Development of a Technical-Regulatory Guidance Document for TPH Risk Assessment at Petroleum-Contaminated Sites

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Advancing Environmental Solutions

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About ITRC

ITRC uses a proven, cost-effective approach to develop guidance documents and training courses

Since 1995:
117 documents
84 training courses

About ITRC

2017 Teams

- Bioavailability in Contaminated Soil
- Characterization and Remediation in Fractured Rock
- Evaluation of Innovative Methane Detection Technologies
- LNAPL Update
- PFAS
- Quality Considerations for Multiple Aspects of Munitions Response Sites
- Remediation Management of Complex Sites
- Stormwater BMP Performance Evaluation Team
- TPH Risk Evaluation at Petroleum-Contaminated Sites

What is TPH?

- TPH: **T**otal **P**etroleum **H**ydrocarbons
  - Petroleum hydrocarbons include crude oils and refined products and may consist of *hundreds to thousands of individual compounds* with **wide-ranging physical and chemical properties**
  - This complex mixture may be referred to by a number of different names: *mineral oil*, *hydrocarbon oil*, *oil and grease*, *volatile hydrocarbons*, *extractable hydrocarbons, gasoline range organics, diesel range organics, motor oil range organics, volatile range compounds, purgeable hydrocarbons, extractable hydrocarbons, etc*.
  - TPH data may be used for delineation of bulk oil in the environment, product identification, forensic evaluation of the potential leak source or sources, estimation of risk or hazard to people and the environment, selection of remedial options, and/or compliance monitoring.

What is TPH?

- Ideally TPH should quantify the total combined concentration of all the petroleum -derived hydrocarbons in an environmental media sample, but in reality it may not be **T**otal, may not be **P**etroleum, and may not be just **H**ydrocarbons.

- TPH results depend on the analytical method:
  - all petroleum constituents in an environmental sample are not captured
  - non-petroleum hydrocarbons are included (e.g., natural plant and animal organics)
  - non-hydrocarbons are included (e.g., halogenated solvents, PCBs)

What is TPH?

- There is no one best method for measuring petroleum contamination and in practice there are a variety of analytical methods, and no analytical method can selectively measure:
  - *only* petroleum-derived hydrocarbons.
  - *all* of the petroleum-derived hydrocarbons in a sample.
- TPH analysis results are semi-quantitative and may vary for the same sample analyzed:
  - by different TPH methods
  - with the same method twice

What is TPH?

- The same TPH concentration may represent very different compositions and very different potential risks or hazards to human health and the environment
  - at two sites
  - at the same site in different media (waste, soil, sediment, water, air)
- Definitions for TPH vary for different regulatory jurisdictions and for different analytical laboratories.
  - There are no federal or EPA methods developed specifically for TPH.
  - TPH has typically been regulated under State programs.
  - It is necessary to understand the analytical method used in order to interpret the TPH results obtained for a given sample.

Key Challenges

- Accurate identification and quantification of TPH
- Not all TPH is created equal
- TPH changes over time
- Use of indicator compounds and surrogates such as BTEX, may not capture all of the risk at a site
- Various Media (soil, groundwater, surface water, vapor, etc.)
- Conciseness and usability of the document

TPH Risk Assessment Guidance

- Introduction
- Regulatory Framework
  - History of TPH Regulation
  - TPH-Specific Regulatory Challenges
  - Regulatory Tools
- TPH Fundamentals
  - Petroleum Chemistry
  - Physical and Chemical Properties, TPH Carbon Ranges, and Metabolites
  - Alterations of Petroleum Mixtures in the Environment

TPH Risk Assessment Guidance

- Conceptual Site Model
  - Sources
  - Transport
  - Uptake
  - Human and Ecological Receptors
- Investigative Strategies
  - TPH Data Collections
  - Sampling and Analytical Methods
  - Data Quality and Usability

TPH Risk Assessment Guidance

- Human Health Risk
  - Exposure
  - Toxicity
  - Risk Characterization
- Ecological Risk Assessment
  - Exposure
  - Toxicity
  - Risk Characterization
- Risk Calculators
  - Methods for Evaluating TPH Risk
  - Defining and Selecting TPH Fractions
  - Risk Calculating Tools

TPH Risk Assessment Guidance

- Special Considerations
  - Emergency Conditions
  - Managing TPH-Contaminated Sites
  - Remedial Action and Institutional Controls
  - Common Mistakes and Lessons Learned
- Stakeholder Concerns

Timeline

- **2016** – Team-building, collecting data and information using surveys, case studies, and literature review to identify and evaluate regulatory approaches, technology used for characterizing risk of petroleum, and real site practices at petroleum-contaminated sites. A summary of regulatory approaches and a list of issues similar to those described above will help direct the development of guidance documents.
- **2017** –Use this information and data to evaluate and provide an overview of recommended technologies required for risk-based decisions, including but not limited to, project planning, sampling soil, sampling groundwater, sampling air, characterizing source areas and dissolved-phase-contaminated areas, monitoring attenuation, statistical analysis, determining toxicity and assessing risk. Develop a Tech-Reg guidance document.
- **2018** –Implementation phase: develop an Internet-based training curriculum for TPH risk evaluation at petroleum contaminated sites.

Timeline

- Updates and Revisions
- References and Copyright
- Figures and Graphics
- Peer Review
- External Review
- Internet-Based-Training (IBT)
- IBT Practice
- Scheduled publication date 4Q18

TPH Risk Assessment Team

- **145 individual members**
  - **Federal Government - 8**
  - **State and Local Government - 37**
  - **Academia - 7**
  - **Public and Tribal Stakeholders, International Members, Emeritus - 8**
  - **Industry Affiliates**
    - **Petroleum Industry – 15**
    - **Consultants – 70**

Additional Information

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www.itrcweb.org

TPH Risk Assessment Team Page:
http://www.itrcweb.org/Team/Public?teamID=76

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