



## Urban Drainage Group

# Competency Framework

**DRAFT**

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# 1 INTRODUCTION

This document comprises the revised Urban Drainage Group (UDG) Competency Framework. It builds upon the building blocks of the original competency document, enhancing both the extent of the framework and the detail within competency knowledge groups.

This revision of the UDG Competency Framework is intended to provide a technical update to the knowledge framework from the original WaPUG Competency Framework and also to provide guidance and an evidence base to show how the items detailed within the Competency Framework can enable an individual to apply for the various levels of professional registration and membership within CIWEM.

This revised UDG Competency Framework fulfils two primary objectives, which are currently retained as two separate consultation documents:-

- **Presentation and Assessment of the Revised Competency Framework**
- **UDG Specific CIWEM Professional Membership Support**

This document will ultimately provide the detail of both of these critical objectives with the CIWEM Professional Membership Support becoming an appendix to this document, enabling urban drainage professionals to review their progress against the competency framework and utilise the information provided to support their pathway towards becoming Chartered Water and Environmental Managers and Members of CIWEM.

This document describes the view of the CIWEM UDG Committee on the levels of competence expected to achieve specific typical roles encountered within the sector. Modelling is a key component in these activities but a wider experience is necessary to carry out this work successfully and to a level of competence to meet professional development objectives.

While the UDG does not directly assess the competence of urban drainage professionals, this document does provide the evidence base to support routes to Professional Membership and Chartered Status with CIWEM.

For more details refer to the CIWEM website on [www.ciwem.org.uk](http://www.ciwem.org.uk).

## 1.1 History of the Competency Framework

The first draft of the WaPUG Competency Framework was released in September 2006. The vision for this initial iteration of the framework was to “Provide guidance for an accredited



programme of assessment, education and training”.

Initially, the competencies required of a wastewater network planner were defined in the guide, with information on how the competencies should be assessed at each level. This allowed individuals and managers to track progress and identify areas where further training and experience were required to meet the levels detailed within the Competency Framework. The competencies then provided a framework for training providers to design training courses to match particular parts of the competencies. These courses would be wider in scope than the use of any particular software tools used to carry out studies.

### 1.1.1 From WaPUG to CIWEM

Since 2006 there has been significant development in the approaches and environment that we as urban drainage professionals are operating in. This has not just been influenced by technological advances, but the significant environmental impact of periods of extreme weather in the late 2000's which have had a dramatic influence on the legislative and political framework within which we work.

In 2010 WaPUG became a CIWEM Special Interest Group. The **Urban Drainage Group** (UDG) now has the additional role of supporting urban drainage professionals to achieve Chartered Water and Environment Status and promote best practice and innovation within the Urban Drainage sector.

This has also led to UDG representing a much wider sector within the Urban Drainage field, with much greater representation within all sectors of the industry, from Consultants, through Water Companies and Regulators to Lead Local Flood Authorities to name a few. As a result the revised Competency Framework has been written to try and accommodate all of these interest groups, providing a document that is accessible for all.

## 2 UDG KNOWLEDGE FRAMEWORK

This and the following chapters of this document will detail how the UDG Competency Framework is structured, the broad topic areas and individual competences that make up the overall framework. It will detail the scoring process that should be used to assess competence and provide an indicative set of 'Key Competences' that can be used to assess certain typical sector roles in line with the original competency framework assessment approach. All documents are designed to run alongside individual company Structured Training Processes and Specifications, to ensure all aspects specific to organisations can be covered.

### 2.1 Knowledge Groups

The revised UDG Competency Framework has been designed to expand the original WaPUG competences to reflect the advancements and current activities and approaches within the sector. The revised Framework has **11 Knowledge Groups** with specific competences identified in each. Figure 2.1 below highlights the breakdown of these modelling groups.

Knowledge Groups	
1	Legislative Framework and Funding
2	Stakeholder Engagement
3	Planning, Risk & Serviceability
4	Integrated Urban Drainage
5	Data Collection and Management
6	Hydraulic Modelling
7	Feasibility and Catchment Strategy
8	Engineering Design and Construction
9	Health & Safety, Environmental and Quality
10	Management
11	General Skills

Figure 2.1 – Knowledge Groups

### 2.2 Individual Competences

Within the 11 Knowledge Groups a total of **57** individual competences have been identified, covering the broad scope of topics within the Urban Drainage community. These are detailed within Figure 2.2 below, with additional detail in subsequent chapters.



Those competences currently identified as 'Core Competences' are highlighted within Red Boxes within this table. These have been identified to provide some replication of the role requirement sheets within the original WaPUG Competency Framework. The Full Framework has been supplied as an editable attainment sheet, to enable the development of company specific assessments if required.

Knowledge Group	Competence
<b>Legislative Framework and Funding</b>	Legislation
	Regulation
	Funding and Investment
	Business Planning
	Change Management and Future Challenges
<b>Stakeholder Engagement</b>	Stakeholders & Customers
	Customer Interactions
	Public Relations
<b>Planning, Risk &amp; Serviceability</b>	Stakeholder Interactions
	Sewerage Risk Management
	Risk Assessment & Planning
	Customer Impacts
	Environmental Impacts
	Asset Deterioration
	Model Concepts
Levels of Service	
<b>Integrated Urban Drainage</b>	Major and Minor Systems
	Hydrology
	SuDS
	Exceedance
	Hydraulics
<b>Data Collection and Management</b>	Asset Management
	Sources of Information
	Data Collection
	Stakeholder Data Sharing
<b>Hydraulic Modelling</b>	1D Model Building
	Hydraulic Verification
	Water Quality Verification
	2D Modelling
	IUD Modelling
	Risk Modelling
	Model Use
<b>Feasibility and Catchment</b>	Feasibility Assessment

Knowledge Group	Competence
Strategy	Risk based interventions
	Developing Catchment Strategy
	TOTEX Investment Plans
Engineering Design and Construction	Design Standards & C of P (CDM)
	Knowledge of Materials
	Construction Techniques and Build-ability
	Operability
	Carbon Footprint
Health & Safety, Environmental and Quality.	Concepts and Legislation
	Health and Safety
	Risk Assessment
	Sustainability and Environmental Impact
	Quality Management
Management	Line Management
	Project Management
	Programming
	Contracts
General Skills	Technical Software
	GIS
	Report Writing
	Communication Skills
	History of the Urban Drainage Group
	History of the Water Industry
	Maths

**Figure 2.2 – UDG Competency Breakdown**


A total of **33** individual competences have been identified as Core Competences that cover all business areas within the UDG. This would include individuals working for Consultancies, Water Companies, Contractors, Academia and Regulators among other business areas.

### 2.3 Defining Competent – The approach to scoring

The Assessment of the revised UDG Competency Framework has been aligned to the assessment criteria used by CIWEM within their assessment of suitability of individuals for attaining Professional Status (C.WEM MCIWEM). This should incorporate a mix of knowledge, skill and experience. All three aspects must be present if someone is to become an effective urban drainage professional.

The following Grading System detailed within Figure 2.3 is used to record achievement against competences and the relevant levels. The required scores will be specifically

detailed for the key competences within the specific Role Based Assessment sheets detailed within **Error! Reference source not found.**



Score	Description
5	Expert (able to help others)
4	Competent without supervision
3	Able under Supervision
2	Able to Assist
1	Aware

**Figure 2.3 – Scoring Breakdown**

It should be noted here that to and it is detailed within the later appendix on Professional Membership Support that in order to meet the appropriate level of knowledge, skill and experience, candidates must **achieve Level four against all of the CIWEM Mandatory Competences**. It is anticipated that individuals will achieve a score of five within their own critical areas of expertise. The Professional Membership Support Appendix within this document details the breakdown of how UDG competences can be incorporated into the CIWEM Mandatory Competences.

### 3 KNOWLEDGE GROUP AND COMPETENCE BREAKDOWN

Updated November 2015

This section will provide an overview of each of the knowledge groups detailing what is intended to be covered. It provides a table detailing the specific competences within each group (with core competences highlighted in red) and then provides a description of the type of concepts and detail that group members may have exposure to. This detail should be reviewed in the context of the scoring process detailed in Section 2.3, considering a scoring of 1 to 5, assessing the level of knowledge skill and experience.

It should be noted here that the detail in each of the specific competences is not exhaustive, it is designed to give a flavour of the detail within it. It has been designed to enable wider interpretation across the diverse user base within the CIWEM Urban Drainage Group. Specific organisations active within the group may provide more prescriptive detail within their own procedures and assessment processes to support competency review.

#### 3.1 Legislative Framework and Funding

This Knowledge Group is intended to represent the underpinning knowledge of how the Water Industry currently operates, looking at all aspects of the legislative and regulatory framework through to business planning and managing change. This can be interpreted from a role within any stakeholder within the Urban Drainage sector. The following table highlights the competences within this Knowledge Group:

Reference	Description	
1	Legislative Framework and Funding	
1.1	Legislation	Core competences in red
1.2	Regulation	
1.3	Funding and Investment	
1.4	Business Planning	
1.5	Change Management & Future Challenges	

Figure 3.1 – Legislative Framework and Funding Group Competences

##### 3.1.1 Legislation

Demonstrate appropriate levels of knowledge, skill and experience in:

The legislative framework which your company operates in and how it influences your specific role and the projects that you work on. This could consider (but is not restricted to):

- The Legislative Framework within the UK and Europe - UWWTD, EU Bathing Waters, EU Shellfish Waters, Water Framework Directive Water Act Floods and Water Management Act

- Case Law – What specific cases have shaped how our system works?

### 3.1.2 Regulation

Demonstrate appropriate levels of knowledge, skill and experience in:

How the sector is regulated and the roles that regulators have as part of the stakeholder framework of the Urban Drainage Sector. You should be able to demonstrate how the role of the regulator impacts projects/programmes within the Urban Drainage Sector. This could consider (but is not restricted to):

- Roles and Relationships between regulators, water companies and the supply chain
- Different regulatory challenges (financial, environmental)
- Applicable across borders

### 3.1.3 Funding and Investment

Demonstrate appropriate levels of knowledge, skill and experience in:

How the Urban Drainage sector is financed and how total expenditure (TOTEX) can be implemented within investment programmes. This could consider (but is not restricted to):

- Financial aspects of the Water Industry – Net Present Value, Company Finance, Financial Risk, CBA, Willingness to pay
- Payment Processes – Invoicing, Purchase Orders and Business Cases
- Funding Mechanisms – Water Bills, Central and Local Government funding, borrowing

### 3.1.4 Business Planning

Demonstrate appropriate levels of knowledge, skill and experience in:

How business plans and cycles determine how investment is planned and implemented within the Urban Drainage Sector. This is also applicable from the perspective of a private company, and how their business would be structured and operated to ensure continued growth/workload. This could consider (but is not restricted to):

- Business Planning and The AMP Cycle including price review
- Outcomes and ODIs
- Frameworks and Supply Chain
- Bid Completion and Management

### 3.1.5 Change Management

Demonstrate appropriate levels of knowledge, skill and experience in:

What are the challenges that the industry is currently facing and how may it deal with them? What are the future challenges that the sector is likely to face? How have you been involved in a change management process? This may relate to business or driver changes. This could consider (but is not restricted to):

- HOT TOPICS – PDAS, SuDS (particularly ownership), Growth, Flooding, Urban Creep, Climate Change
- Business Restructuring
- Regulatory Change – Change in focus
- Legislative change – e.g. tightening targets linked to the WFD

### 3.2 Stakeholder Engagement

This Knowledge Group is intended to represent the underpinning knowledge of the stakeholders that are involved with projects within the Urban Drainage Sector. This should allow an assessment from a base in any of the specific employment areas within the group, with individuals needing to understand the stakeholder and customer needs, both from the perspective of a specific project, but also ultimately members of the public as ultimate customers. The following table highlights the competences within this Knowledge Group:

Reference	Description
<b>2</b>	<b>Stakeholder Engagement</b>
2.1	Stakeholders & Customers
2.2	Customer Interactions
2.3	Public Relations
2.4	Stakeholder Interactions

Core competences in red

**Figure 3.2 – Stakeholder Engagement Group Competences**

#### 3.2.1 Stakeholders and Customers

Demonstrate appropriate levels of knowledge, skill and experience in:

How different stakeholders are involved and interact as part of an Urban Drainage Project and how the needs of customers are considered. This should include the customer linked to project delivery and also the impact on the public as the ultimate customers of urban drainage projects. This could consider (but is not restricted to):

- External Stakeholders – Government, Regulators, Water Companies, Lead Local Flood Authorities, Local Authorities, Internal Drainage Boards

- Internal Stakeholders – Any internal department with a responsibility for an aspect of a project e.g. Asset Planners, Operations Teams
- Customers – Should consider all aspects of potential customer interaction through the Consumer Council for Water, Local Customer Action Groups, Domestic and Commercial Customers
- Customers from a Business Perspective – Understanding the specific needs of your customer e.g. efficiency, programme, cost control
- Pressure Groups e.g. Surfers Against Sewage

### 3.2.2 Customer Interactions

Demonstrate appropriate levels of knowledge, skill and experience in:

How different companies interact with the public. This could consider (but is not restricted to):

- Non Flushable Campaigns – e.g. Bag it and Bin it
- Social Media and Customer Interaction
- Customer Warning Systems – e.g. Bathing Water Quality Announcements or Flood Risk notifications

### 3.2.3 Public Relations

Demonstrate appropriate levels of knowledge, skill and experience in:

The significance of Public Relations in how businesses are perceived. This could consider (but is not restricted to):

- Response to complaints
- Link to Service Incentive Mechanism
- Social Media and Customer Interaction

### 3.2.4 Stakeholder Interactions

Demonstrate appropriate levels of knowledge, skill and experience in:

How all of the relevant stakeholders with differing expectations, levels of service, funding mechanisms and data can be brought together to develop robust integrated solutions to urban drainage challenges. This could consider (but is not restricted to):

- Integrated Flooding Studies e.g. Surface Water Management Plans

### 3.3 Planning, Risk and Serviceability

This Knowledge Group is intended to represent the change to a Risk Based approach to managing urban drainage, and the understanding of all aspects of catchment strategy and performance on serviceability in the Urban Area.

The following table highlights the competences within this Knowledge Group:

Reference	Description	
<b>3</b>	<b>Planning, Risk &amp; Serviceability</b>	
3.1	Sewerage Risk Management	
3.2	Risk Assessment & Planning	Core competences in red
3.3	Customer Impacts	
3.4	Environmental Impacts	
3.5	Asset Deterioration	
3.6	Model Concepts	
3.7	Levels of Service	

**Figure 3.3 – Planning, Risk and Serviceability Group Competences**

#### 3.3.1 Sewerage Risk Management

Demonstrate appropriate levels of knowledge, skill and experience in:

The principles of Sewerage Risk Management and the philosophy of an integrated, risk based approach with the costs of interventions supported by economic justification. This could consider (but is not restricted to):

- The history of the Sewerage Rehabilitation Manual
- Sewerage Risk Management (<http://srm.wrcplc.co.uk/>)

#### 3.3.2 Risk Assessment and Planning

Demonstrate appropriate levels of knowledge, skill and experience in:

The development and planning of investigation and investment programmes based on prioritisation methodologies, covering the triggering of studies such as Sewerage Management Plans, through to the development of risk based interventions within a catchment or programme across a range of catchment issues which may cause one or more service failures. This could consider (but is not restricted to):

- Prioritisation of modelling/investigation programmes
- Development of intervention programmes within a catchment
- Cost Benefit Analysis



### 3.3.3 Customer Impacts

Demonstrate appropriate levels of knowledge, skill and experience in:

Understanding the impacts of the Urban Drainage environment on customers (members of the public). The Legislative and regulatory frameworks are in place to ensure that we minimise impacts on the customer and the environment. This could consider (but is not restricted to):

- Hydraulic Flooding – Internal and External (From any source)
- Pluvial Flooding – Inundation and overland routing
- Other Causes Flooding – Blockage, Collapse, Equipment Failure
- Restricted Toilet Use
- Odour
- Nuisance – Impacts caused by works e.g. Traffic Disruption
- Emergency Response – Impact on first responders

### 3.3.4 Environmental Impacts

Demonstrate appropriate levels of knowledge, skill and experience in:

Understanding the potential environmental impacts that may arise from works and investigations within the Urban Drainage environment. This includes the assessment of baseline environmental risk and the direct impact urban drainage systems on sensitive sites or water bodies and how these measures affect water quality in line with the Water Framework Directive. This could consider (but is not restricted to):

- Pollution – direct and indirect pollution routes
- Site Sensitivity and special site designation
- Watercourse classification and amenity value
- Static and Intermittent discharges
- Event Duration Monitoring and Programmes
- Groundwater pollution

### 3.3.5 Asset Deterioration

Demonstrate appropriate levels of knowledge, skill and experience in:

Understanding how and why assets deteriorate. This should consider how structural issues can form over time and how the deterioration of assets can be modelled and investigated. This could consider (but is not restricted to):

- Deterioration modelling for business planning

- Structural Grading
- Hydrogen Sulphide attack
- Rising Main Failure

### 3.3.6 Model Concepts

Demonstrate appropriate levels of knowledge, skill and experience in:

The construction and development of hydraulic models for specific purposes. This should include the understanding of the levels of confidence that are associated with different modelling approaches and ensuring that the modelling approaches selected are achieve the appropriate levels of confidence for their intended use. This could consider (but is not restricted to):

- Multi-Driver Sewerage Management Planning Models
- Scheme Specific models
- 1D v 2D
- Strategic Models
- Neural Networks
- Forecasting Models

### 3.3.7 Levels of Service

Demonstrate appropriate levels of knowledge, skill and experience in:

The different levels of service which different stakeholders use to develop urban drainage solutions and how this can influence the performance of an Urban Drainage system. This could consider (but is not restricted to):

- Levels of service and Cost Benefit Analysis
- Potential constraints on multi-agency projects

## 3.4 Integrated Urban Drainage

This Knowledge Group is intended to represent the underpinning knowledge of the development of approaches to integrated urban drainage, sustainable drainage and the governing principles of hydraulics and exceedance. This section can also reference the WaPUG modelling guidance which can be found [here](#), which includes the Integrated Urban Drainage Modelling Guide. The following table highlights the competences within this Knowledge Group:

Reference	Description
4	Integrated Urban Drainage

Core competences

4.1	Major and Minor Systems
4.2	Hydrology
4.3	SuDS
4.4	Exceedance
4.5	Hydraulics

in red

**Figure 3.4 – Integrated Urban Drainage Group Competences**

### 3.4.1 Major and Minor Systems

Demonstrate appropriate levels of knowledge, skill and experience in:

The definition and role of major and minor systems within the context of integrated urban drainage and how an integrated approach to modelling their interaction should be developed. This should also consider the benefits and/or limitations of different approaches to integration and an appreciation of how different urban features can influence performance.

This could consider (but is not restricted to):

- Various system interactions
- 2D modelling
- Pluvial Inundation
- Varying levels of service and design standards

### 3.4.2 Hydrology

Demonstrate appropriate levels of knowledge, skill and experience in:

Hydrological assessments and calculations to support the development and understanding of integrated catchment analysis. This will include aspects of hydrological modelling as well as an understanding of the different aspects of hydrology which could influence Urban Drainage projects. This could consider (but is not restricted to):

- Surface water hydrology
- Groundwater hydrology
- River basin management
- Water quality
- Soil moisture

### 3.4.3 Sustainable Drainage Systems (SuDS)

Demonstrate appropriate levels of knowledge, skill and experience in:

The application, modelling and design of SuDS systems as part of urban storm water management. This includes the complexities of stakeholder engagement and the

assessment and suitability of different SuDS options as part of developing a surface water management strategy. This could consider (but is not restricted to):

- Attenuation
- Infiltration
- Surface conveyance
- Pollution prevention
- Sediment settlement

#### 3.4.4 Exceedance

Demonstrate appropriate levels of knowledge, skill and experience in:

Understanding how systems and schemes may fail and the methodologies to understand the exceedance of systems and schemes. This could consider (but is not restricted to):

- CIRIA Designing for exceedance
- Overland flow and 2D modelling

#### 3.4.5 Hydraulics

Demonstrate appropriate levels of knowledge, skill and experience in:

The principles of hydraulics that are in place within 1D piped and open channel systems.

### 3.5 Data Collection and Management

This Knowledge Group is intended to represent the underpinning knowledge of the role that the range and quality of data plays in a successful urban drainage project. This group should explore how asset management processes and assessments can support data collection activities and how information should be shared across stakeholder groups. The following table highlights the competences within this Knowledge Group:

Reference	Description
<b>5</b>	<b>Data Collection and Management</b>
5.1	Asset Management
5.2	Sources of Information
5.3	Data Collection
5.4	Stakeholder Data Sharing

Core competences in red

**Figure 3.5 – Data Collection and Management Group Competences**

#### 3.5.1 Asset Management

Demonstrate appropriate levels of knowledge, skill and experience in:

The implementation of Asset Management principles to Urban Drainage catchments and information. This should include the development of data management processes and the assessment of performance through the assessment of asset information. This could consider (but is not restricted to):

- ISO 55000 and PAS55
- Deterioration modelling
- Asset databases
- Asset Management Strategy (e.g. Pollution Strategy)
- Asset resilience assessments

### 3.5.2 Sources of Information

Demonstrate appropriate levels of knowledge, skill and experience in:

Availability and sourcing data from internal and external stakeholders to support the development of an urban drainage project. This could consider (but is not restricted to):

- Asset records
- Performance information
- Online data repositories

### 3.5.3 Data Collection

Demonstrate appropriate levels of knowledge, skill and experience in:

The planning, management, implementation and review of data collection activities to support the understanding catchment performance and increasing confidence in Urban Drainage models and projects. This could consider (but is not restricted to):

- Flooding Questionnaires
- Short Term Flow Surveys
- Asset and Ancillary Surveys
- Long term monitoring programmes
- Telemetry systems
- Gauging systems
- Quality sampling

### 3.5.4 Stakeholder Data Sharing

Demonstrate appropriate levels of knowledge, skill and experience in:

How and where different stakeholders can share information within the constraints of integrated urban drainage projects. This could consider (but is not restricted to):

- Data protection
- Confidentiality

### 3.6 Hydraulic Modelling

This Knowledge Group is intended to represent the fundamental development of a variety of models to support Urban Drainage objectives. It should consider all of the aspects of modelling, including external inputs such as rainfall, to generate models within the appropriate levels of confidence to achieve the required outcomes. This competency group should directly link to the UDG Code of Practice which can be found [here](#). The following table highlights the competences within this Knowledge Group:

Reference	Description
<b>6</b>	<b>Hydraulic Modelling</b>
6.1	1D Model Building
6.2	Hydraulic Verification
6.3	Water Quality Verification
6.4	2D Modelling
6.5	IUD Modelling
6.6	Risk Modelling
6.7	Model Use

Core competences in red

**Figure 3.6 – Hydraulic Modelling Group Competences**

#### 3.6.1 1D Model Building

Demonstrate appropriate levels of knowledge, skill and experience in:

The construction of 1D models to achieve urban drainage outcomes. This should cover all aspects of the development of 1D models and should also consider the alignment with corporate model build and verification procedures as well as associated industry guidance. This could consider (but is not restricted to):

- Network model construction – Asset Geometry and headloss
- Network model construction – roughness and sediment
- Network model construction – above ground contribution and DWF
- Ancillaries and operational controls
- Rainfall – TSR, Design, Radar – Climate Change, Antecedent conditions
- Runoff Models and approaches including slow response and ground infiltration
- Checks, reviews and auditing

#### 3.6.2 Hydraulic Verification

Demonstrate appropriate levels of knowledge, skill and experience in:

The verification of urban drainage models to achieve the levels of confidence required for Urban Drainage projects. This should include an understanding of all methods and approaches to achieve suitable verification outcomes and confidence levels. This could consider (but is not restricted to):

- DWF Verification
- Storm Verification (discrete events and full period assessment)
- Seasonal variation and compliance
- Historical verification (flooding and ancillary performance)
- Telemetry verification
- Checks, reviews and auditing

### 3.6.3 Water Quality Verification

Demonstrate appropriate levels of knowledge, skill and experience in:

Aspects of modelling which could influence the development of water quality assessments and Urban Pollution Management (UPM) Studies. This should include all levels of assessment to support Water Framework Directive (WFD) assessments. This could consider (but is not restricted to):

- Pollutant loading and wash off parameters
- Diffuse and point source pollution
- Simplified UPM
- Detailed UPS
- Event Duration Monitoring
- Water Quality assessments
- Watercourse Amenity value
- Ecological Assessment

### 3.6.4 2D Modelling

Demonstrate appropriate levels of knowledge, skill and experience in:

The development of 2D overland flow and exceedance modelling approaches to meet Urban Drainage modelling objectives. This could consider (but is not restricted to):

- LiDAR – quality, extent and resolution
- Impact and modelling of street furniture and structures
- 2D detailed modelling approaches

### 3.6.5 IUD Modelling

Demonstrate appropriate levels of knowledge, skill and experience in:

The hierarchy and development of integrated modelling approaches. This section can reference the detail and objectives outlined in the Integrated Urban Drainage Modelling Guide which can be found [here](#). This could consider (but is not restricted to):

- Boundary conditions
- Interaction of major and minor system models
- Interaction of 1D and 2D modelling approaches.

### 3.6.6 Risk Modelling

Demonstrate appropriate levels of knowledge, skill and experience in:

Developing an understanding of risk through hydraulic modelling or non-modelling approaches. This should also consider the assessment of the confidence that can be attributed to hydraulic models. This could consider (but is not restricted to):

- Model confidence assessment
- Deterioration modelling
- Company-wide risk assessment
- Asset Management risk modelling
- Ancillary failure risk

### 3.6.7 Model Use

Demonstrate appropriate levels of knowledge, skill and experience in:

The development of models to achieve a specific outcome and the limitations of model use based on the level of confidence achieved. This should also include the assessment and understanding of the future suitability of models and the levels of complexity and detail that need to be included within the model build process to achieve the desired outcomes and confidence levels. This could consider (but is not restricted to):

- Future proofing models – Creep, climate change and growth
- Design Standards
- Strategic planning
- Detailed Design modelling

## 3.7 Feasibility and Catchment Strategy

This Knowledge Group is intended to represent the underpinning knowledge the development of interventions and assessments to support catchment strategy and



investment plans within Urban Drainage catchments. The following table highlights the competences within this Knowledge Group:

Reference	Description
<b>7</b>	<b>Feasibility and Catchment Strategy</b>
7.1	Feasibility Assessment
7.2	Risk based interventions
7.3	Developing Catchment Strategy
7.4	TOTEX Investment Plans

Core competences in red

**Figure 3.7 – Feasibility and Catchment Strategy Group Competences**

### 3.7.1 Feasibility Assessment

Demonstrate appropriate levels of knowledge, skill and experience in:

The testing and assessment of solutions to achieve the required levels of service. This should include an understanding of the design standards required across the stakeholders involved in the project. The feasibility assessment could span a range in levels of complexity.

This could consider (but is not restricted to):

- Sensitivity testing
- Flood alleviation and pollution management feasibility
- Development Impact Assessment
- Levels of service
- Thresholds
- Intervention cost models

### 3.7.2 Risk Based Interventions

Demonstrate appropriate levels of knowledge, skill and experience in:

The linking of performance to serviceability risk. This includes the development of a risk based catchment ‘needs’ list, where all potential risks are measured against a common measure (financial), enabling the interventions to be prioritised against the most significant risks within the catchment or wider operational areas. This has links to corporate optimisation processes.

This could consider (but is not restricted to):

- Prioritising catchments for investment based on serviceability and risk
- Understanding the changing risk in future scenarios
- Developing catchment risk priority lists
- Levels of service and cost benefit

### 3.7.3 Developing Catchment Strategy

Demonstrate appropriate levels of knowledge, skill and experience in:

Understanding the combined risks affecting a catchment and determining the short, medium and long term intervention strategies for a catchment. This should include all potential aspects of strategy, including programmes to increase confidence in catchment areas. This could consider (but is not restricted to):

- Capital interventions
- Rehabilitation programmes
- Pro-active maintenance programmes
- Investigation programme
- Modelling programmes

### 3.7.4 TOTEX Investment Plans

The development of a range of solutions within an Urban Drainage context that could make up a TOTEX investment plan. This could consider (but is not restricted to):

- Capital projects
- Capital maintenance plans
- Ancillary rehabilitation
- Rehabilitation and Repair
- Cleansing and Investigating

## 3.8 Engineering Design and Construction

This Knowledge Group is intended to represent a level of understanding in the development of schemes on site, looking at the principles governing

The following table highlights the competences within this Knowledge Group:

Reference	Description	
<b>8</b>	<b>Engineering Design and Construction</b>	
8.1	Design Standards & C of P (CDM)	Core competences in red
8.2	Knowledge of Materials	
8.3	Construction Techniques and Build-ability	
8.4	Operability	
8.5	Carbon Footprint	

**Figure 3.8 – Engineering Design and Construction Group Competences**

### 3.8.1 Design Standards and Codes of Practice

Demonstrate appropriate levels of knowledge, skill and experience in:

The standards that dictate the development of capital works in terms of the development of projects through feasibility, to detailed design and their construction on site. The principles of CDM should be considered at the core of this. This could consider (but is not restricted to):

- British Standards
- Design Manuals
- Industry Guidance
- Sewers for Adoption

### 3.8.2 Knowledge of Materials

Demonstrate appropriate levels of knowledge, skill and experience in:

The range of materials and processes that is available within the development of Urban Drainage schemes. This could cover works on both major and minor drainage systems and cover both infrastructure and non-infrastructure options. This could consider (but is not restricted to):

- Hard or soft engineering solutions
- Standard pipework options
- Pump types

### 3.8.3 Construction Techniques and Buildability

Demonstrate appropriate levels of knowledge, skill and experience in:

The suitability of solutions to Urban Drainage problems based on the limitations of the catchment area where the scheme is to be developed. This should include the assessment of a variety of viable solutions for any given problem. This could consider (but is not restricted to):

- Site footprint
- Trench v Trenchless
- Planning, Land, Environment, Power

### 3.8.4 Operability

Demonstrate appropriate levels of knowledge, skill and experience in:

The implementation of designs to meet all operability requirements within an Urban Drainage context. This should be linked to the implementation of design manuals and industry guidance. This could consider (but is not restricted to):

- Sewers for Adoption
- Self-Cleansing velocity

- System maintenance
- Ancillary maintenance

### 3.8.5 Carbon Footprint

Demonstrate appropriate levels of knowledge, skill and experience in:

The objective to review and manage the carbon footprint of businesses as well as specific projects. This should include the assessment of schemes based on their carbon load and the strategy for managing carbon through the construction phase and the operational phase.

This could consider (but is not restricted to):

- Carbon Strategy
- Material selection
- Emissions
- Carbon ‘Hot Spots’

## 3.9 Health and Safety, Environmental and Quality

This Knowledge Group is intended to represent the underpinning knowledge of the criticality of Health and Safety, Environmental performance and quality management (SHEQ) within the Urban Drainage Sector, from an industry perspective, through to their application of projects. This is a critical section linked to the CIWEM Mandatory Competences. The following table highlights the competences within this Knowledge Group:

Reference	Description
<b>9</b>	<b>Health &amp; Safety, Environmental and Quality.</b>
9.1	Concepts and Legislation
9.2	Health and Safety
9.3	Risk Assessment
9.4	Sustainability and Environmental Impact
9.5	Quality Management

Core competences in red

**Figure 3.9 – Health & Safety, Environmental and Quality Group Competences**

### 3.9.1 Concepts and Legislation

Demonstrate appropriate levels of knowledge, skill and experience in:

The legislative framework that governs SHEQ and how EU directives are implemented within law. This should also cover how companies ensure that their businesses are compliant with these specific requirements within day to day business. This could consider (but is not restricted to):

- EU Directives and their application in law (e.g. Health and Safety at Work Act)

- BS OHSAS 18001 Health and Safety Management System
- ISO 45001 Occupational Health and Safety Management Systems
- ISO 9001:2015 Quality Management System
- ISO 14001:2015 Environmental Management System

### 3.9.2 Health and Safety

Demonstrate appropriate levels of knowledge, skill and experience in:

Ensuring that health and safety management is at the heart of all company processes and practices. This should cover safety in the office, through to the specific risks that may be encountered whilst working on a project within the Urban Drainage sector and who might be exposed to these risks. This could consider (but is not restricted to):

- Role of the HSE
- Office H & S
- Confined Spaces
- Traffic Management
- COSHH
- Public Health
- CDM (this is also covered within the Engineering, Design & Construction Group)

### 3.9.3 Risk Assessment

Demonstrate appropriate levels of knowledge, skill and experience in: The understanding

The development and application of Risk Assessments within Urban Drainage Projects and their implementation within specific activities related to the projects. This should include internal processes, but also the review of supply chain documentation. This could consider (but is not restricted to):

- Risk Assessment structure
- Specific Assessments
- Mitigation/Control Measures
- Safe Systems of Work
- Dynamic Risk Assessment
- Contractor Processes and documentation (e.g. Manhole Survey contractors)

### 3.9.4 Sustainability and Environmental Impact

Demonstrate appropriate levels of knowledge, skill and experience in:

The environmental impact of workplace and site activities. This should include the development and understanding of the environmental risk assessment process, but also the specific environmental impacts of site work through planning and scoping through to construction and commissioning. This could consider (but is not restricted to):

- Environmental management
- Environmental Impact Assessment (EIA)
- Ecological Impacts of schemes
- Sustainable business activities
- Carbon accounting

### 3.9.5 Quality Management

Demonstrate appropriate levels of knowledge, skill and experience in:

The implementation of the principles of quality management required to meet ISO 9001 standards and how these principles are achieved on specific projects. This could consider (but is not restricted to):

- Internal Management Systems (IMS)
- Data Management and Quality
- Confidence (data, model, output etc.)
- QA Processes (specifically around modelling processes)
- Feedback, review and improvement

### 3.10 Management

This Knowledge Group is designed to cover the challenges of management and leadership within the Urban Drainage sector, aligning with a clearer requirement within the CIWEM mandatory competences. It will cover the management of projects and resources to achieve the desired project outcomes. The following table highlights the competences within this Knowledge Group:

Reference	Description
<b>10</b>	<b>Management</b>
10.1	Line Management
10.2	Project Management
10.3	Programming
10.4	Contracts

Core competences in red

**Figure 3.10 – Management Group Competences**

### 3.10.1 Line Management

Demonstrate appropriate levels of knowledge, skill and experience in:

Team management and development, understanding the principles of management within the context of delivery teams and the wider resources required within an Urban Drainage Project. This could consider (but is not restricted to):

- Principles of Line Management (e.g. motivation, performance management, problem solving etc)
- Appraisal and performance review
- Staff development
- Leadership v Management

### 3.10.2 Project Management

Demonstrate appropriate levels of knowledge, skill and experience in:

The successful scoping, costing, management and delivery of projects within the Urban Drainage sector. This could consider (but is not restricted to):

- Proposals and bids
- Cost control and value management
- progress tracking
- Resource Management
- Client Management
- RACI
- Feedback and review

### 3.10.3 Programming

Demonstrate appropriate levels of knowledge, skill and experience in:

Organising and managing the delivery of a programme of work covering multiple projects across a given time frame, for example a programme of drainage investigations across a number of catchments.

This could consider (but is not restricted to):

- Governance
- Cost Control and value management
- Supply chain and resourcing
- Change management

### 3.10.4 Contracts

Demonstrate appropriate levels of knowledge, skill and experience in:

This could consider (but is not restricted to):

- Framework agreements
- Project specific contracts
- Differing Contract Types (e.g. NEC Engineering and Construction Contracts)
- Milestone delivery

### 3.11 General Skills

The General Skills Knowledge group is designed to cover specific software and other skills which may need to be implemented within the working environment. It also covers specific competences that support the historical understanding of the development of both the industry and the Urban Drainage Group. The following table highlights the competences within this Knowledge Group:

Reference	Description
<b>11</b>	<b>General Skills</b>
11.1	Technical Software
11.2	GIS
11.3	Report Writing
11.4	Communication Skills
11.5	History of the Urban Drainage Group
11.6	History of the Water Industry
11.7	Maths

Core competences in red

**Figure 3.11 – General Skills Group Competences**

#### 3.11.1 Technical Software

Demonstrate appropriate levels of knowledge, skill and experience in:

The use of industry specific software to achieve the required outcomes of an Urban Drainage project. These can be focussed on any aspect of the development of strategy within the catchment. This could consider (but is not restricted to):

- 1D Hydraulic modelling Software
- 2D Assessment Software
- Integrated Catchment Modelling Software
- Asset Management Software
- Data Handling Software



### 3.11.2 GIS

Demonstrate appropriate levels of knowledge, skill and experience in:

The use of GIS throughout all aspects of an Urban Drainage catchment project. This should include consideration of data management pre, during and post project. This is intended to cover day to day use, but can also include more development of bespoke solutions and implementation of tools. This could consider (but is not restricted to):

- GIS Software packages
- Spatial Mapping,
- Dataset Refinement
- Metadata
- Workspaces and theming
- Querying and SQL
- Scripting and plug-in development

### 3.11.3 Report Writing

Demonstrate the ability to prepare, write and review technical reports.

### 3.11.4 Communication Skills

Demonstrate effective communications skills through interactions with clients, customers and peers. This could consider (but is not restricted to):

- Client facing project meetings
- Bid presentations
- Presentations at CIWEM and UDG events
- Presentations at other events
- Internal presentations and training

### 3.11.5 History of the Urban Drainage Group

The individual should be able to demonstrate an understanding of the history and evolution of the Group, through its early foundation and principles, through to the transition into CIWEM and the development of the Urban Drainage Group.

### 3.11.6 History of the Water Industry

Demonstrate appropriate levels of knowledge, skill and experience in:

The development of the Water Industry within the UK. This should be an over-arching understanding of the sector, pulling on specific knowledge demonstrated within other knowledge groups.

### 3.11.7 Maths

Demonstrate appropriate levels of knowledge, skill and experience in:

The mathematical principles that underpin the investigation and analyses that are undertaken within a variety of Urban Drainage scenarios. This could consider (but is not restricted to):

- Accuracy and tolerance
- Probability
- Sampling
- Statistical analysis and distribution
- Results validation