PROJECT TITLE: EFFECTS OF INTENTIONAL OR ACCIDENTAL RELEASES OF OIL AND GAS (OG) WASTES IN THE ENVIRONMENT

Dr. Isabelle Cozzarelli, Jeanne Jaeschke Jaeschke@usgs.gov, Bridgette Polite bpolite@contractor.usgs.gov

Discipline: Ecology; Surface Water; Groundwater; Biogeochemistry;

PROJECT DESCRIPTION

BACKGROUND

The USGS conducts research aimed at understanding the environmental impacts of petroleum products and unconventional oil and gas (UOG) wastewater and drilling fluids. Both product and co-produced water spills occur with regular frequency. Spills occur at the well pad during energy development, or during transport and storage. Accidental and intentional releases of petroleum products, such as crude oil, or by-products, such as produced waters, have been documented to release contaminants into groundwater and surface water at concentrations that are above regulatory levels. The effects of these releases on soils, including microbial communities, has also been documented. In this project, we seek to document the chemical changes that occur in waters and soils from such releases and assess how natural resources are impacted.

This position is located in the Geology, Energy & Minerals Science Center in Reston, Virginia and work for this position will be performed in the Reston Biogeochemical Processes in Groundwater Lab (RBPGL). The RBPGL research team conducts long-term investigations on the fate and geochemical effects of organic contaminants in surface and subsurface environments. Our approach combines field observations and laboratory experiments to determine how transformations of organic contaminants impact aquifer, soil, and surface-water chemistry, targeting transformations with potential ecological and health impacts. Our results inform regulators charged with the protection of human and environmental health and aid in reducing and responding to future contamination issues.

An intern with the RBPGL will have an opportunity to contribute to several projects that have an underlying theme of understanding the processes that control the movement and biodegradation of contaminants from energy development activities. We have a broad range of analytical research capabilities at the RBPGL, including analytical capabilities for water analyses for non-volatile dissolved organic carbon, low molecular weight organic acids, methane, and inorganic anions and cations.

INTERN TASKS

An intern with the RBPGL will be offered experiences in all stages of the scientific process and will be exposed to a diverse array of interdisciplinary methods that are needed to answer scientific questions. The student will gain work experience in both laboratory and, if schedules allow, field methods, that could be an important part of the foundation for a future scientific career. There will also be numerous opportunities for the intern to participate in seminars and discussion groups, which we have in our research group on a weekly basis.
In particular, the intern will perform laboratory and, possibly, field work, participate in experimental design, literature reading, laboratory maintenance, and data analysis as follows:

Experimental Design. The intern will participate in the experimental design process by participating in discussions of identifying research questions, developing hypotheses, and consulting the primary literature for methods. The intern will work as a part of the RBPGL team to design experiments and will learn through hands on experience and mentorship from the RBPGL team members.

Laboratory and Field Work. The intern will primarily assist with laboratory analysis, but if opportunities arise, they will be included on field sampling trips. Laboratory work includes preparing water and sediment samples for analyses, including preparation of standards and routine analyses on analytical instruments. The intern will get experience using wet chemical methods such as pH determinations and chemical titrations and may assist in analyses using a carbon analyzer, high performance liquid chromatography, gas chromatography, ion chromatography and optical emission spectrometry. Samples will come from field and laboratory monitoring and experiments.

Data Analysis. The intern will be responsible for collating geochemical data into EXCEL spreadsheets, proofing spreadsheets, and plotting data to look for trends in multiple studies. The intern will also consult the primary literature in order to learn how to interpret data and make scientific conclusions.

Laboratory Maintenance. This includes organizing chemicals, sorting samples and laboratory equipment and supplies, and general glassware cleanup. The student will also assist in the preparation of sampling supplies and equipment and the shipping of supplies prior to field excursions.

Additional Tasks. The student will be trained to maintain careful and accurate records in a laboratory notebook and will follow basic laboratory QA/QC procedures. The student will also attend scientific seminars and discussions at the USGS in order to learn more about environmental research and issues such as scientific ethics and data preservation protocols. The intern will also conduct literature reviews and participate in weekly group meetings to learn more about the scientific process, evaluate the literature and how to design research experiments.

BENEFITS TO INTERN

Through this internship, the intern will be able to get a glimpse of the broad careers available at USGS. They will be part of a diverse Science Center (GEMSC) that conducts research on energy, minerals, climate, and environmental issues. This Center has many opportunities for engagement and an excellent history of working on diversity, equity and inclusion issues, from which any intern would benefit. The intern will have both hands-on experience in the laboratory, through which they will gain practical skills (as described above), as well as seminar experiences that will broaden their perspectives of scientific careers beyond what they would typically be exposed to in the classroom.

MENTORING PLAN

My research group has had many summer interns and we are very experienced with mentoring interns. Some of them have gone on to become full professors and Deans at Universities and speak very highly of their intern experiences at USGS. Our goals for this intern would include (1) Introduce the student intern to government and academic research; (2) Provide routes for career growth & exploration and (3) Encourage and enhance skill development & learning opportunities not available at school. In order to achieve these goals, this intern would work on a daily basis with experienced laboratory staff in the Reston Biogeochemical Processes in Groundwater
Lab (RBPGL) and meet weekly with the PI (Principal Investigators) and RBPGL lab staff to review progress and plans. In addition, they will meet weekly with the broader research team that we collaborate with (every Monday) to share experiences and challenges, provide project updates, and ask questions. The projects this intern will work on are part of our Environmental Health Energy Integrated Science Team (IST). This IST meets monthly to share our science and host seminar experiences. The intern would participate in these monthly meetings as well as monthly Science Center meetings. The intern would also be encouraged to attend scientific seminars presented both within our GEMSC and more broadly within USGS in order to get a picture of the breadth of what USGS does.

ADDITIONAL DETAILS

STUDENT SKILLS AND INTERESTS

Some experience with chemistry and laboratory procedures and methods through formal education or previous jobs/internships is preferred. Experience using EXCEL for data organization and analysis is essential. An interest in understanding environmental processes, water quality and contaminants would be ideal.

LOCATION: Reston, Virginia

ACTIVITY LEVEL:

Level 8-2: The work requires some physical exertion such as long periods of standing, walking over rough, uneven, or rocky surfaces; recurring bending, crouching, stooping, stretching, reaching, or similar activities; or recurring lifting of moderately heavy items. The work may require specific, but common, physical characteristics and abilities such as above-average agility and dexterity.

| FIELD WORK | 0-25% | VIRTUAL? | No |
| LAB WORK | 50-75% | |
| OFFICE WORK | 25-50% | |
| OTHER | None | |

PROJECTED START DATE 5/23/2022
EXPECTED DURATION 3 months