Request for Proposals

Map Traps
Case Studies Database

Expressions of interest must be received by April 30, 2018 at:

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About E-Flux

E-Flux provides cutting-edge environmental measurements of soil gas flux using proprietary passive sampling technology generated at Colorado State University (CSU) (2013, ZImbron et al). Since 2012, E-Flux has been the driving force behind technical improvements, commercialization and widespread acceptance of Fossil Fuel Traps. These traps are one of the main accepted methods for measuring the rate of petroleum biodegradation (also known as natural source zone depletion rate, or NSZD) at contaminated sites (API, 2016; ITRC, 2017).

E-Flux Services

Our proprietary technology is used to measure the rate of CO_2 emanating from the soil, also known as CO_2 flux (McCoy et al., 2015). Since CO_2 is the main product of contaminant biodegradation, measurement of CO_2 flux is the basis for estimating NSZD rates (API, 2016).

CO_2 soil fluxes change quickly due to daily ambient pressure variations (also known as “barometric pumping”), ambient temperature variations and/or tidal fluctuations. Our passive sampling method accounts for these variables by providing average CO_2 flux measurements integrated over a two-week period. Other methods only provide short duration “snapshot” measurements, which do not take these important fluctuations into consideration.

Another advantage of our passive sampling system is that it is easy to use: Fossil Fuel Traps have no moving parts and do not require power, which enables easy deployment at remote locations.

Fossil Fuel Traps also remove the need for a background location correction, in which NSZD rates are estimated by subtracting the CO_2 flux at a background (uncontaminated) location from the total flux at the contaminated location. In our experience, the variability of vegetation cover is too large between two such locations, making the background correction highly error-prone. A much more robust alternative is the use of a location-specific ^{14}C correction (Zimbron and Kasyon, 2015).

E-Flux offers two variations of our patented technology:

1. **Fossil Fuel Traps** measure the rate of petroleum biodegradation by capturing CO_2 emitted from petroleum-contaminated soil. Our method corrects this total CO_2 measurement using the isotopic signature of the captured CO_2 as determined by radiocarbon (^{14}C) analysis, so that the fraction of CO_2 originating from the petroleum is separately quantified. Ours is the only technology that easily eliminates the interference from modern carbon sources (natural soil respiration processes). This location-specific correction is very important: According to the American Petroleum Institute, “The use of ^{14}C is arguably the best, most quantitative means for background correction and it should be considered of utmost reliability.” (API, 2016). Fossil Fuel Traps use the most accurate ^{14}C analysis available (via accelerator mass spectrometry) for this correction.

2. **Map Traps** measure total CO_2 flux. Using a proprietary, low-sensitivity, low-cost qualitative analysis based on the radioactive decay of ^{14}C, Map Traps indicate if a sample has significant fossil fuel carbon content. Although this qualitative ^{14}C analysis is not sufficient for NSZD rate estimation, it makes our Map Traps an ideal tool for contaminant delineation.

Background and Motivation

E-Flux has tested Map Traps at various LNAPL-contaminated sites with excellent results and is currently assembling a larger data set for publication in a peer-reviewed journal. The purpose of this request for proposals is to seek out additional test sites. In exchange for permission to use the data in a publication, E-Flux is offering a complimentary set of Map Traps to three qualifying sites and full availability of the collected data. If desired, acknowledgement of support in any work produced, including written reports, conference presentations and peer-reviewed journal publications will be included. In addition, a round of Fossil Fuel Traps will be provided at a 50% discounted rate, for NSZD rate quantification after site characterization. E-Flux will keep the site location and other identification anonymous to the extent required by the applicant.

Requirements

Successful applications will have the following characteristics:

a) An LNAPL source zone that has already been mapped with a high-resolution characterization tool, such as laser-induced fluorescence, membrane interface probe, discrete soil gas analysis (multiple elevations at multiple locations), or petroleum analysis (gas chromatography) on discrete core sections.
b) The site data is non-confidential (for example, the site is managed by a government agency), or the site owner is willing to authorize the use of data in a peer-reviewed publication.
c) E-Flux receives an expression of interest by April 30, 2018.
d) The site owner signs a mutual non-disclosure agreement by April 30, 2018.
e) Map Traps must be deployed by October 31, 2018.

E-Flux will also rate proposals based on the following factors:

a) responsiveness to the requirements set forth in this request for proposals,
b) relevant past performance/experience, and
c) technical expertise and experience of bidder and bidder's staff.

E-Flux reserves the right to award to the bidder that presents the best value to E-Flux as determined solely by E-Flux using its absolute discretion.

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References

American Petroleum Industry. (2016) Quantification of Vapor Phase-Related Natural Source Zone Depletion Processes, 93 p. .www.techstreet.com/api/standards/api-publ-4784?gateway_code=api&product_id=1984357.

Interstate Technology and Regulatory Council. ITRC LNAPL Update Document (in progress).

McCoy K., Zimbron J., Sale T., and Livers M. (2015) Measurement of Natural Losses of LNAPL Using CO_2 Traps. *Groundwater* 53(4), 658-667. doi:10.1111/gwat.12240.

Zimbron J. and Kasyon E. (2015) Combined Use of Isotope Analysis and Passive CO_2 Flux Traps to Estimate Field Rates of Hydrocarbon Degradation. Battelle Remediation Conference, D-002 (abstract), Miami, Florida.

Zimbron, J., T. Sale, and M. Lyverse. (2013) Gas flux measurement using traps. Patent WO 20131020063A1.