

## STUDENTSHIP AGREEMENT



between:

**The University Court of the University of Edinburgh**, a charitable body registered in Scotland under registration number SC005336, incorporated under the Universities (Scotland) Acts and having its main administrative offices at Old College, South Bridge, Edinburgh EH8 9YL (the "University");

**Coal Authority**, an executive non-departmental public body sponsored by the Department of Business, Energy and Industrial Strategy and having its main administrative offices at 200 Lichfield Lane, Mansfield, Nottinghamshire, NG18 4RG (the "Company"); and

**Mylène Receveur** c/o School of Geosciences, The University of Edinburgh, Grant Institute, The King's Buildings, James Hutton Road, Edinburgh, EH9 3FE (the "Student")

(each being a "Party" and together the "Parties")

The following essential details of a studentship research project (the "Project") are agreed between the Parties:

1. Project title: "Investigating geothermal heat resources of legacy mine workings, why are some mine waters hotter than others?", as described in fuller detail in the Appendix to this agreement.
2. Project period: 4 years commencing on or around 1st September 2019 and ending on or around 31<sup>st</sup> August 2023
3. Academic Supervisor: Dr Christopher McDermott
4. Company Supervisor: Dr Ian Watson
5. The Parties recognise that their principal aims are: to enable the Student to carry out a research project and produce a thesis for examination in accordance with the University's regulations covering postgraduate study; and to lead to academic publications relating to the results of the Project.
6. Funding sources:
  - 6.1 The Edinburgh Earth, Ecology and Environmental (E4) Doctoral Training Partnership led by the School of GeoSciences at the University of Edinburgh, funded by the Natural Environment Research Council (NERC).
  - 6.2 The Company will pay to the University a contribution to the costs of the Project totalling £5,000 (plus VAT where applicable), payable in the following instalment(s):
    - a) £5,000 on 1<sup>st</sup> September 2019
7. Payments will be made by the Company within 30 days of receipt of an invoice from the University, which invoice(s) shall be sent for the attention of Dr Ian Watson, at Coal Authority, 200 Lichfield Lane, Mansfield, Nottinghamshire, NG18 4RG, or alternatively by email to [IanWatson@coal.gov.uk](mailto:IanWatson@coal.gov.uk) and shall include the Company purchase order number.
7. The Company will also pay the Student's reasonable travel and subsistence costs incurred as a result of any placement by the Student at the Company's premises.
8. The Company will provide the Student with a placement at its premises for a minimum of 3 months during the Project period and will provide appropriate supervision, training and other resources as required.

9. Each Party will keep confidential such of the other Parties' information as is expressly noted to be confidential in writing, or may otherwise reasonably be considered to be of a confidential nature. This obligation shall not apply to such information as the receiving Party can show to the reasonable satisfaction of the disclosing Party: (a) has become public knowledge other than through any fault of the receiving Party; (b) was already known to the receiving Party prior to disclosure by the disclosing Party; (c) was independently developed by the receiving Party without recourse to or use of any confidential information; (d) has been received by the receiving Party from a third party who did not acquire it in confidence from the disclosing Party, or someone owing a duty of confidence to the disclosing Party; or (e) the receiving Party is required to disclose by law or by a requirement of a regulatory body.
10. All proposed publications shall be submitted in writing to each of the Parties for review at least 30 days in advance. Except in respect of the Student's thesis (which is not subject to the remainder of this paragraph), the reviewing Parties may require deletion or amendment of reference to their confidential information, or delay of the publication for a maximum period of an additional 90 days if, in the reviewing Party's reasonable opinion, the delay is necessary in order to seek patent or similar protection to Foreground owned by the reviewing Party, provided it so notifies the publishing Party within the 30 day period.
11. The Parties will not prevent or hinder the Student from submitting a thesis based on results generated within the Project nor from following the University's procedures for examination and admission to postgraduate degree status (which procedures include provisions to place the thesis on restricted access within the University library).
12. Each Party shall allow the other Parties to use such of its existing intellectual property, knowledge, and know-how as it is free to make available and as is used pursuant to the Project, for the purposes of the Project only.
13. Any intellectual property arising in the course of the Project ("Foreground") shall be owned by the Party that creates it and, where created jointly, shall be owned jointly by the Parties; save that any Foreground created by the Student in the course of the Project shall be owned by the University and the University will enter (or has entered) into a separate agreement with the Student to this effect.
14. The University grants to the Company a royalty-free, irrevocable, non-transferable, non-exclusive right and licence to use the University's Foreground for internal research and development only.
15. The Company grants to the University and the Student a royalty-free, irrevocable, non-transferable, non-exclusive right and licence to use the Company's Foreground for the purposes of teaching and research.
16. In the event that either the Company or the University wishes to commercialise the other Party's Foreground, this shall be governed by a further written agreement negotiated in good faith and within a reasonable time between duly authorised representatives of the Company and the University on terms that are fair and reasonable taking into account the respective contributions of the Parties to the Project.
17. The Company will make no claim in connection with the Project against the Student or an employee of the University (save in respect of fraud or wilful misconduct). This does not prejudice any right the Company may have against the University.

Several factors are considered to contribute to the temperature profile, including natural heat flow, energy inputs including solar and anthropogenic sources as well as geothermal, the architecture of the near surface geology, groundwater flow regime, connectivity of the workings and extent of the workings. Examining only the mine water temperatures indicates that there is no clear relationship with depth of measurement. Other factors must be dominant. The purpose of this PhD is to determine what they are and understand the subsurface "plumbing" and heat distribution of mine workings.

#### Methodology

Collation of available mine water temperature data from the Coal Authority and other sources, then investigate the key controls on mine water temperature. In first year the student will be involved in data collection and development of hydrogeological conceptual models, this will progress through the second and third year with numerically modelling the temperature profiles and interpretation of the results particularly with relevance to scoping out the size of the temperature resources available to use. The data will include information from in situ sensors, seasonal data based on the student's own measurements, legacy data available in various archives and geological data. The work is expected to include the use of numerical tools to demonstrate convective flow in highly connected subsurface voids, demonstrate the influence of natural heat flow, and the influence of local and regional groundwater flow. A key outcome of the work will be the development of a predictive tool/model or conceptual approach that enables the scientific estimation of the extent and nature of the heat available over the long term from mine workings.

18. This agreement shall be interpreted in accordance with Scots law and the Parties submit to the exclusive jurisdiction of the Scottish Courts.

IN WITNESS WHEREOF this agreement is signed by the duly authorised representatives of the University and the Company and by the Student as follows:

for and on behalf of the University:

Signed: Mark Warner

Name: Mark Warner  
Senior Contracts Manager

Title: .....

Date: 28/02/20

for and on behalf of the Company:

Signed: Jeremy Crooks

Name: Jeremy Crooks

Title: HEAD OF INNOVATION

Date: 26/02/20

by the Student

Signed: [Signature]

Date: 12.03.2020

## APPENDIX

Project title: "Investigating geothermal heat resources of legacy mine workings, why are some mine waters hotter than others?"

### Project summary

Why are some mine waters hotter than others? What controls the mine water temperature available for geothermal use? Can the water temperature and its resilience be modelled and predicted?

### Project Background

A recent Scottish Government study on the geothermal potential of Scotland (AECOM, 2013) showed there is a significant variation in the temperature of fluids down to a depth of circa 1500 m. Temperature gradients ranging from 3.7°C/1km to 45°C/1km have been recorded in some 61 boreholes. Recently legacy mine workings are being increasingly viewed as a low carbon source of heat or cooling ("Coolth") and are a major research area, e.g. (<http://www.bgs.ac.uk/ukgeoenergyjobs/home.html>). Mine workings access a large volume of rock, are easily accessible from the surface and are often situated near built up areas. Understanding why the mine waters have reached a certain temperature is critical to being able to estimate realistically the heat resource and storage potential present. The Coal Authority is particularly interested in understanding this resource better, including aspects of how long the heat/storage of heat may last into the future, and the lateral extent of the zone of influence of a typical scheme.