



2016 ITRC PROJECT PROPOSAL

TPH Risk Evaluation at Petroleum-Contaminated Sites

PROPOSAL DATE: January 14, 2016

Proposal Contacts

Amended Focused Proposal (Jeff Kuhn, Tom Booze, Mike Kwiecinski)

Proposals Topical Area

CHAR/CONT "Characterization / Contamination"

Proposal Summary

Complete remediation at petroleum release sites is often infeasible for technical or cost reasons. Many of these sites may be depleted in typical indicator compounds, such as BTEX, but still heavily contaminated in terms of Total Petroleum Hydrocarbons (TPH). In many cases, states have closed such sites with long term strategies involving institutional control mechanisms (ICs). However, TPH contamination at sites closed with ICs can cause problems associated with future redevelopment of the site when conditions change and contractors are directly exposed to petroleum contamination in soil, groundwater, and vapor containing elevated TPH levels. Some common problems encountered include the following scenarios:

- 1) Concerns of workers over potential health effects from exposure to contaminated soil, water, and vapor
- 2) Fouling of heavy equipment with oil
- 3) Sudden need to store and dispose of large volumes of contaminated soil and/or water
- 4) Need for redesign of dewatering system due to high levels of dissolved TPH (or TPH-related degradation products) in groundwater, etc., and
- 5) Need to redesign engineering plans to address concerns over potential vapor migration into utility corridors or new buildings.
- 6) Discoloration of soils.
- 7) Odors which may alarm workers and nearby residents.

These problems can lead to work stoppages, temporary losses of jobs, disruptions to small businesses involved in the project, unrepaired roads and utilities, etc., and impose economic hardships on a community. A process that allows a more informed use of TPH data to identify potential problems ahead of time is an important part of the solution.

The traditional single-compound approach of managing petroleum contaminants does not fully identify short- and long-term potential environmental concerns, creates delays and cost run ups due to residual petroleum contamination encountered during subsurface utility work or redevelopment. States should utilize a risk-based approach to more effectively incorporate TPH data in addition to traditional BTEX data in cleanup and long-term management decisions.

A 2011, Alaska Department of Environmental Conservation (ADEC) survey of all 50 states and Canada found wide variation in RBCA Tier 1 cleanup approaches using TPH cleanup levels:

- TPH cleanup levels ranged from 50 mg/kg (OK) to 4,100 mg/kg (AZ)
- GRO cleanup levels ranged from 3.1 mg/kg (OH) to 1,500 mg/kg (UT)

- DRO cleanup levels ranged from 2.7 mg/kg (OH) to 5,000 mg/kg (UT)
- RRO (ORO) cleanup levels ranged from 99 mg/kg (TX) to 10,000 mg/kg (UT)

Methods and techniques for characterizing the risk of petroleum mixtures were refined during the period 2004 to 2014 using a variety of methods, which lead to a wide range of cleanup values. Better guidance is needed to help states develop consistent methodology for establishing risk-based cleanup levels and for establishing and approving methods for risk-based corrective actions.

This ITRC project will review, update, and develop guidance on methods and procedures used for evaluating risk and establishing cleanup requirements at TPH contaminated sites. Much if not all of the information required has already been published by states and other entities over the past 20 years (e.g., TPH carbon range chemistry and toxicity, methods to develop weighted toxicity factors and screening levels for different fuel types, models and approaches to develop screening levels for direct exposure, vapor intrusion, drinking water and aquatic toxicity, gross contamination, etc.). The ITRC document would primarily be a compilation of this existing information presented in an easy-to-use manner for regulators and consultants. This document will also incorporate updated TPH information being collected concurrently by the American Petroleum Institute (API).

A comprehensive guidance on making scientific, risk-based decisions at petroleum-contaminated sites will help states develop guidance to address this common class of contaminants.

The following technical areas and regulatory barriers will be addressed by this project:

- Overview of petroleum fuel and vapor chemistry;
- Review of published, TPH carbon range toxicity factors including those that are part of ongoing API review;
- Review of methods to develop risk-based, TPH carbon range screening levels for soil, water and air/vapor (e.g., standard EPA RSL models);
- Review of lab methods for testing of carbon ranges and TPH in soil, water and air;
- Example use of risk-based TPH screening levels for the remediation and long-term management of petroleum-contaminated sites.
- Possible review and consideration of approaches to develop weighted toxicity factors and screening levels for specific petroleum fuels and mixtures;

The 3-year schedule below would be a reasonable approach:

- 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.

Proposed Personnel

Team Leaders: Tom Booze, California DTSC, and Mike Kwiecinski, Colorado DLE.

States indicating interest:

HI - Roger Brewer (completed a study detailing a method for petroleum vapors), CA – Tom Booze (lead author of DTSC petroleum risk guidance), CO – Mike Kwiecinski (member of ITRC PVI and GRO Teams), WA – Hun Seak Park (ECY - developed the Washington 4 phase calculator), OR - Mike Poulsen (helped develop Oregon RBDM Calculator), UT – Robin Davis (PVI Team member), MT – Scott Gestring (POC for Montana, MT contact on TPH issues), AK- Fred Vreeman (former POC, helped prepare the initial TPH Team Proposal). Many other states have indicated a strong interest in the topic as well.

DoD components:

USAF funded implementation of Alaska’s risk based decision making calculator by paying for consultant training and other development costs. ACOE has a significant interest in development of this guidance as well. DLA (Defense Logistics Agency) has indicated interest but does not have a funding mechanism for it. US Army originally funded the 4 phase modeling research in Alaska and will be interested in this effort.

Federal Agencies:

Department of Transportation (FAA) funded development of a series of papers for the “Statement of Cooperation” working group in Alaska. These documents update the TPHCWG information. This effort led to development of a “Hydrocarbon Risk Calculator” approved in 2011.

USGS worked with various parties in 2002 to attempt characterization of risk in contaminated aquifers.

Department of Interior (BLM, USFWS & NPS) are involved in numerous cleanups, and Department of Agriculture (USFS & others) also has an extensive cleanup program.

EPA offices should be involved, possibly from several regions.

Industry:

The American Petroleum Institute (API), and the individual petroleum industry companies are keenly interested in developing risk based approaches to remediation at petroleum sites.

Summary of Deliverables (primary project product(s))

This guidance will provide:

- A consistent framework based on risk-based decision-making at typical petroleum-contaminated sites (e.g., retail gas stations, bulk fuel storage facilities, refineries, and pipelines), covering conceptual site model, investigation and sampling, characterization of contaminated areas and media, characterizing concentrations, assessing human health and ecological risk,
- Identify appropriate technologies and important data to collect so that defensible risk-based decisions can be made.
- Discuss and provide sources of information on toxicity values and appropriate methods to assess the risk of petroleum mixtures found at contaminated sites.
- Recommendations for improved State technical oversight through application of an acceptable risk-assessment strategy at petroleum sites.

Targeted Users

- Regulatory staff, staff and managers from all state and federal environmental, public health, and remediation programs
- Site owners and “Responsible Parties”
- Federal Agencies cleaning up Petroleum Contaminated Sites owned by the Federal Government
- Remediation and Cleanup consultants and Engineers
- Public stakeholders at the local, tribal, and community level
- Academics interested in using or developing science-based approaches to assess risk posed by petroleum-contaminated sites