Guidance on Continuing Professional Development

Introduction

This guidance note is particularly aimed at those who do not have easy access to a formal programme of continuing professional development (CPD). It does not take the place of a formal scheme but we hope that you will find it useful in considering your career development. You are encouraged to manage your own CPD scheme by considering how you would like your career to evolve and the capabilities you need to achieve this. A range of capabilities and skills that may be expected of hydrogeologists are described. You may decide to develop some of these further as specialist expertise over time, depending on the direction you take for your career path.

Knowledge and skills

Hydrogeology is a multi-faceted subject, with many opportunities for specialising in its various aspects. Fundamental to this are a thorough knowledge of geology and an understanding of how rock types and structure impact on groundwater occurrence and movement. As an example, the following is a list of skills required to attain Chartered Geologist status in the UK, which has been customised for hydrogeologists:

- Understanding of the complexities of geology and of geological processes in space and time in relation to hydrogeology;
- Critical evaluation of geoscience information to generate predictive models;
- Effective communication, in writing and orally;
- Competence in the management of health, safety and environmental issues, and statutory obligations;
- Clear understanding of professionalism and ethical conduct; and
- Commitment to continuing professional development;

In addition to this, hydrogeologists should be able to demonstrate that they have essential competencies (i.e., able to perform without direct supervision and able to direct others) in a range of areas, including:

- Multi-dimensional conceptualisation, ability to develop conceptual models of groundwater recharge, flow and discharge from a local to a regional scale;
- Designing, implementing and supervising ground investigations to collect hydrogeological data; and
- Field collection of groundwater quantity and quality data.

Development of competencies in specialist areas of work are possible over time and options include:

- Borehole design and construction;
- Engineering applications;
- Borehole yield testing (Hydraulic Aquifer and Pump Testing);
- Hydrochemistry and isotopes;
- Ecosystem biogeochemistry;
- Geophysics;

- Saline intrusion;
- Managed Aquifer Recharge (MAR);
- Irrigation;
- Geothermal groundwater;
- Groundwater remediation;
- Hydrogeological impact and risk assessment;
- Numerical modelling; and
- Remote sensing.

Working as a hydrogeologist

An in-depth understanding of theories and concepts in hydrogeology, including the physical, chemical and biological interactions with associated waters and the environment, needs to be developed. A thorough awareness of natural and human-induced variations is needed. The ability to understand and interpret maps, geographical data, historical evidence and models to build up a picture of groundwater regimes, potential for current and past contamination and to establish a conceptual view of groundwater flow in three dimensions is essential.

Hydrogeologists must analyse and evaluate data, to assess and predict the impact of activities such as landfilling, construction developments, mining or agriculture, on the quality and resource availability of groundwater and inter-connected surface waters. The data available may often be complex and incomplete, but as a hydrogeologist you must still be able to draw valid conclusions, while understanding the uncertainty in the interpretation.

Hydrogeologists are expected to undertake field work and site visits for investigations and monitoring, particularly in the early years of a career, activities that help develop core skills and essential underpinning knowledge. Capability may be required in designing and overseeing drilling programmes and undertaking field tests, such as hydraulic aquifer tests or pumping tests. Groundwater sampling for on-site or subsequent laboratory analysis may require specialised instrumentation and equipment, which needs to be maintained and calibrated. Field work may need to be carried out in difficult weather and environmental conditions, the ability to adapt as unforeseen climatic events occur is desirable. Attention to safety and use of the necessary personal protective equipment is mandatory. A driving licence is often expected.

A high level of level of numeracy is expected. Capability in information and communication technology, and using databases, within a hydrogeological context, are important. Understanding of and the ability to critique outputs from mathematical models is necessary. The further ability to undertake modelling of groundwater flow, chemistry, and temperature according to geological formations, surface water flow and man-made influence is an invaluable specialist role.

You will be expected to develop a thorough understanding of environmental laws, regulations and permits concerning groundwater to ensure that you comply with these and so that you can provide clear advice and guidance to others.

You should be able to demonstrate your competency for particular roles through your technical qualifications, professional status and verifiable experience. This should include evidence of ongoing training, keeping up to date with technological and legislative developments, certifications, licences and references.

Skills in oral and written communication with those who have a technical understanding and others from a non-technical background are essential e.g. written reports, meetings, phone calls and at conferences. Mentoring and training of colleagues and others may be necessary. These all require the demonstration of skills other than just technical capabilities. Knowledge of other languages can be valuable for international careers.

You will be expected at times to work independently on projects and at others as a member of a team, often within a multidisciplinary framework. You will be expected to assist project teams and to develop your own project management skills. The ability to manage several projects at one time, including budgeting, managing staff or contractors, and scheduling of projects will require an organised but flexible approach to your work.

Development of business management skills, in public as well as private sectors, and commercial awareness and participation in retaining and seeking clients in commercial settings will be valuable.

You will liaise with other hydrogeologists and professionals in related fields, including hydrologists, ecologists, engineers, chemists, planners. As such you will need to have an appreciation of a range of disciplines and the context within which hydrogeological skills may be applied.

Awareness of the importance of hydrogeology to society, the relationship of hydrogeology to other disciplines such as hydrogeology, ecology, meteorology, climatology and to socio-economic contexts is indispensable. Consideration of ethical and social aspects related to the application of their knowledge and skills is imperative. You should aim to be an ambassador for your profession.

Continuing Professional Development (CPD)

You will be expected to maintain and develop your professional expertise throughout your career. You will also be expected to demonstrate this to employers and clients.

Continuing Professional Development is the process of tracking and documenting the skills, knowledge, and experience that you gain beyond any initial training. The process helps you to identify the further development needs you may have and to set out a plan to achieve them. By documenting and reviewing what you experience, learn and apply, this helps you to plan and manage your own development.

It is for you to own and direct your CPD scheme. There will, though, almost certainly be aspects that will complement the expectations of your employer and you may want to get the support of your line manager or another colleague.

Keep a log of your activities, training, and development, including the level reached (see Appendix 1).

Write down your overall career goals – where you want to be in two, five and 10 years' time. This may well be influenced by your aptitudes, interests, strengths and weaknesses. Set out the attributes and requisite skills/capabilities that seem appropriate for these goals. A review of available jobs and job descriptions will help you in this. Job vacancies advertised online will usually have a detailed specification of the requirements for the job (e.g. see https://www.joshswaterjobs.com/ and Earthworks Jobs).

Review your current capabilities and where the gaps are compared with what you hope to achieve. Then write down no more than three specific and achievable shorter-term objectives, including the dates by which you want to achieve them.

The activities you undertake to meet these objectives, and more generally as part of a longer-term personal training and development strategy, should be designed in response to the needs that you identify during this process. You should expect this to cover:

- science and technical matters in hydrogeology and supporting disciplines (e.g. physics, chemistry, biology, computing, economics, law) where relevant
- factors such as soft skills, technical, management, languages, communications including social media, presentations, expert witnessing,
- personal management, team management, business management, finance and planning, mentoring

Some of the skills you want to achieve can be learned through on-the-job training, or by following suitable practical guidance, while others may require formal education or certification:

- learning from colleagues or shared learning from networking
- reading about new technologies, new methods of working, legislative changes
- shadowing or assisting an experienced colleague
- insights and learning points from coaching and mentoring
- reflections, insights and learning points from taking on a new responsibility
- organisational or role change
- temporary job swaps within the department/organisation
- deputising or covering for colleagues
- insights and lessons learned from mistakes
- lessons learned from critical incidents or events
- experiencing the process of publishing your work, or reviewing manuscripts, in peer-reviewed journals e.g. https://link.springer.com/journal/10040
- developing your profile e.g. on LinkedIn or other platforms and contributing to discussion items

Set a time in advance for review of the objectives you've set yourself. Review your experiences and make a note of any outcomes of each learning experience and what difference it has made. You may want to review the activities you undertake as you go along, and you should certainly take a periodic overview of the activities and how these are helping you meet the objectives you have set e.g. once every three, six or 12 months.

Each year you will need to consider how these shorter-term objectives fit with your overall strategy and set further shorter-term objectives to help meet your longer term plans. At the same time you should review your overall strategy, focussing on learning from your experiences, and adjust it in line with any further needs you have identified, including changes in career aspirations.

Educational and training resources

You can find information about education resources, conferences and other training opportunities on IAH's website at https://iah.org/ and https://iah.org/education. A useful summary is provided in our note, "Considering a career in Groundwater?"

Conclusion

Setting out your process for continuing professional development will help you to identify apparent gaps in your skills and capabilities. It will help you maintain your goals, supporting your career development or a possible career change and further development needs. It will also provide a record of your achievements and the progress you have made in your professional development. You will be able to easily find examples for your CV or interview and you will have a comprehensive record that demonstrates your professional standing to clients and employers.

Acknowledgements

This guidance note draws on information from:

- https://www.prospects.ac.uk/job-profiles/hydrogeologist
- https://climbtheladder.com/hydrogeologist-skills/
- https://www.environmentalscience.org/career/hydrogeologist

Appendix 1: CPD record

You should aim to record a variety of information for your CPD scheme e.g.

- Overall goals – where you want to be in two, five, and ten years' time
- Attributes associated with these goals and the requisite skills
- A list of gaps between your current capabilities and those required for your goals

Objectives and activities

Set up a document that includes at least the following information:

- Year of CPD *(for each year of your CPD scheme you will set objectives and activities designed to achieve your overall career goals)*
- Objectives for this year *(normally 3 key objectives that contribute to your overall goals in a systematic way)*
- Activities *(designed with these objectives in mind)*
    - Date completed
    - Description of activity
    - Evidence of completion (e.g. certificates for training courses)
    - A review of how the activity has contributed to achieving this year's objectives (or other development needs)

Other CPD schemes

The Geological Society of London has as a CPD scheme that members are expected to follow, which you may find useful to look at - see https://www.geolsoc.org.uk/cpd

It lists six main categories of activities:

- Formal learning
- On-the-job
- Informal learning or training
- Self-directed study
- Professional practice
- Other

It has also issued a summary diagram of the types of activities that members might be involved in professionally and could therefore be considered for CPD: https://www.geolsoc.org.uk/careers-and-training/continuing-professional-development-cpd/cpd-activities/