting and trees.

Site factors	Maintenance and Management Requirements
Light and water availability at the site;	Ultimate natural size of plants;
Soil pH;	Habit / form;
Soil conditions;	Maintenance (access and frequency of operations);
Exposure to pollutant and salt;	Tolerance to pests and diseases;
Discouraging fauna from hazardous area;	Tolerance to drought;
	Tolerance to pollution and the ability to trap particulate matter;

Site factors	Maintenance and Management Requirements
Slope gradient.	Tolerance to road salt; Tolerance to light or shade; Life expectancy; Seasonal interest (flower, fruit, foliage, stem colour).

Furthermore, the use of native species is an objective of national and international policy, including the National Biodiversity Plan (2002), All-Ireland Pollinator Plan 2015-2020, and the UN Convention on Biological Diversity (1992), as well as contributing to Ireland’s commitments under the EU Habitats Directive, 92/43/EEC and EU Strategy for Supporting the Implementation of Green Infrastructure (European Commission, 2005). TII recognises that the planting of non-native, non-invasive species which have an ecological value may be more appropriate in some urban areas, where resilience, plant form, management, and aesthetic considerations will be important. The use of non-natives can be considered where native plants are demonstrated not to be able to fulfil the desired planting function.

5.2 Timing of Landscape Works

Planting during the dormant season is always preferable, thanks to the reduced chance of damaging a dormant plant during the delivery and installation stages, as well as dormant plant stock generally being more cost effective. Ideally soft landscape treatments would be planted in the late autumn while there is enough warmth for some root development to take place. Root growth generally ceases in winter. Some species of evergreens or conifers benefit from being planted in the early spring. The Landscape Professional should make sure that the optimum planting times are reflected and included in the construction programme, as this will minimise maintenance, plant stress and the likelihood of failure. Where external or programme constraints exist so that planting has to take place at other times of the year, then extra care is required when transporting and storing plants and trees in order to minimise the likelihood of root system exposure or drought damage. Delivery of plants to the site in advance of the site being ready for planting is to be avoided, to ensure temporary storage is minimised. Whether bare root, root balled or containerised, plant stock should always be stored in an upright position, supported and irrigated in a secure area where damage to the stock by construction activities is reduced.

Table 5.2 - Planting season guide for Soft Landscape Treatments.

Type of Plant	Planting Season	
	Start	End
Bareroot trees, shrubs, climbers	1 st November	31 st March
Rootballed trees, shrubs, climbers, conifers	1 st November	30 th April
Container grown shrubs & herbaceous plants	Year round	Year round
Emergent vegetation	1 st February	31 st March
Grass Seeding	1 st April	31 st May
Grass Seeding	1 st August	31 st October

Liaise with the nurseries supplying the plants to confirm to the Project Manager, the availability of stock, nursery delivery times and best time for tree works to take place. Nursery production lead-times will be dependent on their existing available stock, required plant variety and size: orders should be placed well in advance to meet project programme dates.

In the event that a particular plant cannot be supplied in time or in the volumes required, the Landscape Professional shall accept a substitution only if the alternative species proposed fulfils the original soft landscape design intent and function and is appropriate to the local context.

It may be necessary to visit the nursery supplying the stock to tag the plants in advance of them being delivered to site. This will be required in particular where a tree is being proposed as a scheme feature with a specific function to fulfil, such as that of highlighting a junction. The plants' form and branching structure need to be considered in relation to the specific location within the planting context. Visiting the nursery in advance to tag the exact tree specimen required will avoid a poorly balanced or formed tree being delivered to site. For some larger schemes and if specific plant characteristics or volumes are required this tree selection may need to be done several years in advance.



Figure 5.1 - Nursery stock.

Table 5.3 - Planting times as per NBS Specification Q31/125.

Plant Group	Time of year for Planting
Deciduous Trees and Shrubs	late October to late March
Conifers and Evergreens	September/October to March/April
Container grown plants	Anytime, but extra watering may be required at establishment phase if conditions are dry

Finally, all tree planting works shall be undertaken in accordance with the following British Standard Codes of Practice:

- BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations
- BS 3936-1:1992 Nursery stock specification for trees and shrubs;
- BS 3998:2010 Tree work. Recommendations;
- BS 4428:1989 (Section 7) Amenity Tree Planting;
- BS 8545:2014 Trees: from nursery to independence in the landscape – Recommendations.

5.3 Existing Soft Landscape Elements

Existing trees have an important role to play in the streets of our towns and villages. Also considering that trees amenity and biodiversity values increase over time as they mature, so retaining existing trees should be considered as a design objective at the start of any project. Examples of mature trees on the national road network are indicated in Figure 5.2.

When assessing a study area at the design stage it is important to record and assess the quality, health and viability of existing trees and hedges. Where possible, mature trees are to be maintained where they do not cause a hazard to road or footpath users.



Figure 5.2 - Existing mature trees add to the character of the street and act as landmarks, Birr N52.

It may be necessary to get the advice of an approved arborist for a professional opinion on the health and long-term suitability for retention of existing trees. Mature trees may have hidden defects that could render them unsuitable for long term retention in a street. However, many mature trees have long useful lifespans and as noted above their value to a street increase over time, so their removal needs to be carefully considered.

Where mature trees are retained, each tree footprint varies, and the surrounding hard surfaces need to be designed for its unique position within a new streetscape especially where there are new kerb lines. Proposed utility layouts need to be designed to ensure that they avoid impacting the root zones of retained trees. See Figure 5.3.

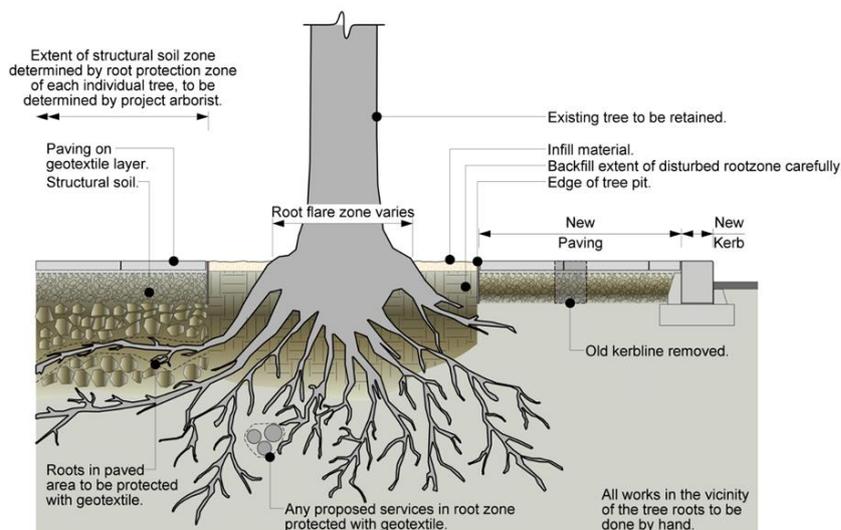


Figure 5.3 - Surrounding Treatment for existing trees.

Where existing paving surfaces have been forced out of line or uplifted by tree roots and cannot be lowered, the paving should either be ramped over the roots, or a suitable finish laid to provide a safe walking surface. See Figure 5.3 Where tree trunks have outgrown the original tree pit, the surface opening should be extended to allow for future tree trunk growth. Bound gravel can be used to allow for irregular tree bases and root flares to be accommodated with minimal damage. Where the carriageway width is being reduced consider a kerb extension locally to facilitate the trees future growth. Where changes are being made to the footway or carriageway, the works contract must include procedures for protecting retained and existing trees. Where trees are to be retained ensuring they are protected for the duration of the works in accordance with BS 5837:2012—Trees in relation to design, demolition and construction— Recommendations. Temporary protective fencing shall generally be required to the outer limit of the canopy (drip line) or a distance equal to half the height of the tree, whichever is the greater. Where works are to be done within this zone the advice of an arborist should be sought as limited works may be carried out if done with care and under supervision of the Project Arborist or Landscape Architect.

5.4 Soil Health and Management

Soil are a non-renewable resource. Therefore, existing soil resources must be protected and carefully managed, e.g., topsoil must be conserved where possible. For guidance on soils and their management refer to CC-SPW-00600.

5.5 Soft Landscape Specification

5.5.1 Trees and the Canopy Layer

Trees are an important element to soft landscape treatments and play a pivotal role and function in establishing valuable, healthy, biodiverse and climate resilient spaces. Refer to OTD GE-ENV-03002 for key functions and values of this treatment type.

For the purposes of this Guide, the broad soft landscape category of trees has been organised into the following sub-categories:

- Specimen trees, i.e., individual trees chosen for a specific purpose. Can be planted as a stand-alone feature or in an avenue;
- Woodlands, i.e., groups or clusters of trees where the canopies meet;
- Fruit and nut trees, i.e., trees maintained for food production.

The following paragraphs will provide technical guidance to inform the correct species selection, organisation and specification for each of these sub-categories, with subsequent guidance on planting, maintenance, and management across all categories of trees and groups.

5.5.1.1 Specimen Trees

Specimen trees are individual trees chosen for a specific purpose and include species sized from 12-14cm in girth (3-3.5m in height) and larger.



Figure 5.4 - Photograph of a Specimen trees planted in hard landscape used along a residential avenue at Horse Fair, Grand Canal Dock, Dublin.



Figure 5.5 - Photograph of a Specimen trees planted in soft landscape used along a residential avenue at Cuil Duin Ave, Dublin.

Species Selection

Species choice is vital to the success of any planting scheme. Species selection should be informed by local conditions and the proposed function of the tree in the landscape and streetscape. The tree choice must be considered at the early stages of design and the design strategy for tree planting should refer to the design principles as outlined in the OTD GE-ENV-03002. For each project the tree planting strategy outlining planting concepts and planting functions should be summarised in the Landscape Report.

Diversifying the species and the age class of tree can reduce threats from pests and diseases. Conversely, monocultures are the best environments to cause uncontrollable pest and disease outbreaks. For TII schemes no single species should account for more than between 10% -15% of any single plantation / proposal. This is an approach to tree species selection that is also seen in Dublin City Council's tree strategy (2016) which requires that:

- No more than 10% of same tree species;
- No more than 20% from the same genus, and;
- No more than 30% from the same family.

The plant palette must be informed by the local context and part of the species selection will be to ensure compatibility with local plant and tree communities. An overview of how the tree species have been selected is to be included in the Landscape Report for each scheme.

The function and timescale in terms of the required impact of the tree in the scheme will also influence the designer's consideration of species, size and planted densities. When specifying trees, the size at time of planting will be directly related to the function of the tree in the scheme and its role in the landscape. For example, in a town core a large size may be specified to ensure the tree has immediate impact, but this tree will require more aftercare and may have a high failure rate if not properly maintained. In the transition zone, where trees may be planted at a higher density and have a screening function, smaller sizes of trees may be specified where they will attain height more quickly. Where there are site constraints which mean that the available root zone is limited this may then inform the use of smaller trees which will require less rooting areas to establish. Where space allows such as in the Transition zone, trees with large canopies should be prioritised as the bigger the tree canopy the greater the benefits to the corridor. Refer to the OTD GE-ENV-03002 for detail on the functions and values of this treatment type.

When specifying trees ensure that if they are to be placed beside the carriageway that they have a clear stem height of 2.5m so they do not impact on pedestrian or cyclists head room. Pruning may be required in the first 5-10 years to encourage the canopy up and over the carriageway if the canopy needs to be trained to suit the road requirements.



Figure 5.6 - Tree clear-stem heights.

See Figure 5.6 and Figure 5.7 for further detail. Generally larger trees will create a more immediate impact so in streets and feature trees 18- 20cm girths or 20-25cm should be considered. Trees at junction should be a species with a high branching canopy to maximise visibility to traffic signs and signals.

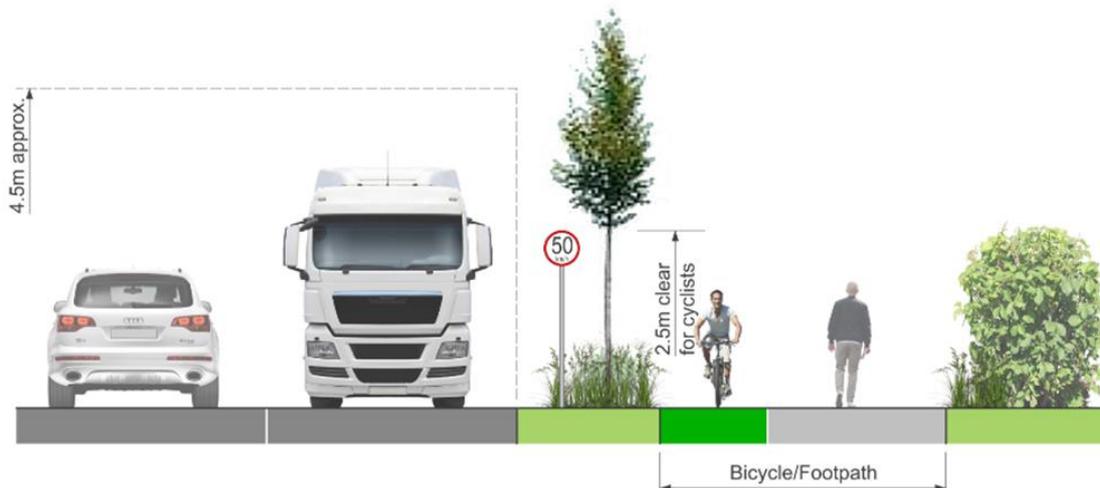


Figure 5.7 - Tree specified with 2.5m clear stem – year 1.

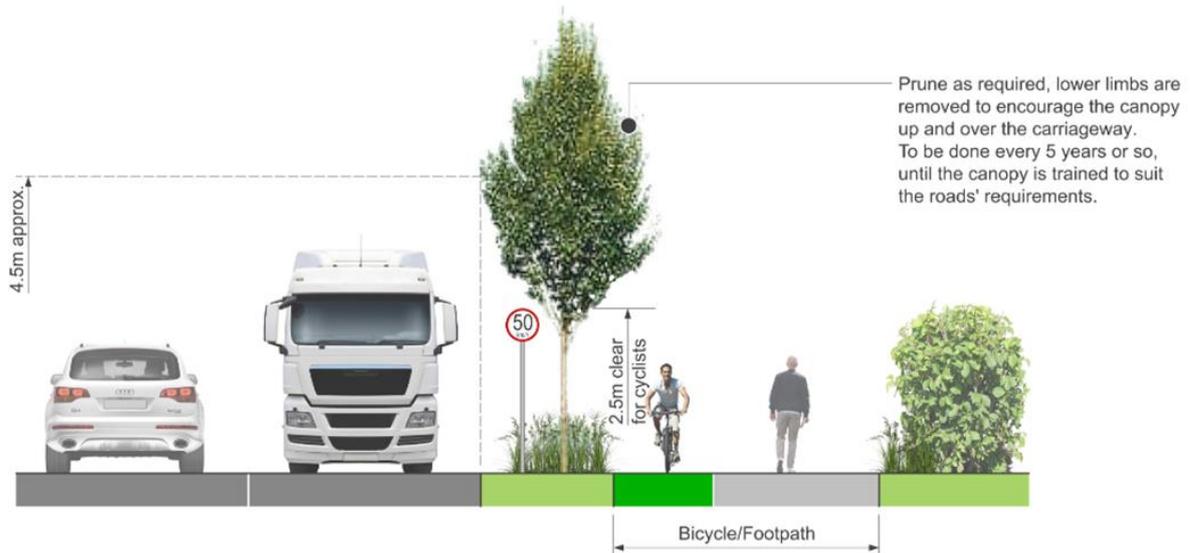


Figure 5.8 - Tree specified with 2.5 clear stem – year 10.

Individual trees shall be specified according to their girth which is a measurement of the circumference of the tree trunk measured one metre above the ground. See Figure 5.9.

Table 5.4 shows how trees of various sizes are referred to and measured in relation to their girth size.

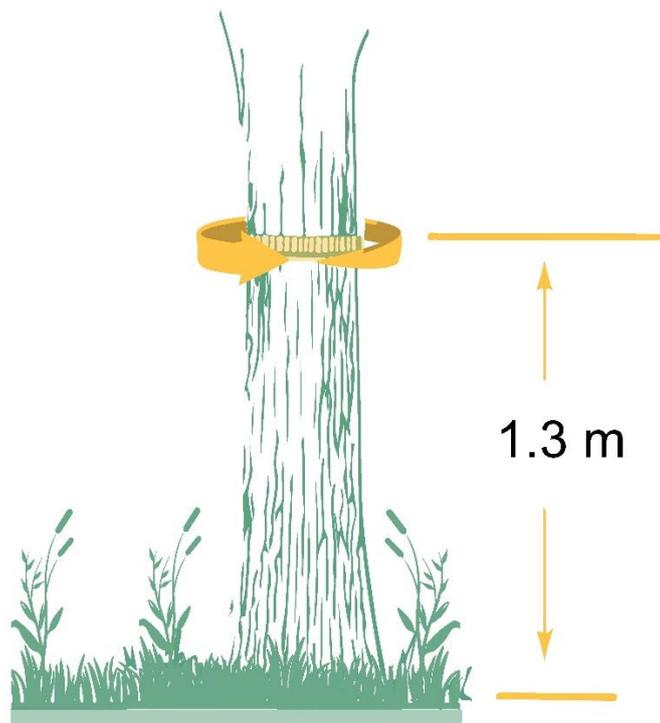


Figure 5.9 - Girth size measurement should be taken at 1300mm above the ground from where the tree sprouted or was planted with a flexible measuring tape. Measurement shall be taken horizontally.

Table 5.4 - Tree Classification Chart

Specification	Tree Girth (cm)	Approx. Height (m)	Root Ball diameter (cm)	Height Root Ball (cm+-)	Weight Root Ball (kg)
Light Standard (LS)	6-8	2.40-2.75	Bare Root	Bare Root	Bare Root
Standard (S)	8-10	2.40-2.75	Bare Root	Bare Root	Bare Root
Select Standard (SS)	10-12	2.75-3.00	Bare Root	Bare Root	Bare Root
Heavy Standard (HS)	12-14	3.00-3.50	40	30	50
Extra Heavy Standard (EHS)	14-16	3.50-4.25	40-50	30/35	100
Advanced Heavy Standard (AHS)	16-18	4.25-5.00	50	35/40	135
Semi Mature (SM)	18-20	5.00+	60	40/45	150
Mature (M)	20-25	4.00-6.00	70	40/50	250
Mature (M)	25-30	5.00-6.00	80	45/55	360
Mature (M)	30-35	6.00-7.00	90	50/60	550
Mature (M)	35-40	6.00-8.00	100	60/70	750
Mature (M)	40-45	6.00-8.00	110	65/75	800
Mature (M)	45-50	6.00-8.00	120	65/75	1000

When specifying larger trees, Landscape Professionals must consider how the root ball will develop over time. Root balls must be able to fit into the available space and manoeuvring them must be planned out and considered within the risk assessment and related registers.



Figure 5.10 - Rootball (18-20cm) of a semi mature Tilia eu. 'pallida'. 60cm wide and 40cm deep.

Table 5.5 - Root Ball Classification Chart (Van Den Berk, 2017)

Root Balls			
Stem Circumference (cm)	Diameter Root ball (cm)	Height root ball (cm)	Weight root ball (kg)
12-14	40	±30	50
14-16	40-50	±30/35	100
16-18	50	±35/40	135
18-20	60	±40/45	150
20-25	70	±40/50	250
25-30	80	±45/55	360
30-35	90	±50/60	550
35-40	100	±60/70	750
40-45	110	±65/75	800
45-50	120	±65/75	1000
50-55	120	±70/80	1250
55-60	130	±70/80	1500
60-70	140-150	±70/100	1750-2000
70-80	160-170	±70/100	3000-3500
80-90	180-200	±70/100	3500-4500
90-100	200+	±70/100	4500-5500
100-120	200+	±70/100	5500-7500

*All measurements and weights are averages and can be used as an indication only.

Upon the arrival of the trees on site, Landscape Professionals must assess the tree and its rootball and check for any damage such as large cut roots, which would indicate inadequate transplanting procedures. Refer to the below Table 5.6 for the terms commonly used in the specification of trees.

Table 5.6 - Tree Specification Terms

Specification	Annotated as	Explanation
Twice Transplanted Tree	2x	As per specification
Three Times Transplanted Tree	3x	As per specification
Four Times Transplanted Tree	4x	As per specification
Rootballed in Hessian	RB	Root wrapped in biodegradable material
Wire Root balled	WRB	Root wrapped in steel wire
Container Grown/Air Pot	CG	As per specification
Feathered Trees	F	Branches to the base or ground
Clear Stem Trees	CS	No branches to specified clear stem (CS) height
Bare Root Trees	BR	As per specification

Planting and Organisation

Tree spacing and their arrangement pattern shall be decided based on the context and the design intent. Trees can be laid out according to different spatial arrangements; geometric layouts will see trees being located along a single line or parallel lines emphasising linear symmetry (for instance, to create an avenue); trees can again be arranged in a square, hexagonal or quincunx configuration. Trees layouts can also be organised to reflect a more organic distribution, to mirror plant arrangement occurring in natural plant communities.

The organisational patterns of tree spacing shall depend on the context and the design intent. The more regular layout of linear symmetry (to create an avenue for example), square, hexagonal or quincunx tree layouts may be contrasted with a more organic distribution evidenced in plant arrangement in natural plant communities.

Tree Planting Methods

Generally, trees will be planted in either prepared pits in **soft ground** such as verges or grassland or in **hard landscape areas** where they will be planted in below ground pits where a more technical approach may be required to ensure they have suffocated roots zone areas and growing condition to ensure their long-term survival.

Trees planted in Soft Landscape

There will generally be greater opportunities to plant trees in open ground within the rural fringe and the transition zones where there may be more space within the road corridor. Trees planted in this way are more cost effective and require less underground infrastructure. In areas where tree pits are excavated, excess soil may be used on other areas of the road corridor for planting or mounding to create habitat features.



Figure 5.11 - Tree planting in soft landscape areas with single stake method.

For details of planting in soft ground see CC-SCD-03003.

Trees planted in Hard Landscape

In the town and village core where there is competition for space, both above and below ground, it is more likely that trees may be planted in areas of hard landscape.



Trees planted in hardscape areas, an exposed tree grill on the left and a recessed paving tree pit in Waterford

For details of planting in hard landscape areas see CC-SCD-03001 and CC-SCD-03002.

5.5.2 Soils for Trees in Urban Sites

In urban context, optimal root space is not always available. Two key methods have been developed to overcome these constraints, focusing on the design of suitable soils and substrates, and commercially produced systems able to support the adjacent paved areas whilst allowing for tree root growth. These systems involve:

- The use of structural soils;
- The use of engineered soils;
- The use of modular cell-based systems that support the footpath while allowing roots access to uncompacted soil.

Each of these systems are outlined as follows.

Structural Soils

Structural soils shall be used in any trafficked area (including zones subject to maintenance traffic). This type of soil creates a robust layer beneath the surface, whilst providing good rooting medium and soil volume for the tree.

Structural soil is made from a mixture of 80% crushed stone and 20% soil. As such, a minimum soil volume of 10m³ per tree shall be specified for larger tree pits. Biochar shall be added to improve nutrient uptake and water holding capacity.

The compacted crushed stone is used to transfer the surface loading.

This method is commonly referred to as the Stockholm System.



Figure 5.12 - Collage of images showing the process and layers of construction for a structural soil linear tree planting strip in Grangemocklar.

Engineered Soils

Engineered soils shall be used in any area subject to vehicular traffic (including maintenance traffic). This type of soil creates a robust layer beneath the surface, whilst providing good rooting medium and soil volume for the tree.

Engineered soils consist of 60-70% graded clean silica sand and 40-30% Organic matter – the latter is added to increase the soil's aeration, water retention, and available nutrients. This method is commonly referred to as the Heicom's Amsterdam Tree Sand or Soil.

Where engineered soil or structural soils are used it is important that non-organic soil components do not contribute to the plant nutrition and that the resultant soil volumes should be increased pro-rata to compensate for this deficiency.

Modular Cell-Based Soil System for Tree Planting

Modular cell systems use structural load bearing components in the form of plastic crates to transfer the vertical loading from the footpath or adjacent road to a compacted base layer, whilst allowing tree roots' access to an uncompacted soil volume located between the plastic cells' voids. During construction, these modular systems can be stacked to various heights and form different shapes adapting to specific space requirements.

Similarly, to the use of structural soil described previously, soil cells can also perform a stormwater treatment function. Runoff rainwater can enter the system through pervious paving or drains. In such instances, sufficient drainage must be considered at the base of the tree pits, or a provision shall be made for a network of trees to be connected in a linked drainage chain. Irrigation, aeration, and services can be integrated into the soil cell layout.



Figure 5.13 - Series of photos showing the construction of a modular cell based soil system at Clarendon Street by Colm Kenny Landscape Architecture

Trees Planted in Medians or Roadside Verges

Trees can be planted in medians where space allows. Figure 5.14 and Figure 5.15 show examples of such planting done in DCC.



Figure 5.14 - Semi Mature Tree with Rootball installed in central median – Dorset Street, Dublin (Credit Dublin City Council Parks Instagram account)



Figure 5.15 - Retrofitted Median Planting – Nicholas Street, Dublin

Tree pit volume will depend on the tree species chosen. Fastigiate trees will require less rooting space than wide canopy forms. The function of the tree, its canopy volume and the size of the available rooting zone need all to be considered when design on tree species to be used in a project. In linear areas such as medians or buffer zone / verges, tree pits will be combined to maximise the root zone area. Adjacent trees can share the same pit growing space as root systems can overlap. Root barrier can be placed to the edge to limit root growth into the carriageway. In most urban situations and especially isolated medians, one of the most critical roles of the pit is to store water for tree growth. Structural soil solutions such as the Stockholm system should be considered.

Trees planted in medians should have a high canopy form to maximise visibility or be of an upright form where the canopy will not impact on the adjacent traffic lanes. The extent of root zone available in a median or island planter will dictate the number and size of trees planted.

If shrubs or perennials and to be planted under trees in the median they should not be above 1.1m eventual height or if hedges are proposed, kept trimmed to this height with an annual or biannual maintenance cut. A planted or permeable surface to the median will allow a greater exchange of oxygen into the soil and increased opportunities for drainage. Low maintenance drought tolerant species are encouraged and also species that can tolerate salt. All planting in the transition zone and town and village streets to comply with the aims of the All-Ireland Pollinator Plan. For lists of suggested species to use see the Guide for Transport Corridors for advice. https://pollinators.ie/wp-content/uploads/2019/10/TransportCorridors_actions-to-help-pollinators-2019-WEB.pdf. Planting on median strips can have maintenance implications which may require lane closures so consider this when choosing plant types and tree species.



Figure 5.16 - Planted verges to both sides of the road in the Transition Zone, Killeagh Co. Cork.

5.5.3 Rooting Volume Requirements for Urban Tree Planting

For successful urban tree planting, adequate soil volume must be provided so as to allow root growth. There are a number of methods for calculating soil volumes: the most common one being the use of the crown projection (or area under the tree drip line) to calculate a specific volume of soil.

When tree planting is arranged in lines or grids, continuous planting trenches shall be designed so that multiple trees can share rooting space, therefore allowing the required rooting volume for each tree to be reduced by up to 25%. This same reduction can be applied to trees sharing a wide, unpaved, and continuous soft primary rooting zone - such as a roadside verge.

Refer to Table 5.8 for optimal rooting volumes related to urban trees of different canopy widths, as recommended by best practice guidance.

Table 5.7 - Table illustrating target rooting volumes for urban trees. Target rooting volumes must be in line with the Local Authority requirements.

(Lindsey & Bassuk, Specifying soil volumes to meet the water needs of mature urban street trees and trees in containers, 1991)
 (Lindsey & Bassuk, Redesigning the urban forest from the ground below: a new approach to specifying adequate soil volumes for street trees, 1992)

Mature Canopy	Canopy Area	Target Soil Volume
LARGE (8m dia+)	30m ² +	30m ³
MEDIUM (5m-8m dia+)	20m ² +	12m ³
SMALL (3m-5m dia+)	7m ² +	5m ³

Table 5.7 provides the minimum soil volume required for trees of different canopy widths to be used in existing urban transport environments - such as existing town centres and streets. Where feasible, optimal root volumes shall be proposed. It is recognised that during construction there may be below ground features that will impact on the optimal rooting volumes. In such instances, Landscape Professional must be consulted and shall advise on the suitable approach to resolve the issue making sure design intention is achieved and the planting strategy is followed. In these circumstances, TII may approve volumes smaller than the minimum values shown in Table 5.8.

Table 5.8 - Table illustrating optimal rooting volumes for urban trees.

Mature Canopy	Canopy Area	Minimum Soil Volume
LARGE (8m dia+)	30m ² +	10m ³
MEDIUM (5m-8m dia+)	20m ² +	6m ³ (IIN)
SMALL (3m-5m dia+)	7m ² +	3m ³

Fastigate trees (i.e. trees with branches that grow erect and close together) will require less rooting space than wide canopy forms.

Where structural soil systems are used, the size of the rooting zone shall be increased proportionate to the amount of nutrient rich soil compared to structural soil. Designers shall look for opportunities to extend tree pits into adjacent green areas where possible, by creating root channels or break out zones.

For further information on planting trees within urban settings refer to Trees in Hard Landscape (Trees & Design Action Group, 2014).

5.5.4 Above Ground Finishes

Once the below ground conditions and planting typology has been approved, the above ground treatment and finish shall be considered. This shall be informed by the landscape function and the local setting.

Trees planted in town / village settings may require protection to support them as they establish. Depending on the location and project requirements, flexible bamboo matting affixed to the trunk to protect the bark from the injury and damage may be considered. This can be removed once the tree establishes and the bark becomes thicker and less susceptible to damage.

When trees are located in denser urban areas, they may require a metal tree protection to defend the tree against risk of damage from vehicles, especially in locations near parking and there is a higher risk of collision.

Tree grills can also be used in a multi-functional manner for cycle parking or creative seating opportunities. Project Landscape Architect can assess the scheme and define when this is appropriate.

Careful and correct installation of the tree guards / stakes must be carried out. See Figure 5.18.



Figure 5.17 - Trees protected by metal guards in Midleton, Co. Cork.

Newly planted younger trees in more protected settings will also need support. This can be in the form of wooden stakes.

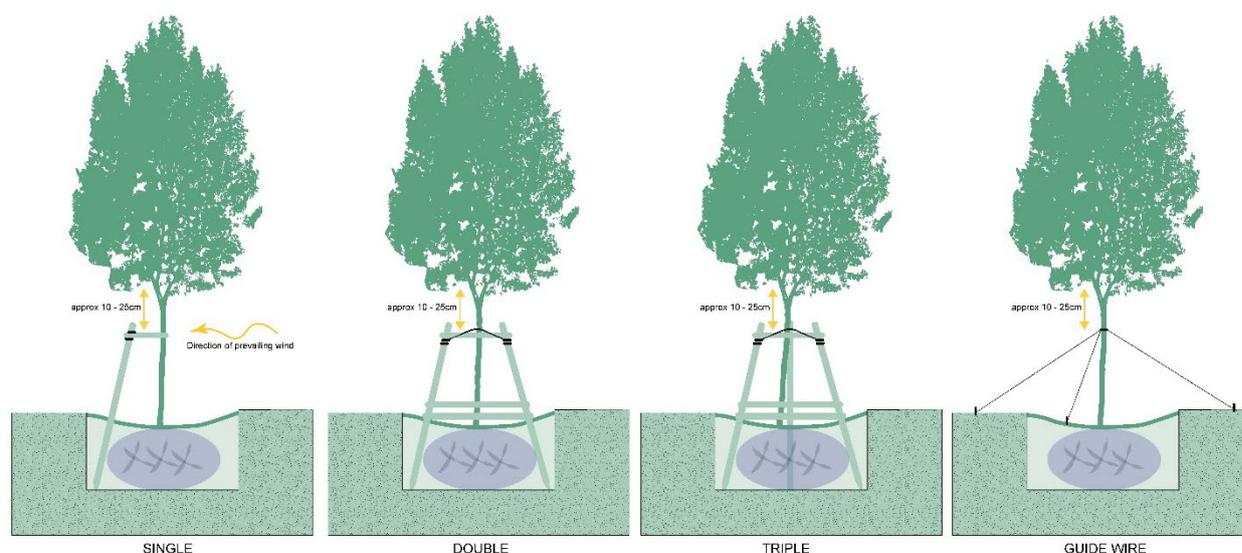


Figure 5.18 - A range of tree staking approaches can be taken as shown in the above graphic.

Replanting Trees

Consideration may be given to recycling young trees from a disturbed site and replanting them within the scheme or a local site. An Arborist is required to assess the existing trees suitability for replanting. This must be agreed with the Project Manager or Local Authority.

For example, Young Alder (*Alnus glutinosa*) trees as well as Oak (*Quercus spp.*) can be replanted in this manner, where they are present within the land-take of an urban transport corridor scheme.

Each species of tree can have unique treatments to maximise the chance of successful replanting, certain young trees shall be cut back or coppiced first and the stumps relocated directly to the receiving site, preferably during the dormant winter season. After re-sprouting, trees should reestablish quickly.

The advice of an Arboriculturist may be required to ensure the viability of the trees as candidates for lifting and replanting. Involvement of Arboriculturists must be at Project Managers request.

5.5.4.1 Woodlands and Planted Belts

For the purposes of this document, woodlands and planted belts are considered as groups or clusters of trees where canopies meet. Refer to GE-ENV-01102 for more information on the general principles of woodland planting along TII transport corridors. This document relates to woodland planting on the approaches to towns and villages, and on the streets along National Roads. For detail on the function and value of woodland and tree belts along transport corridors refer to the OTD GE-ENV-03002.

Species Selection

TII publication “A Guide to Landscape Treatments for National Roads Schemes in Ireland” (2006) also describes woodland treatments in terms of high canopy or low canopy woodlands.

High canopy woodlands have dominant species such as Oak, Ash or Scots Pine, whereas low canopy woodlands have dominant species such as Alder, Hazel, Birch or Willow. Where planted belts are proposed with a screening function a proportion of evergreen planting may be required. Where woodlands or woodland belts are proposed to create linkages with existing woodland or tree belts, the species mix should reflect the plant communities they are connecting to.

Specification

Woodland trees shall be specified as whips, transplants, or seedlings. Alternatively, woodland trees may be seeded.

Whips and Transplants

Whips are single-stemmed bare root plants 60-80cm tall with no side shoots. Transplants are bare root plants up to 2.5m tall.

On exposed sites, dense planting (e.g., one plant per square metre) shall be considered in order to achieve faster establishment. Thinning will be required over time.

In species specifications, the Landscape Professional shall aim for planting that will ensure canopy closure over three years. Regular maintenance must be carried out during the 'establishment phase' to ensure successful and quick establishment.

Seedlings

Seedlings are grown in root trainers (i.e., plastic modules containing compost), and can demand the use of higher volumes of single use plastic. Seedlings are planted in summer or autumn.

Direct Seeding

Although it can be unpredictable, direct seeding is a cost-effective method for woodland establishment. This method performs well on lowland sites with good, agricultural quality soils, and can result in quicker canopy cover than conventional planting.

This method allows woodlands to be established from seeds which are either drilled in lines or broadcast randomly. Large seeds such as acorns shall be planted to a depth of 10cm. Smaller seeds shall be planted to a depth of 2cm and rolled into the ground with a light roller.

Weed control is essential in the first year. Woodland established by direct seeding will also require thinning over time. Sites close to existing woodlands could suffer from seeds being consumed by small mammals.

Organisation and Planting

Structural diversity must be considered when planting new woodlands and woodland belts. Planting may be carried out in phases by specifying trees at different growth stages, to achieve a varied mix. This diversity may be encouraged by including open areas or glades within the woodland. Long Term management plans should consider up to 25% open canopy cover for glades and open habitats. Alternatively, retaining existing mature trees as a foundation for the creation of a new woodland may extend the age class within the woodland.

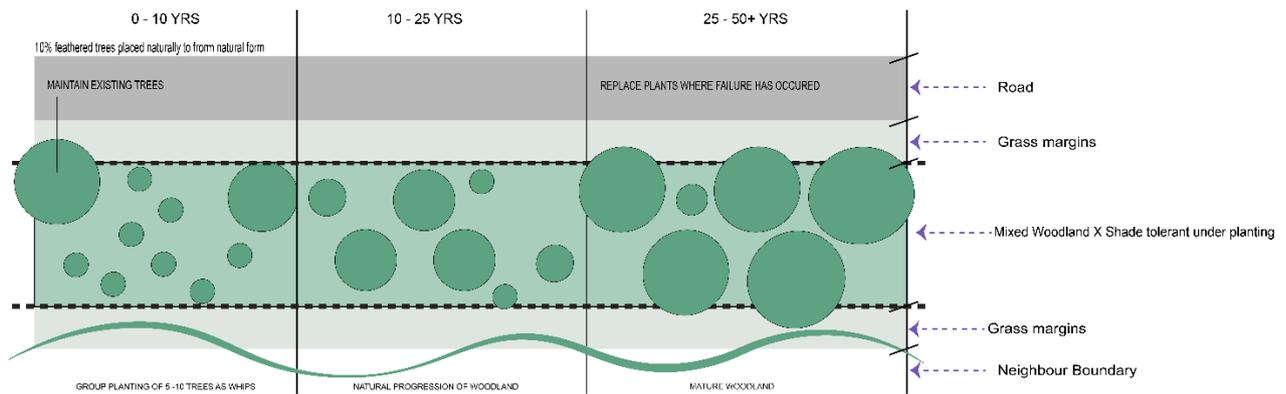


Figure 5.19 - Planting structure of woodlands and Planting structure of woodlands and planted belts to ensure diversity.

For woodland planting, trees generally will not require staking. However, appropriate staking and ties shall be provided if plants are taller than 1.5m high.

During establishment, fencing should be used to protect young trees from rabbits or hares. Individual rabbit guards may also be used; however, where guards are used, stakes should be provided for plant support. Plastic fixings are to be avoided. Stakes should be removed typically after one to two growing seasons. Tree guards should be removed typically after three to four growing seasons. Seedlings must be healthy and well-established before tree guards are removed.

5.5.4.2 Fruit and Nut Trees

For the purposes of this document, Fruit and Nut Trees are defined as trees maintained for food production.



Figure 5.20 - Planting of apple trees.

Species Selection

Species selection will vary depending on the planting location. Local varieties should be used where possible. The designer must consider groupings of different fruit and nut varieties to ensure successful pollination. Fruit trees have the benefit of seasonal variety in that they have a blossom in the spring followed by fruit in late summer/early autumn. Where there is a local urban food initiative it may be possible to support community groups who are introducing food into the local town or village. For example a community orchard is being proposed along the Tralee to Fenit Greenway which aims to ‘reconnect with nature through food landscape and community.’

Specification

When specifying fruit and nut trees, their variety and rootstock shall be considered as these determine the size of the tree at a mature stage.

Fruit and nut trees are specified based on their height, not their girth size.

Most fruit trees are grafted onto rootstocks (i.e., the plant part located below, ground influencing the tree’s height reached maturity).

The table below outlines the specification criteria for selecting Apple trees. Similar criteria apply to the selection of Cherry, Plum and Pear trees. A selection of heritage fruit trees is available from a selected number of Irish suppliers.

Apple Tree selection criteria,		
Rootstock name	Rootstock type	Ultimate Height
M27	Extreme Dwarf	1.2M
M9	Dwarfing	1.8-2.4M
M26	Dwarfing	2.4-3M
M6	Semi Dwarfing	3M
M106	Semi Dwarfing	3-4M
M25	Standard	6-7M

Nut trees may also be worth considering for amenity planting.

Many native hedge and shrub species produce edible fruit. For a list of species refer to OTD GE-ENV-03002.

Topsoil for fruit and nut tree planting shall be uncompacted, free draining and should be 600mm deep. Some varieties will grow better atop small mounds of soil.

Organisation and Planting

Fruit and nut trees shall be planted within orchards or in selected locations where their falling fruits will not impact on surrounding road or active travel surfaces or cause a hazard.

Linear orchards are suited to the transition zone where space may allow for longer rows of planting for example along active travel provision or greenways. In some areas it may be possible to plant fruit trees as espaliers along a boundary wall or fence to function as screening.

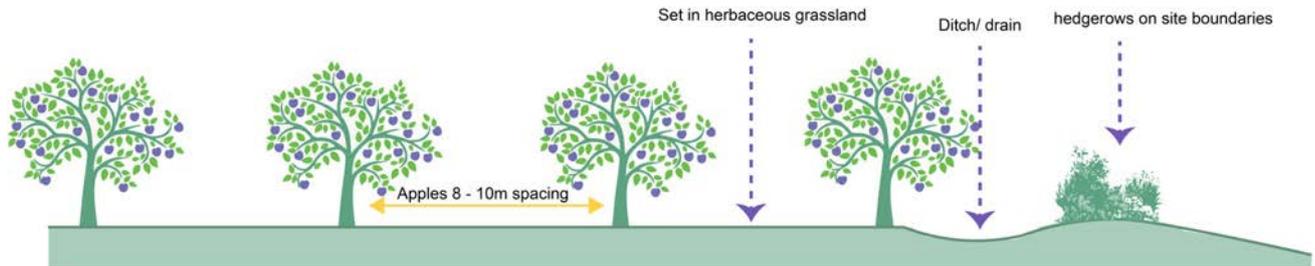


Figure 5.21 - Diagram of linear orchards that could be planted in Rural Fringe and Transition Zone.

Larger orchards shall be designed in square or quincunx layouts to ensure each tree receives adequate amount of sunlight.

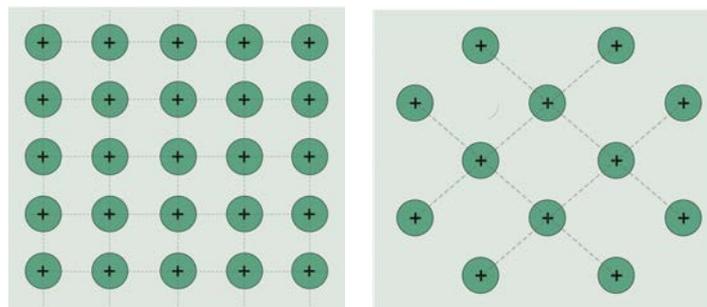


Figure 5.22 - Orchard planting layouts plan diagram showing how best to optimised arrangement Square on the left, Quincunx on the right side.

Refer to CC-SCD-03007 for a planting detail.

5.5.5 Hedges and the Shrub Layer

Hedges and field patterns define the rural Irish Landscape and contribute to landscape character and identity, as well as biodiversity. In urban transport environments, hedgerows help create lower speed environments by narrowing a driver’s field of vision. For more details on function and value of this treatment type refer to OTD GE-ENV-03002.

For the purposes of this document, ‘Hedges and Shrub Layer’ consists of native hedgerows, ornamental hedgerows, shrubs and climbers.

Refer to TII Publication GE-ENV-01102 A Guide to Landscape Treatments for National Road Schemes in Ireland for more information on the general principles of hedgerow planting along TII transport corridors in rural areas and All Ireland Pollinator Plan for guidelines on planting and management of transport corridors.

Shrubs are defined as woody plants with several stems that are smaller than trees, whereas hedges are closely planted shrubs that form a vegetated screen.

The criteria for selecting hedge and shrub species may be governed by habitat or biodiversity criteria. In some instances, these may be detailed in an Environmental Impact Statement.

Species Selection

When planting hedges it is best to select native hedging, which reflects the local landscape character and links with existing local vegetation. Principal hedgerow species should include Hawthorn (*Crataegus monogyna*) Blackthorn (*Prunus spinosa*) Holly (*Ilex aquifolium*) and Hazel (*Corylus avellana*), however complementary species should be included at lower densities in mixed hedgerows and these may include Spindle (*Euonymus europaeus*), Elder, (*Sambucus nigra*), Guelder Rose (*Viburnum opulus*), Dog Rose (*Rose canina*), Willow (*Salix sp.*), Wild Cherry (*Prunus avium*) or Honeysuckle (*Lonicera periclymenum*). Mixes are to chosen that will provide blossom throughout the season. Be sure to source species of native (preferably local) provenance.

Species	Blossoming Period
Willow	March-April
Blackthorn	March-April
Wild Cherry	April-May
Crab Apple	April-May
Rowan	April-May
Birch Cherry	April-May
Whitebeam	May-June
Spindle	May-June
Whitethorn/Hawthorn	May-June
Guelder Rose	May-July
Elder	June

List of some native hedgerow species that are insect-pollinated with their approximate blossoming period as outlined in AIPP.

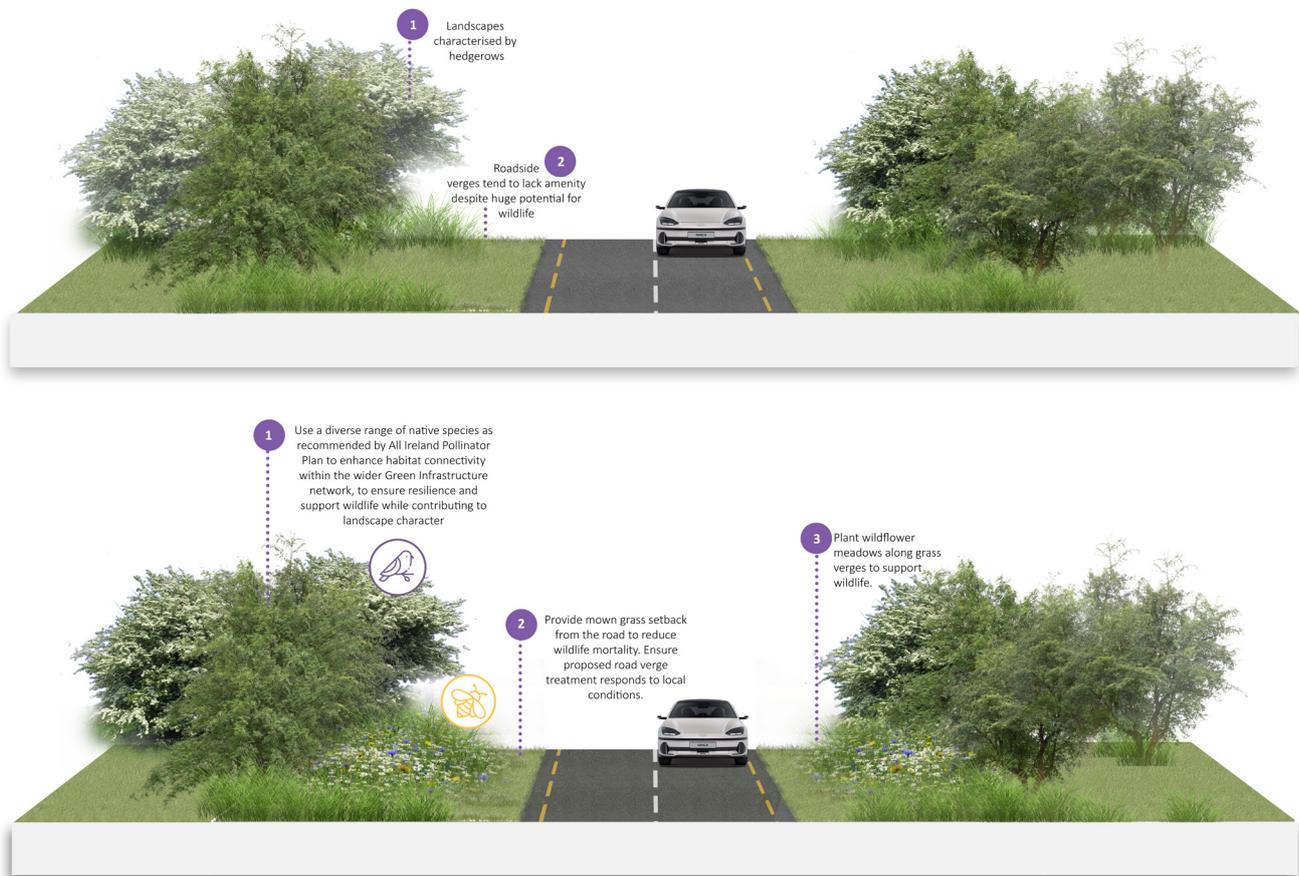


Figure 5.23 - Preferred treatment of Rural Fringe with Native Hedgerows. All Native Hedgerows shall be designed according to AIPP.

Ornamental hedgerows

Ornamental hedges may be permitted in urban or sub-urban contexts where their design function will not be fulfilled by native species alone. Smooth or rough, airy or solid, dark or light, hedges vary in character depending on context and species chosen. Species selection should be informed by design function. The use of single species hedges such as Hornbeam (*Carpinus betulus*), Beech (*Fagus sylvatica*) or Yew (*Taxus baccata*) may have a strong design effect but offer less in terms of habitat or biodiversity, so it is not recommended.

Refer to CC-SCD-03009 for planting detail.

Shrubs

Shrubs may be selected for their form, colour, scent, winter structure etc. Species selection of shrubs therefore requires knowledge of these aspects of their performance. Where shrubs are to be included within perennial schemes species should be chosen which are compact or are suitable to hard pruning.

Climbers

Climbers may be used where there is little space for in ground planting and where the use of vertical space for greening is appropriate.

Climbers can also be used to improve the appearance of boundaries and can promote biodiversity in tight street corridors as they take up little ground space. They also deter climbing of walls or structures and discourage graffiti. Climbers or wall shrubs may be used to reduce the visual impact of transport corridor boundaries. The following criteria should be considered when selecting species to plant for vertical greening.

- Growth types- if no climbing supports are provided self-clinging varieties to be used.
- hardiness – ability to withstand potential shading and restricted root zones areas especially when planted close to boundary foundations. ;
- fast growing – screening and graffiti mitigation can be achieved faster however quick growing species such as Parthenocissus can quickly outgrow its space and will need regular pruning if used ;
- low maintenance - species that do not require frequent pruning.
- Biodiversity function – evergreen plants also provide nesting and shelter for biodiversity

Species worth considering are Honeysuckle (*Lonicera periclymenum*) and Ivy, (*Hedera helix*) Vertical planting should not interfere with the structural integrity of the wall or structure and when planting ensure future maintenance of the wall or structure is allowed for.

Specification

Hedging, shrubs and climbers shall be specified either as Bare Root (BR), Pot Grown (Pot), or Rootballed (RB). Bare Root hedging of less than 80cms tall is referred to as a whip; as transplant, when greater than 80cm.

Table 5.9 below describes the specification of bare root hedging.

Table 5.9 - Specification of hedging plants.

Specification	Explanation
1+0	1 year seedling, not yet transplanted
1+1	1 year seedling, planted out for a further year
1+2	1 year seedling, planted out for 2 further years
2+2	2-year-old plant, planted out for further 2 years

Taller hedge species such as Hawthorn (*Crataegus monogyna*) shall be specified as 900 to 1000mm high. Smaller species shall be specified as 300 to 450mm high. Design intent shall dictate the height of the plant.

Organisation and Planting

Plants shall be arranged in a staggered layout or offset line. Bare root hedging shall be planted with five plants per linear meter to create a single line. If the design intent is to achieve a mass planting effect, then planting density may be increased. To achieve an instant effect outside of the planting season, pot-grown plants can be used, although this is not recommended. Refer to CC-SCD-03010 for planting detail.

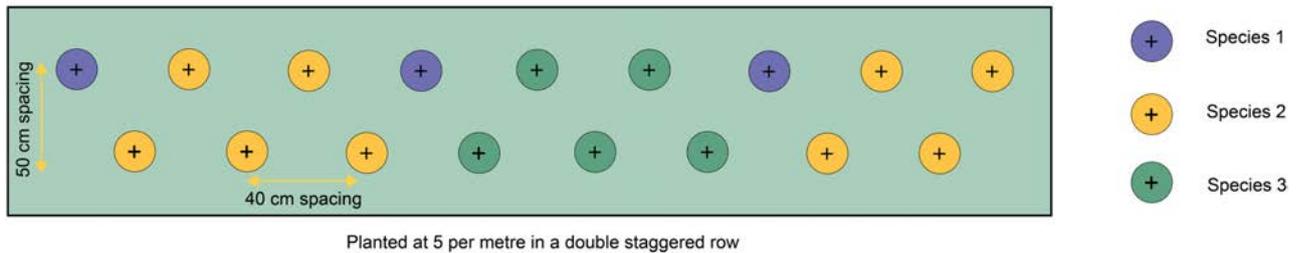


Figure 5.24 - Double staggered hedgerow planting layout.

Shrub layer



Figure 5.25 - Shrub and perennial planting at an island outside of the Busaras, Dublin.

Where shrub planting is specified within areas for natural recolonization, plants may be spaced at distances up to 1.5m. The spacing should be reduced when quick establishment is desired. The spacing of shrubs will vary depending on the form and characteristics of the species been selected. Three plants per m² achieves a closed canopy relatively quickly and is appropriate for more ornamental schemes or streets in urban areas. Climbers will generally be supplied as pot grown with a cane support. If planting against a wall, position the hole 30–60cm from the base, where the growing conditions should be better. The size and depth of foundation of the wall or structure will determine the extent of possible root growth.

BS Standards to comply with: BS 3936 part 1: 1992 nursery stock. Specification for trees and shrubs.

Table 5.10 explains specification terminology associated with shrubs and hedging.

Table 5.10 - Specification terminology used with shrubs and hedging.

Shrub characteristics	Specification	Meaning
Root Condition	Bare root	Grown from seedlings, hardwood cuttings and then transplanted - supplied bare root
	Rootballed	Shrub lifted and rootball wrapped in hessian or steel wire
	Container Grown	Shrub grown in a container for sufficient time to allow root growth to have penetrated the medium without being root bound; well-balanced in accordance Seedling shrubs specified by root volume
	Cell Grown	Their root system is surrounded by a small amount of soil; a midway point between bare root hedging and pot grown hedge plants
Size	Height	Dependent on the species characteristics, commonly specified in cms
	Volume (as supplied in pots)	0.5L (note commonly referred to as a P9 size pot), 1L, 1.5L, 2L, 3L, 4L, 6L, 7.5L or 10L
Habit/form	Branched	Plant with lateral shoots arising from main stem or from central point
	Bushy	Plant without primary, clearly defined stem
	Leader and laterals	A Shrub with leader and laterals is a plant with a single dominant shoot and with significant side shoots
	Several Shoots	A plant with several shoots arising from ground level
	Single Leader	A Plant with a single dominant shoot with few, if any, side shoots
	Number of breaks	The number of branches / breaks / lateral growth that can be expected from a given size of a specified plant

Consideration may also be given to the establishment of live cuttings of Willows (*Salix ssp*) and Alder (*Alnus glutinosa*). These shall be planted in the dormant season and may be more appropriate to planting schemes at the edge of a town, where more space is available, or for sensitive locations such as riverbank stabilisations. Advice of the project ecologist or a Local Authority Biodiversity officer must be sought.

Where translocation of native vegetation is proposed, Landscape Professionals must consider whether land take is required to arrange for a suitable storage area in the vicinity of the donor site; this will allow the material to be temporarily stored until it can be transferred.

Bareroot plant works shall be carried out during the dormant season, during favourable weather conditions. Rootballed plants shall be planted during the dormant season, that is to say from 01st November to 30th April.

Container grown plants may be planted throughout the year but will require additional monitoring if planted during the summer months when drought periods may be expected. No preparatory planting works shall be performed if the ground is frozen or flooded or during drought periods.

All hedge and shrub planting works must be undertaken in accordance with British Standard BS 3936, parts 1 to 11 Nursery stock.

5.5.6 Perennials, Bulbs and Ornamental Grasses

The category of perennials, bulbs, and ornamental grasses includes a wide variety of species of different sizes and forms. The choice of species, layout of planting and combination of colours can reflect stylistic choices and societal drivers. For further guidance relating to function and value of this soft landscape treatment refer to OTD GE-ENV-03002.



Figure 5.26 - Ornamental grasses and perennials along roadside. Example in Ashbourne, Co. Meath.



Figure 5.27 - Bulb planting along roadside. Example from Summerhill, Co. Meath.

Refer to the below for an overview of these elements:

- *Perennials*: Herbaceous Perennial plants identifies a group of small flowering species that live for more than two years;
- *Bulbs*: flowering or ornamental bulbs are a type of herbaceous perennial plant that usually forms underground;
- *Ornamental Grasses*: ornamental grasses are usually perennial species which regrow in spring each year from their roots, where they have stored energy from the previous season. This category can include evergreen, winter dormant or deciduous species.

This section provides technical guidance to inform species selection, specification, and organisation and planting for Perennials, Bulbs and Ornamental Grasses. Guidance on maintenance and management across all categories is also included in Section 6.

Specification

Bulbs shall be specified according to a number representing the bulb largest circumference when measured perpendicular to the axis of the stem. This measure is to be expressed in centimetres. For example, a size 10 allium bulb is an allium with a 10cm circumference. The size of the bulb must be considered to ensure successful establishment.

The grading system is species-specific, and it is outlined in Table 5.11.

Table 5.11 - Herbaceous perennials and bulbs characteristics for species selection.

Herbaceous perennials Bulbs		
Common Name	Minimum Height	Top Size
Tulip	10cm	12cm+
Daffodil	12cm	16cm+
Hyacinth	14cm	19cm+
Amaryllis	24cm	34cm+
Crocus	4cm	5cm+
Asiatic Lily	12cm	14cm+
Large Allium	19cm	20cm+
Small Allium	4cm	6cm

Perennials and ornamental grasses are supplied in pot sizes ranging from 1 litre to 10 litres. As for Bulbs, Perennials' spacing requirements are species-specific and in-depth knowledge of each plant is required. As a standard, Perennials supplied in 2 to 3 litre pots shall be spaced at 5-7 plants per meter, however a variance from this may be acceptable if in keeping with each species requirements and the design intent.

Schemes using P9 plant sizes (i.e.1 litre) at densities of 10 plants per square metre may be used to achieve rapid establishment, ensuring fast canopy closure.

This treatment type may also include perennial and annual edible species.

Refer to CC-SCD-03016 for planting detail.

Organisation and Planting

The use of herbicides and pesticides shall not be permitted in planting beds containing perennial and ornamental grasses or bulbs. Adequate site preparation combined with the use of sterile mulches will reduce maintenance inputs. A sand mulch of 75-100mm shall be used to reduce the need for weedkiller treatment.

During initial establishment, regular watering will be required: this provision shall be included in the maintenance plans.

Perennials shall be ideally planted during Spring, from March to April, to allow for roots' development before weeds become established.

Container grown plants may be planted throughout the year but will require regular monitoring during the summer months when drought periods may be expected. No preparatory planting works shall occur if the ground is frozen, flooded, or during periods of drought.

5.5.7 Verges and the Field Layer

The term 'field layer' is used to define grasslands and floralistic mixes that cover the ground plane. This layer includes verges and grassed areas and are a common landscape type throughout the road network and within urban settlements. For information on the function and value of this soft landscape treatment refer to OTD GE-ENV-03002.

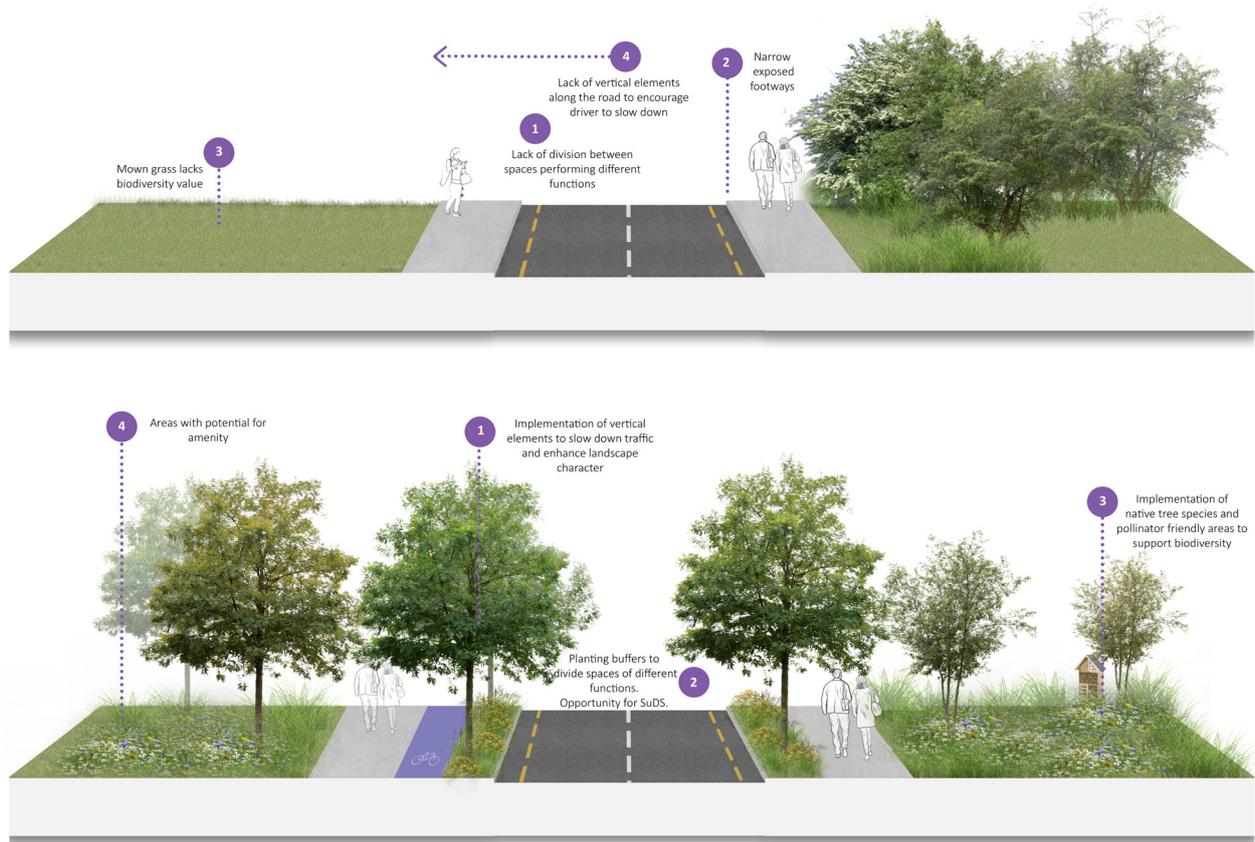


Figure 5.28 - Preferred treatment of Transition zone.

For the purposes of this Document, the broad soft landscape category of Verges and the Field Layer has been organised into the following sub-categories:

- Lawns: Areas of short cut grass;
- Semi-natural grasslands: grassland habitats that support a wealth of biodiversity. Short cut meadows are also included within this category;
- Ornamental Meadows: highly colourful flowering species mixes created with imported commercial seeds.



Figure 5.29 - Ornamental non native meadow with annual mix forming an edge treatment to a local park. A temporary fence has been installed as a deterrent for pedestrians as to avoid damage to planting via walking and damaging plants & compacting soil.

Species Selection

When specifying lawns, semi-natural grasslands or ornamental meadows, priority shall be given to selecting species from indigenous sources.

The process of natural colonisation depends on soil geographic factors, the seed bank and reproductive material within the soil, and the type of plant communities present within the surrounding landscape. Natural recolonisation is likely to be most successful on small areas, close to existing plant communities. The soil within the treatment of the receiving site must have similar geographic factors as that soil which sustains the adjacent native plant communities (donor site). Such plant communities will provide a seed source for the receiving site through wind and animal dispersal. The selection of natural recolonisation as a treatment must be based on an awareness of the presence of invasive weeds and non-native invasive species in the surrounding landscape.

Semi-natural grasslands shall be established in extensive areas and will have the capacity to integrate with the native seed bank. Considerations described in *A Guide to Landscape Treatments for National Road Schemes in Ireland (2006)* should inform the selection. Key points as follows:

- Seed mixes shall be sourced from recognised suppliers. Suppliers should be required to supply a list of the species, their percentage composition within the mix and the seed sources;
- Seed mixes shall be locally appropriate species, which would germinate easily over a wide range of conditions, and which are widespread;
- Seeds of rare or protected species shall be avoided unless their origin is guaranteed from local indigenous seed sources;

- Species with restricted ranges shall not be specified outside their natural geographic range;
- Species requiring specialist habitat, germination or management conditions shall be avoided or minimised as these species are less likely to establish successfully;
- Legumes such as clover, and in particular white clover (*Trifolium repens*), shall not be used as they can become quickly invasive.

Specification

Refer to the definitions shown on Table 5.12 when looking to specify grasslands and meadows.

Table 5.12 - Field layer specification terminology.

Field Layer Terminology	
Terminology	Explanation
Seed	Principal criterion for purchase of seed is its Origin/Provenance
Origin	The place in which an indigenous stand of plants is growing or the place from which a non-indigenous stand was originally introduced
Provenance	The place in which any stand of plants, whether indigenous or non-indigenous, is growing
Clumps	Traditionally perennials were sold as clumps dug from open ground and root-wrapped for protection - marginal and aquatic plants are often sold as clumps
/plugs	Most perennials can be supplied plug grown. Plugs have a smaller soil volume and typically are sold as a tray and have less than 1litre of soil per plug.
Pot grown plants	Most perennials can be supplied pot grown. Pot grown plants have a soil volume typically more than 1litre of soil and are sold as 1 plant per pot.
Turf	A pre-grown mix of plant species grown off-site and can be laid as matt. This method is more intensive but can increase chance of full coverage in year 1.

Organisation and Planting

Sowing shall remain the primary approach for the establishment of lawns, semi-natural grasslands, and ornamental meadows. Sowing may be achieved by:

- Hand sowing - most cost-effective option for small areas;
- Drill sowing - suitable for larger areas, it can be undertaken with tractor-mounted or a pedestrian drill machine;
- Hydro-seeding - suitable for inaccessible sites such as sloped embankments. Process involves the spraying a slurry mixture of seed and mulch onto the prepared surface.

Sowing or turfing shall be undertaken in Spring or Autumn in suitable weather conditions.

Natural colonisation of the bare soil from the surrounding seedbank or surrounding habitats may also be allowed, particularly where the site is adjacent to an existing high-quality grassland.



Figure 5.30 - Traditional meadow maintenance on minor rural road.

Refer to A Guide to Landscape Treatments for National Road Schemes in Ireland (2006) for the order of preference when establishing semi-natural grasslands.

Nutrient-poor soils can be used for establishing semi-natural grasslands. The use of subsoil as the sowing medium to establish species rich, semi-natural grasslands can encourage the development of broadleaved herbs, while limiting the development of grass species.

The sowing of ornamental meadows is generally undertaken with commercial seed mixes from non-native provenance and therefore shall not be used.

Table 5.13 - Soil level requirements.

Location	Requirement
Above adjoining pavement or kerbs	20mm
Shrub areas	Higher than adjoining grass areas
Within root spread of existing trees	Unchanged
Adjoining soil areas	To tie in.

Where soils are part of SuDS (Sustainable Drainage Systems) the levels shall be designed to accommodate runoff as per landscape and drainage drawings.

5.6 Soft Landscape Elements

Soft Landscape Elements can be placed within soft landscape treatment areas. These elements can be defined as two main categories, SuDS elements & vegetation associated with structures) and their associated typologies, as listed in Section 4 and detailed in the OTD GE-ENV-03002.

5.6.1 SuDS Elements

There is a wide range of guidance documents on SuDS systems, this section should be read in conjunction with the 'NTA Greening & Nature-based SuDS for Active Travel Schemes' and any relevant guidance documents produced by the relevant local authority.

SuDS elements with a vegetated component include:

- Swales;
- Bioretention and rain gardens;
- Bioretention Tree pits;
- Filter strips;
- Wetlands and Infiltration Basins.

Refer to OTD GE-ENV-03002 for detailed descriptions and information on function and value of SuDS treatments.

Specification

Swales

Native and, where appropriate, non-native plant species may be used to provide a dense and durable vegetation cover that creates habitat and forage for indigenous species. In rural settings, swales shall be planted with native species that reflect local conditions.

In urban settings, non-native pollinator species that can introduce diversity within the public realm planting may be used. Swales may also accommodate trees.

Planting must be able to tolerate fluctuating levels of moisture and allow water infiltration without impeding water flow. Grasses used in swales shall have a soil binding root structure and a dense cover, in order to increase infiltration and stabilise the soil. Where the runoff is originated from roads and hard standing areas, therefore likely to contain grit during the winter months, planting shall be salt tolerant.

Grassed swales shall be sown with robust low maintenance grass species as described in OTD GE-ENV-03002.

The use of native translocated marginal and emergent vegetation from an adjacent wetland may be appropriate to facilitate rapid colonisation of newly created wet swales.

Marsh plants will naturally recolonise areas where the implementation of check dams have created permanent damp or wet conditions.

Erosion control fabrics, coir blankets, or geotextiles shall be considered on slopes of 1:2 or steeper, and in locations prone to heavy precipitation.

Refer to CC-SCD-03012 and CC-SCD-03013 for a planting detail.

In specific high impact locations, it may be appropriate to plant a mix of non-native species into the Bioretention system.

In such instances, the planting palette will be determined by the composition of the soil and the resultant infiltration rates. For instance, drought tolerant species may be appropriate to soils with high infiltration rates, as this condition generally leads to dry conditions for planting for most of the year.

For further guidance see Perennials, Bulbs and Ornamental Grasses in Section 5.5.6.

Bioretention Tree Pits

Species planted in Bioretention Tree Pits must be able to withstand harsh urban environments and regular rainfall flood. Tree species must be selected considering sightline requirements and existing utilities.

For further information on species selection, refer to the following guidance documents:

- Tree Species Selection for Green Infrastructure: A Guide for Specifiers (TDAG, 2018);
- Trees in Hard Landscapes: A guide for delivery (TDAG, 2014);
- The Right Trees for Changing Climate Database (Forest Research, 2019), and;
- Urban Tree Manual (Forest Research, 2018);
- Greening and Nature-based SuDS for Active Travel Schemes (NTA, 2023).

Refer to CC-SCD-03014 for a planting detail.

Filter Strips

The purpose of a filter strip is to slow the flow rate during stormwater events, whilst allowing sediment to be trapped. Planting selection shall not impede the water flow. In this case, robust low maintenance grass species well suited to semi-natural grassland treatments may be appropriate. Such species may include mix of Creeping Bent (*Agrostis stolonifera*), Red Fescue (*Festuca rubra*) and Sheep's Fescue (*Festuca ovina*).

Refer to CC-SCD-03011 for a planting detail.

Wetlands and Infiltration Basins

Permanent shallow standing water bodies may become colonised by native aquatic vegetation including Bulrushes (*Typha latifolia*), Reeds (*Phragmites australis*), and Yellow Flag Iris (*Iris pseudacorus*). Colonisation will be facilitated in water bodies with a consistent depth of 0.6m to 1m, and they will require regular maintenance to keep the water body open.

To prevent the occurring of obstruction and blockages, consideration must be given to including a deeper zone at the centre of the pond to minimise the risk of colonisation. This design may incorporate surrounding shallow benches for colonisation.

Refer to CIRIA SuDS Manual C753 - chapter 17 Swales for further details, in particular with regards to swale design requirements and related risk assessments.

The use of native translocated marginal and emergent vegetation from adjacent wetlands may be considered to facilitate colonisation of newly created ones.

The area adjacent to Wetlands' standing water, as well as the Infiltration Basins' surface shall be sown with semi-natural grassland species.

Refer to CC-SCD-03015 for a planting detail.

5.6.1.1 Planting of SuDS

Planting considerations related to individual SuDS elements should relate to treatments already outlined in Section 4 that is to say: Trees and the Canopy Layer, Hedges and the Shrub Layer, Perennials, Bulbs and Ornamental Grasses and Verges and the Field Layer.



Figure 5.31 - Planted raingarden in Sheffield, UK.

Where a pond is constructed near an existing wetland, the shallow margins will be colonised by aquatic and emergent vegetation. This process can be encouraged with the use of translocated native vegetation.



Figure 5.32 - Wetland with complete colonisation Bullrush (*Typha latifolia*).

To ensure successful planting establishment, it is recommended the timelines be adhered to:

- Planting of SuDS elements shall be carried out between April and September;
- Emergent planting shall be undertaken between 1st February and 31st March;
- Tree works shall be undertaken during the dormant season;
- Seeding (or Turfing) shall be undertaken in Spring or Autumn in suitable weather conditions.

All shrub and herbaceous perennial planting must be carried out in accordance with BS 3936-1:1992 Nursery stock.

Other key guidance as follows:

- Alien species shall not be introduced into semi-natural habitats. Plants must be sourced from approved nurseries that grow native species of local provenance;
- Wetland plants shall be directly planted into the subsoil;
- Topsoil must not to be placed within 300mm of the Wetland's permanent water level.

5.6.2 Landscape on Structures

Landscape on structures has been sub-divided into 6 categories listed below.

- Green walls ;

- Climber Structures
- Raised planters.
- Roundabouts
- Green roofs (intensive / extensive)

Greenwalls

In areas where a soft landscape treatment is desired but there is limited space, a greenwall should be considered to provide the benefits of soft landscape treatment on a vertical structure. These can be used as buffer planting, biodiversity improvement, energy optimisation or for visual amenity. Depending on the function of the greenwall, species selection should be adjusted to best suit site conditions and desired function.

Greenwalls are at high risk of drought during summer seasons, a maintenance strategy should be in place to ensure the green wall is well maintained.



Figure 5.33 - ANS Global Greenwall, Trinity, Dublin

Climber Structures

In areas where a soft landscape treatment is desired but there is limited space, a climber structure should be considered to provide the benefits of soft landscape treatment on a vertical structure where a green wall is not viable. These can be used as buffer planting, biodiversity improvement or for visual amenity. Species selection should be adjusted to best suit site conditions and desired function.

A maintenance strategy should consider a safe working environment for maintenance staff when carrying out required maintenance.



Figure 5.34 - Virginia creeper, multi stem Birch in a planting mix of hydrangea and libertia and bulb planting, Granville Place. Credit Dublin City Council Parks Instagram.

Raised Planters

Raised planters should be considered when conditions below ground do not enable planting to be done on the ground plane and / or when the road layout is temporary or subject to change in the near future. These planters should provide adequate soil volume for species selected.

Planters are at high risk of drought during summer seasons, a maintenance strategy should be in place to ensure the planters are well maintained.

A maintenance strategy should consider a safe working environment for maintenance staff when carrying out required maintenance.



Figure 5.35 - Above ground planter planted within traffic Island to improve biodiversity and visual amenity value, O'Connell Bridge. Credit Dublin City Council Parks Instagram

Roundabouts

Soft landscape treatments on roundabout require unique considerations for the design. Roundabout design should include consideration on distinct design to act as a placemaking / wayfinding element while also including required visibility splays etc. Refer to TII guidance regarding roundabouts.



Figure 5.36 - Roundabout showing landscape design by Cathal O’Meara Landscape Architects, Cork.

Green Roofs

Green roofs should be considered on structures that sit within the context of soft landscape treatment areas or where the roof will make a significant impact to the visual character of a vista. Green roofs can be sub-divided into three main categories.

Intensive Green Roof

Intensive green roofs are typically used on buildings where planting is been used to support the access and use of the roof terrace. This consists of full depth soil for planting of shrubs, trees and or grasses to provide high amenity value which is supported by a irrigation system.

Consideration should be given to the safe access of staff to maintain the soft landscape elements in safe working environment.



Figure 5.37 - Extensive Green Roof on a bus shelter in Utrecht, Netherlands.

Extensive green roofs are typically used on under-utilised roof space and provide a low maintenance requirement plant mix. This consists of a shallow depth of soil and typically no irrigation system is installed. These plant mixes can vary from sedum, wildflower, biodiverse mixes and water tolerance plants if been combined with a blue roof system. Consideration should be given to select the right plants for the conditions of the roof.

The first two years of maintenance(watering) are critical to ensure the plants can establish and thrive.



Figure 5.38 - Brown Roof

Brown roofs systems consist of specially designed growing medium to promote the growth of indigenous plant species to inhabit the roof.

Existing site materials can be used to create a growing medium that reduces the environmental impact of a development. Consideration must be taken to avoid contaminated material and / or sharp objects.



Figure 5.39 - Existing Materials integrated into brown roof.

6. Maintenance and Management Plan

Maintenance and Management are closely related. When designing soft landscape treatments, it is necessary to take their maintenance requirements into account.

This section provides:

- general guidance on maintenance and management considerations;
- specific maintenance and management requirements for each soft landscape typology as outlined in Section 4.

Maintenance and management arrangements shall be made and agreed with the appointed maintaining firm for every project.

6.1 Maintenance

The goal of maintenance is to preserve soft landscape treatments to a constant level of functioning, rather than having to replace them once no longer fit for purpose due to lack of regular care. A maintenance schedule is a plan, identifying each plant's requirements to avoid or reverse their deterioration; It shall also contain detailed instructions on how to look after the plants, and should outline all tasks related to a plant's care regime. Maintenance treatments include weeding, watering, mowing, laying fresh mulch, pruning, among others. Maintenance tasks can be;

- Corrective, reacting to situations where landscape treatments fail;
- Preventative, focusing on the general maintenance of landscape functions and prevention of plant failure;
- Aesthetic, dealing with tasks aimed at ensuring the overall look and visual quality of landscape treatments.

6.2 Management

Management plans would consider a planted scheme from a high-level perspective,

Their goal is to allow planting to reach specific goals. Typical contents would include:

- responsibility matrix;
- processes to be followed to identify issues;
- care plans related to both newly planted as well as existing trees and shrubs;
- specification of their intended planting function (do they perform a visual screening or act as a wildlife corridor);
- Schedule for irrigation, fertilisation and weed control works to be carried out in order to mitigate risk of landscape deterioration, and;
- processes to remedy issues and their associated monitoring.

Complex landscape planting schemes are more likely to require management plans, whilst the implementation of maintenance plans might be sufficient for more standard schemes.

Management plans are a standard landscape condition to planning consents and they are typically required to cover the first five years after planting. These cover “establishment maintenance” and do not address the issues of long-term management.

A longer-term management plan shall be established for all sites, and more in particular in those where the Design team involved during the initial design stages and its establishment are unlikely to keep a longer-term involvement.

Maintenance shall be carried out proactively, to ensure target conditions are achieved effectively across all planting elements.

The level of management will depend on the proposed planting function as well as the site’s characteristics (e.g., sloped site).

Typical contract maintenance periods range from 36 months to five years.

The defects liability period typically last for 12 months. Landscape maintenance contracts, such as the Joint Council for Landscape Industries (JCLI) Maintenance Works Contract, shall include:

- The Landscape Professional’s Site Inspections schedule – frequency and responsibility are to be defined (see Section 2.2.6);
- Post-construction maintenance requirements for each plant typology depending on its function (refer to OTD GE-ENV-03002 Appendix A);
- Any supplier contact details;
- Instructions for corrective maintenance should landscape treatments fail, including soil remediation and replanting of failed landscaping elements, embankment and slope repairs, erosion and slip repairs, removal of debris and sediment, elimination of pest plants trees, and any animal pests threatening the planting, boundary fence repairs, and any general practice maintenance; (nzta.govt.nz)
- Instructions for preventive maintenance to maintain landscape functions whilst preventing future plant or function failure, including grass mowing, plant pest control, managing of the vegetative cover, managing of plant ancillaries (e.g., stakes and ties for specimen trees), rubbish and debris removal and disposal, and finally any other specific practice maintenance requirements; (nzta.govt.nz)
- Instructions for aesthetic maintenance required by ornamental planting areas and feature landscape treatments;
- Instructions in relation to the use of pesticides, if any;
- Instruction for ongoing monitoring maintenance once the contract is completed, including notes on the frequency of inspections going forward;
- Handover details.

Language used throughout the documentation shall be accessible for all taking responsibility of future maintenance (e.g., the common names of plants and trees should be used along their Latin names).

Refer to OTD GE-ENV-03002 Appendix A for a sample Management and Maintenance guide.

6.3 Management and Maintenance of Trees and the Canopy Layer

Management

Trees in urban areas require careful management.

A tree management strategy shall be prepared for each urban transport scheme to ensure adequate ongoing care of trees associated with the works. Tree management actions shall include all regular inspections and programmed maintenance work including watering, weeding, pruning, tree removal or replacement planting. Regular care and maintenance shall be undertaken, especially in the first five years following planting, to ensure the successful establishment of trees.



Figure 6.1 - Tree with a watering bag planted in Warsaw, Poland to ensure appropriate watering conditions.

Trees immediately next to roads shall be regularly managed to ensure required clear stems are maintained.



Figure 6.2 - Where trees are planted next to the carriageways they shall be specified as clear stems and shall be maintained to retain the minimum clear stem height of 1.8m to ensure safety.

Trees in woodlands shall be managed to achieve a particular design intent. This shall be outlined in a Landscape Report.

Woodland management practices include:

- Thinning;
- Pollarding, practice including tree pruning to retain a desired height; and;
- Coppicing, that is to say the process of felling trees at their base to create a 'stool' where new shoots will grow from.

All methods, and pollarding and coppicing in particular, require specialist knowledge.

When managing groups of trees, and if required, it is recommended to remove one tree at a time, to minimise visual and habit impacts. Standing deadwood is of high wildlife value and shall be retained where possible.

Maintenance

Maintenance of soft landscape treatments shall be undertaken in accordance with BS 7370-4:1993 Grounds Maintenance. Requirements for maintenance of soft landscape.

Litter shall be removed from all planted areas periodically. Regular inspections shall be undertaken by a qualified Arboriculturist to ensure the tree stock is growing healthily, free of disease and damage, and to minimise potential health and safety issues. The schedule of inspections must be as per Landscape Report as the projects long term maintenance and management plan.

To ensure suitable form is retained to fulfil its function as well as safety requirements, topping, pruning, or canopy raising, or clear stems may be necessary. Where clear stem heights have been indicated in contract drawings or other documentation, regular crown lifting works shall be undertaken to maintain these clear stem heights in accordance with BS 3998:2010 Tree work – Recommendations.

Stockpiling any cut branches and arisings from tree and shrub pruning onsite can restore nutrients to the soil and be utilised by wildlife. This approach shall be agreed with the Local Authority or landowner beforehand and should be integrated into the landscape management plan.

Any broken or damaged trees shall be replaced as soon as possible.

The maintenance of trees located within the road median may require lanes closures as necessary.

Designers must be conscious of the additional requirements for maintaining pleached or formally trained trees.

6.4 Management and Maintenance of Hedges and the Shrub Layer

Management

Management plans for hedges shall aim to retain the original design intent throughout scheme's lifetime as outlined in the project Landscape Report.

Hedgerow management must be considered as part of a wider local management objectives – stock control, shelter, screening, etc. Hedgerows play a key role in both natural context as well as Irish landscape character. While in certain locations hedgerows may be trimmed to control growth and ensure safety, in others they may be left to thicken into a managed belt providing a wildlife corridor linking with the wider landscape context.

Management plans for shrubs must also be implemented and shall include practices such as thinning and coppicing. The aim is to remove older and less productive wood whilst stimulating new growth; this may result in a temporary loss of flower. Some shrubs can tolerate a hard coppicing or pruning back to the ground allowing for regeneration from the base. However, where the likely response is unknown, a more prudent approach would include the carrying out of a pruning over two or three years instead.

Maintenance

The following maintenance procedures shall be implemented in the first years following the planting of hedges and shrubs, to ensure successful establishment:

- Inspections shall be carried out to reduce risks of competing vegetation developing at the base of the plants;
- A mulch layer shall be maintained at a minimum 50mm thickness to suppress weed growth;
- Hand weeding may be required to remove vigorous species that could compromise the planting;
- Hedgerow cutting shall be carried out once during the first 3 years of establishment, to encourage dense growth, ensure better overall establishment, and allow for the development of lower branches – giving it a denser base.
- Planting adjacent to cycle lanes and tracks shall be maintained regularly to ensure safe and unobstructed routes for the cyclists;
- No hedge trimming or laying shall occur during the bird nesting season.

Refer to All-Ireland Pollinator Plan for guidance on management of hedgerows for pollinators.

Shrubs shall be pruned according to their flowering season as shown in Table 6.1.

Table 6.1 - Pruning season for shrubs.

Type of shrub	Pruning Season
Winter flowering shrubs	Spring
Shrubs flowering between March and July	Immediately after the flowering period
Shrubs flowering between July and October	Back to old wood in winter
Evergreen Shrubs	After flowering
Rose bushes	Early spring

Where sightline requirements have been indicated in contract drawings or other documentation, regular pruning work shall be undertaken to maintain the specified sightline visibility. Where clear sightlines have been indicated within the project Landscape Report, Project maintenance or long-term management plan are care must be taken to avoid planting that will obscure views.

If hedges are proposed, they shall be kept trimmed to the specified height with an annual or biannual maintenance cut. Planting on median strips can have maintenance implications which may require lane closures and this should be taken into account at a design stage during species selection.

Where possible, trimmings should be retained on site as these can benefit small mammals and invertebrates and will encourage nutrient recycling.

Visibility sightlines shall be designed in accordance with DN-GEO-03060.

6.5 Management and Maintenance of Perennials, Bulbs and Ornamental Grasses

Management

As mentioned previously, management plans shall aim to retain the original design intent throughout scheme’s lifetime as outlined in the project Landscape Report.

The ongoing management of perennial schemes shall be considered at the outset of the soft landscape design stage. Annual monitoring visits shall be carried out after the initial establishment phase (18 months), to assess the plants, and to determine which ones within the scheme are self-seeding.

Perennial plants will last on average from 5 to 15 years. Knowledge on each perennial duration or persistence is important to plan for long term management. A schedule for undertaking replacement planting and its funding need to be factored into management plans.

Perennial schemes shall include an allowance and replacement of 5-10% of all plants every second year. Such schemes must also be considered for renewal at 5-10-year intervals.

Maintenance

Following the initial establishment phase (18 – 36 months), maintenance requirements may be reduced. However, the following maintenance activities shall be continued:

- Most perennials shall be cut to the ground once a year in February; however exceptions may occur, and specific advice may need to be followed;
- Occasional spot weeding shall be undertaken from March to June;
- Minimal maintenance will be required from June to October;
- Seedheads shall be retained through winter, and only removed if problematic or detract from the visual coherence of the scheme.

Bulb foliage in ornamental plantings shall be cut when the leaves have died back naturally, no earlier than six weeks after flowering – with the exception of bluebells, which shall not be cut.

Pruning of ornamental grasses shall be undertaken annually, or to maintain an appealing aesthetic. Like perennial species, grass seed heads shall be retained through winter.

Pruning of ornamental grasses shall be species specific. The following general advice may be applied:

- Deciduous grass species i.e., *Calamagrostis* × *acutiflora* ‘Karl Foerster’ and *Deschampsia cespitosa* ‘Goldtau’ shall be trimmed to ground level before growth starts in early spring;
- Maintenance of evergreen grasses such as *Stipa gigantea* and *Anemanthele lessoniana* must include snipping out the old seed heads and combing through the leaves with a pair of gloves to remove any dead material.

6.6 Management and Maintenance of Verges and the Field Layer

Management

Most semi-natural grasslands are at an early successional stage of the transition into scrub or woodland. This transition will likely occur without management or with inappropriate management (TII, 2006).

Where operation issues such as sightlines or other transport specific landscape management requirements must be maintained along transport corridors, it may not be appropriate to allow grassland to transition. Where scrub is allowed to develop along transport corridors, it can attract larger species such as wild birds or mammals increasing the risk of road-kills due to close proximity to traffic. Intended function of the grasslands shall be outlined in the project Landscape Report and will be used to inform the Management objectives going forward.



Figure 6.3 - Biodiversity area 'no cut' signage.

Management practices for semi natural grasslands and ornamental meadows shall aim to increase or preserve species richness, flower abundance and habitat diversity. The establishment of long meadows is suitable for the wider verge which falls outside clear zone requirements. Verges on poor soil will naturally become more flower-rich due to the existing seed bank and lack of competition in less fertile soils.

Under Irish Law, roadside managers are required to remove and control noxious weeds which may establish in grassland areas. This shall be done in accordance with TII Publication (Standards) GE-ENV-01104.

Maintenance

For the purposes of this Guide, two distinct zones may be identified within the verge:

- Immediate roadside verge, and;
- The wider verge area.

Each zone has particular issues of relevance in the determination of appropriate grassland management. Refer to the All Ireland Pollinator Plan Pollinator-friendly Management of Transport Corridors for details on how to best manage these areas.

Immediate Roadside Verge

The immediate roadside verges have a specific landscape management requirement which may relate to:

- maintenance of sightlines;
- provision of signage and lighting;
- incorporation of drainage, and;

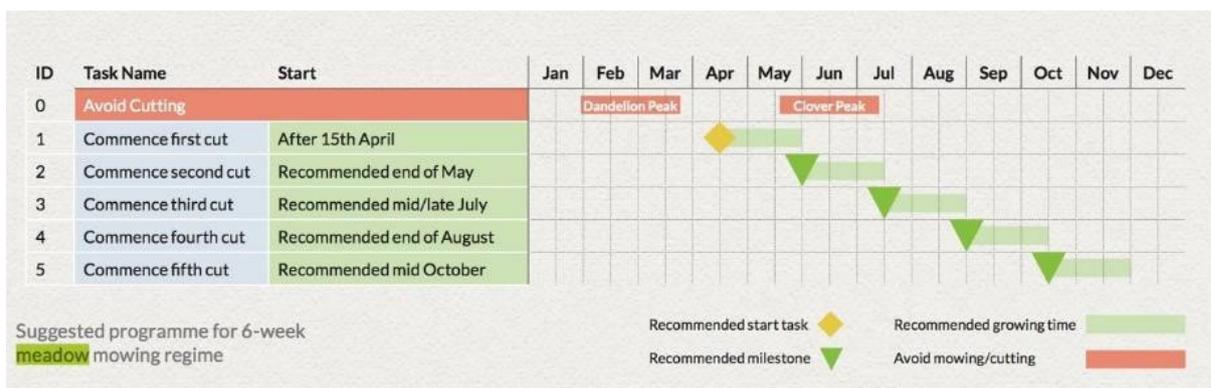
- provision of margin of safety or demarcation between the carriageway and the wider landscape resource or road boundary.



Figure 6.4 - Immediate roadside verge with a mown zone directly next to the road to maintain sightlines and protect wildlife.

A medium frequency maintenance regime is most appropriate for verges in locations characterised by slower vehicle speed and higher residential populations. Table 6.2 describes how a low growing meadow verge may be encouraged through mowing frequency. Requirements for preservation of sightlines may determine the location of short cut verges.

Table 6.2 - Mowing regimes for a low-growing verge (National Biodiversity Data Centre, 2019).



The maintenance of semi-natural grasslands shall be conducted in accordance with GE-ENV-01102.

Wider Verges

The wider verge area refers to the remainder of level or gently sloping area alongside the immediate roadside verge. The wider verge may vary significantly in width depending on the local landscape context.



Figure 6.5 - Varied grass mowing regime on the N24 at Moangarrif roundabout Clonmel, which allows a variety of grass types to enhance biodiversity.

As with the immediate roadside zone, this wider verge area may also have landscape maintenance requirements relating to:

- the maintenance of sightlines;
- the provision of signage and lighting;
- the incorporation of drainage systems;
- its relationship with the adjoining landscape and local street context e.g., hedgerow, built boundary in the transition zone etc.

Where a significant area within the wider verge falls outside clear zones and, where aspects of road safety, access or local streetscape functions are not an issue, consideration can be given to a more diverse range of treatments such as a mosaic of semi-natural grassland with occasional tree or shrub planting.

Where the wider verge falls outside clear zone requirements this may be managed as a longer grassland meadow. Grass areas that can be left uncut until September must be clearly identified within the Landscape Report. Grass shall be cut once a year and lifted where possible to reduce soil fertility over time. It may not always be possible to cut and lift clippings from wider verges or areas identified as 'grass meadows' annually. Where wider verge areas are not cut every year due to access or maintenance issues, these areas are still important for biodiversity.

6.7 Management and Maintenance of SuDS Elements

Management

Management plans shall include adequate provision for SuDS elements that will need to be removed or replanted over time.

Elements such as filter drains, wetlands, or swales that accept sediment may become blocked over time. The management plan shall consider the frequency of removal or replacement of these elements.

Other management activities include:

- Protection of ecological features;
- Removal of deposited sediment;
- Check dams and the flow of weirs periodically;
- SuDS planting may require the filter soil/layer to be removed every few years – This may also necessitate replacement of planting.

Maintenance

The maintenance action required in the early years of establishment is controlling the development of competing vegetation. With this objective and during the design process, the use of sterile mulches or biodegradable erosion control matting may be incorporated into the maintenance strategy as a control mechanism.

Unmaintained SuDS features are likely to fail. Regular inspections shall take place, ideally in wet conditions, to witness the SuDS element performance.

The specific maintenance requirement of each SuDS element will depend on the type of SuDS treatment, the element's size, and the receiving catchment.

Other maintenance considerations include:

- Fertilisers and pesticides must not be used across SuDS planting;
- Access for landscape maintenance shall be considered as part of the design;
- Monitoring of inflows and outflows shall be carried out regularly to check for erosion damage, especially for elements which receive inflows of surface water;
- Regular maintenance and removal of sedimentation at the base of the feature shall be carried out;
- Litter removal shall be included as part of the maintenance regime;
- Within wetlands, vegetation shall be periodically cut back and removed. This shall be undertaken on a phased basis, to allow the migration of affected fauna from areas of disturbance to adjoining and undisturbed areas;
- Compliance with all Legal Requirements shall be ensured, including but not limited to the European Communities (Birds and Natural Habitats) Regulations 2011;
- Maintenance actions must be undertaken outside of the bird nesting season;
- Algae shall be controlled using barley straw;
- Inlets and outlets for all SuDS elements shall be inspected regularly;
- Most perennials shall be cut to the ground once a year in late January. Exceptions to this exist, and specific advice may need to be followed.

Open water can quickly be colonised with vegetation. The banks of such features can also be quickly colonised by self-seeded woody vegetation. Regular maintenance visits will monitor the situation and regular removal of self-seeded vegetation shall be undertaken where this occurs.

6.8 Management and Maintenance Vegetation Associated with Structures

Management

Existing planted soft landscape treatment areas of high amenity value within the network and along national routes may have become overgrown or in need of landscape rejuvenation.

Appropriate action must be taken to ensure mature trees and shrubs, particularly those which have naturally colonised or outgrown their positions, shall not encroach upon the carriageway, do not restrict the envelope of visibility, and have not spread laterally into the outer area of the island. This must be carried out in accordance with DN-GEO-03060.

For existing trees, regular crown lifting, or crown thinning shall be carried out to improve inter-visibility. If tree surgery is required, a qualified arborist or tree surgeon shall be employed to undertake the work. The resultant visual qualities of the canopy shall be considered when undertaking all works. Cutting large expanses of tree canopies to work around other infrastructure is not permitted.

For lower level or shrub planting, thinning may be required to help the rejuvenation of woody plants.

Regular monitoring must be carried out to assess plant conditions, and if necessary, planting can be removed and/or replanted as required.

Any clearance of planting with biodiversity value shall be replaced with appropriate species to ensure no biodiversity net loss. Project Ecologists shall be consulted if possible.

Action to prevent and control the spread of serious pests and diseases affecting trees and shrubs must be taken as soon as their presence is identified.

Maintenance

The requirements for maintenance of median, island and roundabout planting should be considered before the design of the element is completed. The designer shall consider:

- Access for landscape maintenance;
- Selection of species to minimise maintenance requirements and associated lane closures;
- Co-ordination of grass cutting and litter picking operations (the first litter pick is to be carried out prior to the first cut after winter, to ensure that litter is not present when grass cutting occurs);
- Preparation and agreement of a five-year maintenance plan for median, island or roundabout planting as part of the landscape plan or submission;
- Compliance with all Legal Requirements, including but not limited to the European Communities (Birds and Natural Habitats) Regulations 2011;
- Specification of high canopy planting with an emphasis on light trees. The maintenance plan must include options to replant trees which may get too dense;
- Sightline requirements: these shall be indicated in contract drawings or other documentation, and regular pruning work undertaken to maintain the sightline visibility. For sightline requirements refer to DN-GEO-03060.

Glossary

Term	Definition
Age Class	Groups of trees belonging to the same age (e.g., 0–5 years old, 5–10 years ...). This is used as a tool to design and manage woodlands and forests to create diversity in its structure. (A-Z of tree terms, 2021).
Annual	A plant that completes its life cycle (germination, flowering, seeding, dying) in one growing season.
Arboriculturist	A specialist in the care, cultivation, and maintenance of trees.
Bare root	Grown from seedlings, hardwood cuttings and then transplanted - supplied bare root.
Biennial	A plant which grows from seed one year and flowers, fruits, and dies the next.
Biodiversity (Biological Diversity):	The variability among living organisms from all sources including, inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems. Thus, biological diversity may be considered at three levels: ecosystem diversity, species diversity, and genetic diversity within species.
Blue Green Infrastructure (BGI)	Is a 'strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem service' (EUR-Lex, 2013).
Broadcast sowing	Scattering seeds evenly over the ground rather than in furrows or drills.
Canopy Layer	Refers to the layer of leaves and branches formed by the large trees in the woodland. (Real New Forest Guide, 2022)
Clear Zone	The Clear Zone is the total width of traversable land on the nearside or offside of a road which is to be kept clear of unprotected hazards. This width is available for use by errant vehicles. The zone is measured from the nearest edge of the trafficked lane: i.e., the hard shoulder or hard strip forms part of the Clear Zone, refer to DN-GEO 03036 for the required Clear Zone widths.
Constructed wetland	Artificial sustainable wastewater treatment which is designed to look and function like a natural wetland. Constructed wetlands are used for treatment of wastewater and are carefully designed to integrate into surrounding landscape by using native plants, trees, and soil. (Irish Water, 2019)
Contact weedkiller	A weedkiller that kills by direct contact.
Cuttings	Side slopes arising where a road is constructed at a lower level than the landscape. Usually occurs where a road corridor encounters areas of local elevation.

Term	Definition
Cycle Facilities	<p>Cycleway: An offline public road reserved for the exclusive use of people cycling or people walking, wheeling, and cycling.</p> <p>Greenway: A cycleway that caters for people walking, wheeling, and cycling in a mainly recreational environment.</p> <p>Cycle Lane: An on-road part of the road pavement reserved for use by cycles.</p>
Designer	The organisation responsible for undertaking and / or certifying the design.
Designer's Risk Assessment	Key document within which a designer identifies hazards arising from the design, assesses how serious the potential risk is, and decides how to eliminate or reduce these risks (HSA, 2022).
Design Statement / landscape strategy	A key design document submitted as part of the Planning Application process that sets out fundamental landscape design analysis, principles, concepts, strategies, rationale, and proposals.
Drift Planting	A planting style that is designed to imitate natural growth habits by creating colonies of single plant varieties that appear to have occurred through self-seeding or other unaided means of propagation or planting. (Stoll, 2015).
Drill	A narrow, straight furrow in the soil in which seeds are sown or seedlings planted.
Ecological Infrastructure Analysis	The concept of ecological infrastructure analysis involves defining ecological networks of core habitat areas and connectivity zones for a region to decrease the overall fragmentation of core habitats.
Ecological Landscape Design	A landscape design approach which integrates the principles of landscape architecture and landscape ecology while addressing the principles of Sustainable Development including Local Agenda 21 criteria.
Ecologist	A scientist who specialises in the study of the relationships and interactions between organisms and their environment.
Ecosystem	A community of different plant and animal species interacting with one another and with their non-living environment.
Ecosystem services	The direct and indirect contributions ecosystems (known as natural capital) provide for human wellbeing and quality of life.
Embankments	Side slopes arising where a road is constructed at a higher level than the landscape.
Field Layer	The layer of vegetation that tends to cover the soil, sometimes called the herb layer.
Germination	The physical and chemical changes that take place as a seed starts to grow and develop into a plant.

Term	Definition
Grafted	The process of combining one plant's qualities of flowering or fruiting with the roots of another to achieve a more beneficial outcome overall (usually in terms of vigor, size, or resilience). (RHS, 2022)
Grassland	Habitat dominated by grasses, or plants that are 'grassy' in appearance. There are three main grassland categories, and these include improved grassland (agricultural grassland and amenity grassland), semi-natural grassland (dry calcareous and neutral grassland, dry meadows and grassy verges, dry-humid acid grassland, wet grassland) and freshwater marsh (marsh) (Fossitt, 2000).
Green Infrastructure (GI)	A strategically planned network of natural and semi-natural areas, which include other environmental features designed and managed to deliver a wide range of ecosystem services. These include water purification, air quality, space for recreation and climate mitigation and adaptation.
Green wall	A vertical structure attached to the exterior or interior of a building intentionally covered by vegetation that grows in a layer of soil on its surface.
Growing Medium	A growing mixture or other material in which plants may be grown.
Habitat	The physical and living environment in which an organism or community of organisms survive.
Hardy	Plants with ability to withstand year-round climatic conditions including frost, without needing protection.
Hazard	A hazard is any physical obstruction which may, in the event of an errant vehicle leaving the carriageway, result in significant injury or death to the occupants of the vehicle.
Hedgerow	A row of bushes, trees and / or plants enclosing or separating fields or parcels of land.
Landscape	"An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors" (Council of Europe, 2000). (TII, 2020)
Landscape Architect	A Landscape Professional who specialises in, "the planning, design and management of the external environment" (Irish Landscape Institute, 2022).
Landscape Audit Report	A joint report conducted by a Landscape Professional a joint with the site contractor each growing season (June-September) to identify defective plants or maintenance items within the project area.
Landscape Character	May be defined as a "distinct, recognisable, and consistent pattern of elements, or characteristics, in the landscape that make one landscape different from another, rather than better or worse". (Natural England, 2012). (TII, 2020)
Landscape Professional	All landscape practitioners including landscape scientists, landscape planners, landscape architects, landscape managers and urban designer. (Landscape Institute, 2018)

Term	Definition
Landscape Quality	A particular combination of the visual and non-visual attributes of the landscape.
Landscape Sensitivity	The extent to which the inherent character and visual amenity of a landscape are vulnerable to change due to a particular type of development activity.
Lawn	An area of open, regularly mown grass.
Local Needs Analysis	A rigorous process identifying issues that are important now and in the near future for the communities directly impacted by or neighbouring a project or programme.
Maintaining Organisation	The organisation which will be responsible for the maintenance of the road or thoroughfare after construction.
Meadow	Meadow is a grassland habitat which is rarely fertilised or grazed and mown only occasionally. (Fossitt, 2000).
Median / Island planting	The use of planting in areas dividing opposing traffic lanes or regulating the flow of traffic on roads.
Mulches	Loose coverings or sheets of material placed on the surface of soil.
Native species	Species which naturally exists at a given location or in a particular ecosystem.
Nurse species	Nurse plants are those that facilitate the growth and development of other plant species (target species) beneath their canopy because they offer benign microhabitats that are more favourable for seed germination and/or seedling recruitment than their surrounding environment. (Ren, et al., 2008).
Organic matter	Composts or similar materials derived from plant material.
Passively safe	Obstructions that comprise easily deformable elements, or that have been tested and passed for the appropriate speed class in accordance with I.S. EN 12767, Passive Safety of Support Structures for Road Equipment – Requirements, Classification and Test Methods.
Pedestrian Facilities	<p>All types of measures which improve conditions for people walking and wheeling, including:</p> <p>Footpath: A path, separated from the road by a kerb, for use by pedestrians which does not form part of the road pavement.</p> <p>Footway: A path for use by pedestrians, separated from the road by a verge, which does not form part of a road pavement.</p>
Perennial	Any plant that re-grows year after year (deciduous or evergreen / hardy or non-hardy).
Project Manager	The person assigned responsibility for the planning, execution, and delivery of a Project.

Term	Definition
Root Protection Area (RPA)	A root protection area is usually a calculated area of ground that lies immediately under a tree and just beyond the extent of its crown. (Woodland Trust, 2021)
Rural Area	An area outside of a built-up area which is generally controlled by speed limits greater than 60 km/h.
Schedule of [Environmental] Commitments	Sets out requirements emanating from contractually or legally prescribed consultations with third parties (e.g., National Parks and Wildlife Service (NPWS), Regional Fisheries Boards (RFB's) or Office of Public Works (OPW)) and provide a method of documenting compliance with these commitments and/or requirements. (National Roads Authority, 2007)
Settlement	A place where people come to live. (Cambridge University Press, 2022)
Shrub planting	A woody plant that has several stems and is usually less than 1.5 metres tall.
Shrub Layer	A layer of vegetation that consists of low woody vegetation of shrub form.
Specimen trees	Individual trees selected for a specific purpose often acting as a focal point or defining spaces. Trees can be planted individually, in groups or rows.
Streetscape	Everything that makes up the street environment. (NGAN, 2015).
Study Area	The geographical area identified as being potentially suitable for, and influenced by, the development of a Project. (TII, 2019).
Townscape	Townscape is a subset of landscape and comprises "landscape within the built-up urban area, including the buildings, the relationship between them, the different types of urban open spaces, including green spaces and the relationship between buildings and open spaces" (LI/IEMA, 2013) (LI, 2018) (TII, 2020). Throughout this document the term 'landscape' is also used to include 'townscape'.
Wider Verge Area	The landscape area outside of the immediate roadside verge.
Woodlands	Land that is mostly covered with woody vegetation or dense growths of trees and shrubs.
Woody	Vegetation composed in part of wood or hard wood-like tissue.

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