Initial Work Based Learning Plan – with examples to guide applicants

**Background Statement**

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| *You should give a summary of your background in terms of previous academic studies and experience to date*  |
| After completion of a computer science degree at ●●● University, I obtained a hydraulic modelling post at ●●●, a firm of consulting engineers. Following in-house training in the use of ●●● for 1D and 2D models, I worked under the supervision of the senior hydraulic modeller. As my experience of modelling increased I realised that to progress further I needed to expand my area of expertise and took the opportunity to become involved in the firms wider activities within its work for clients such as lead local flood authorities. This allowed me to develop my technical and managerial knowledge and I now manage a small team of hydraulic engineers.  |

**Matching of Work Based Learning with QAA Outcomes**

**Science and mathematics**

The study of engineering requires a substantial grounding in engineering principles, science and mathematics

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| **Outcome**  | **Example Evidence**  | **Example Reflective Statement**  |
| **M1 Science, mathematics and engineering** Apply a comprehensive knowledge of mathematics, mathematics, statistics, natural science and engineering principles to the solution of complex problems. Much of the knowledge will be at the forefront of the particular subject of study and informed by a critical awareness of new developments and the wider context of engineering.  | In designing a retro-fit surface water management scheme at ●●●, I needed to extend my knowledge of the statistical basis of return periods. By study of the Flood Estimation Handbook I was able to appreciate the differences between the Maximum Annual Flood and Peak over Threshold approaches and became aware of the issues associated with extrapolation. At ●●● I was investigating the effects of high flows on river bed stability. By reading and discussion with our geomorphologist, I gained an appreciation of the influence of particle size on the erodibility of river bed materials.  | I now know about the Shield’s diagram. I appreciate that particle movement, especially at small particle sizes is also a function of the bed material’s adhesion. I have since undertaken further reading to improve my knowledge of forces acting on sea bed materials which I hope to employ if we are successful in our bid for the ●●● offshore study.  |

**Engineering Analysis**

Engineering analysis involves the application of engineering concepts and tools to analyse, model and solve problems. This will include working with information that may be uncertain or incomplete.

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| **Outcome**  | **Example Evidence**  | **Example Reflective Statement**  |
| **M2 Problem Analysis** Formulate and analyse complex problems to reach substantiated conclusions. This will involve evaluating available data using principles of mathematics, statistics, natural science and engineering p , and using engineering judgment to work with information that may be uncertain or incomplete, discussing the limitations of the techniques employed.  | Shortly after starting to widen my experience beyond hydraulic modelling, I was given the opportunity to contribute to the production of a surface water management plan for a critical drainage area at ●●● where I had previously carried out modelling work. I was able to identify areas where infiltration basins could be installed. This introduced me to the study of geological maps for the identification of areas where such basins should be feasible but I quickly learnt that these maps did not always give full information on superficial deposits.  |  |
| **M3 Analytical tools and techniques** Select and apply appropriate computational and analytical techniques to model complex problems, discussing the limitations of the techniques employed.  | At ●●● I engaged consultants to carry out modelling of a drainage network. As the eventual outfall was into a tidal river, I sought guidance on tidal patterns and surge events and was able to challenge the consultant’s assumption that the modelled rainfall events would always correspond with bank-full conditions in the river.  | I have learnt that, although mathematical modelling is a valuable tool, it is vital to ensure that realistic assessments are made of boundary conditions.  |
| **M4 Technical literature** Select and critically evaluate technical literature and other sources of information to solve complex problems.  | Whilst I was still a hydraulic modeller, I sought to widen my knowledge of sustainable drainage systems. I studied the CIRIA SuDS manual and became aware of the source-pathway-receptor philosophy and the SuDS treatment train. I arranged to visit a site where SuDS were being introduced.  | I have subsequently studied other CIRIA documents including those on designing for exceedance in urban drainage and retrofitting of SuDS. These have generally been a good source of practical advice. However there have been circumstances where the situation I have been dealing with goes beyond the coverage of the documents.  |

**Design and Innovation**

Design is the creation and development of an economically viable product, process or system to meet a defined need. It involves significant technical and intellectual challenges.

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| **Outcome**  | **Example Evidence**  | **Example Reflective Statement**  |
| **M5 Design** Design solutions for complex problems that evidence some originality and meet a combination of societal, user, business and customer needs as appropriate. This will involve consideration of applicable health & safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards.  | In re-designing a channel at ●●● I had to consider, not only the theoretical aspects of hydraulic design, but also the need to provide continuity of a satisfactory environment for aquatic life during periods of low flow. I therefore sought advice from other specialists, including our ecologist and from such discussions built up a fuller appreciation of the wider constraints on engineering design. At ●●● I was required to carry out flood risk assessment for a proposed industrial development. I was aware that the then PPS25 required that the development would not increase the flood risk elsewhere. I studied CIRIA report C635 on *Design for Exceedance*. This not only provided me with design approaches for the specific site, but also gave me an insight into wider issues such as stakeholder engagement and the evolution of design standards for piped solutions. For the ●●● scheme I had to carry out economic analysis in order to select the optimum solution and to justify it to the Environment Agency for grant in aid. I therefore became aware of the principles of discounting benefits and costs occurring over a period of time.  | I have become aware that hydraulic engineering design is not merely a straight forward application of principles obtained from textbooks. Each scheme is different. Assumptions have to be made and justified. The needs of a diverse range of stakeholders, for example clients, regulators, funders and the public, have to be balanced. I realise that my knowledge of economic analysis remains limited.  |
| **M6 Integrated/systems approach** Apply an integrated or systems approach to the solution of complex problems.  | I was able to integrate my knowledge in the ●●● scheme in which I was involved from initial discussions with the client, tender preparation, survey, data collection, preparation of options, recommendation of the solution to be adopted , advising on the selection of contractors and subsequent monitoring of the implemented solution.  | I learnt that clients may often have a solution before they knew what the problem really was! I needed to convince the client that rather than telling the public that they were to lose a facility to allow the proposal to go ahead, it would be better to work with the community so that they understood that they would gain benefits from the proposal. I learnt the need for compromise: for example the initial preference for an infiltration basin being ruled out by the presence of low permeability soils. I prepared the business case justifying the scheme on technical, social and economic grounds. As well as the development of proposals I was able to advise on a suitable form of contract and the selection of a suitably experienced contractor. When unexpected services were encountered during construction, I worked with the contractor to minimise the disruption to the programme.  |

**The Engineer and Society**

Engineering activity can have a significant societal impact and Engineers must operate in a responsible and ethical manner, recognise the importance of diversity, and help ensure that the benefits of innovation and progress are shared equitably and do not compromise the natural environment or deplete natural resources to the detriment of future generations.

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| **Outcome**  | **Example Evidence**  | **Example Reflective Statement**  |
| **M7 Sustainability** Evaluate the environmental and societal impact of solutions to complex problems (to include the entire life-cycle of a product or process) and minimise adverse impacts.  | I represented one of our clients at a community engagement event for a proposed scheme of surface water management. This was an uncomfortable experience. It turned out that this event, held after the client had applied for planning permission, was the first the affected community had heard of the proposals.  | After the community engagement event, I found that the client’s surface water management strategy required that they develop a community engagement plan at an early stage. I further found that the Environment Agency distinguish between “decide-inform-defend” and “engage-deliberate-decide" approaches. It was clear that our client was reaping the dis-benefits of adopting the former approach in spite of its stated strategy. I have since discovered that CIRIA has produced excellent advice on good practice on community engagement and have since sought to demonstrate to our clients the advantages of proper planning for early community engagement.  |
| **M8 Ethics** Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct.  |  |  |
| **M9 Risk** Use a risk management process to identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activity.  | I have become familiar with the constraints and business opportunities offered by environmental legislation such as the Water Framework Directive. As a team leader I am aware of issues of safety management. I have researched our responsibilities under the CDM regulations.  | I see the need to be aware of political developments that may affect the way we work: anticipating requirements rather than reacting to them.  |
| **M10 Security** Adopt a holistic and proportionate approach to the mitigation of security risks. (The Engineering Council defines security as ‘the state of relative freedom from threat or harm caused by deliberate, unwanted, hostile or malicious acts. It operates on a number of levels ranging from national security issues to countering crime’ – see the guidance note at: https://www.engc.org.uk/standards-guidance/guidance/guidance-on-security/)  |  |  |
| **M11 Equality, diversity and inclusion** Adopt an inclusive approach to engineering practice and recognise the responsibilities, benefits and importance of supporting equality, diversity and inclusion.  |  |  |

**Engineering Practice**

The practical application of engineering concepts and tools, engineering and project management, teamwork and communication skills. Engineers also require a sound grasp of the commercial context of their work, specifically the ways an organisation creates, delivers and captures value in economic, social, cultural or other contexts.

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| **Outcome**  | **Example Evidence**  | **Example Reflective Statement**  |
| **M12 Practical and workshop skills** Use practical laboratory and workshop skills to investigate complex problems  |  |  |
| **M13 Materials, equipment, technologies and processes** Select and apply appropriate materials. Equipment, engineering technologies and processes, recognising their limitations.  |  |  |
| **M14 Quality management** Discuss the role of quality management systems and continuous improvement in the context of complex problems.  |  |  |
| **M15 Engineering and project management** Apply knowledge of engineering management principles, commercial context, project and change management, and relevant legal matters including intellectual property rights.  |  |  |
| **M16 Teamwork** Function effectively as an individual, and as a member or leader of a team. Evaluate effectiveness of own and team performance.  |  |  |
| **M17 Communication** Communicate effectively on complex engineering matters with technical and non-technical audiences, evaluating the effectiveness of the methods used.  |  |  |
| **M18 Lifelong learning** Plan and record self-learning and development as the foundation for lifelong learning/CPD.  |  |  |

**Action Plan**

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| *Enter here details of how you intend to fill any gaps you have identified in your learning. You should include target dates for completion.* I have identified above the need for me to increase my understanding of economics applied to flood management projects. I intend to enrol for the next available delivery of CIWEM’s Environmental Economics course. [The Action Plan will need to be expanded depending on any further gaps that are identified when all the QAA Learning Outcomes have been considered]  |