RED HILL IN FOCUS
WEBINAR SERIES

Drinking Water Update for Red Hill

April 20, 2023

Webinar Series

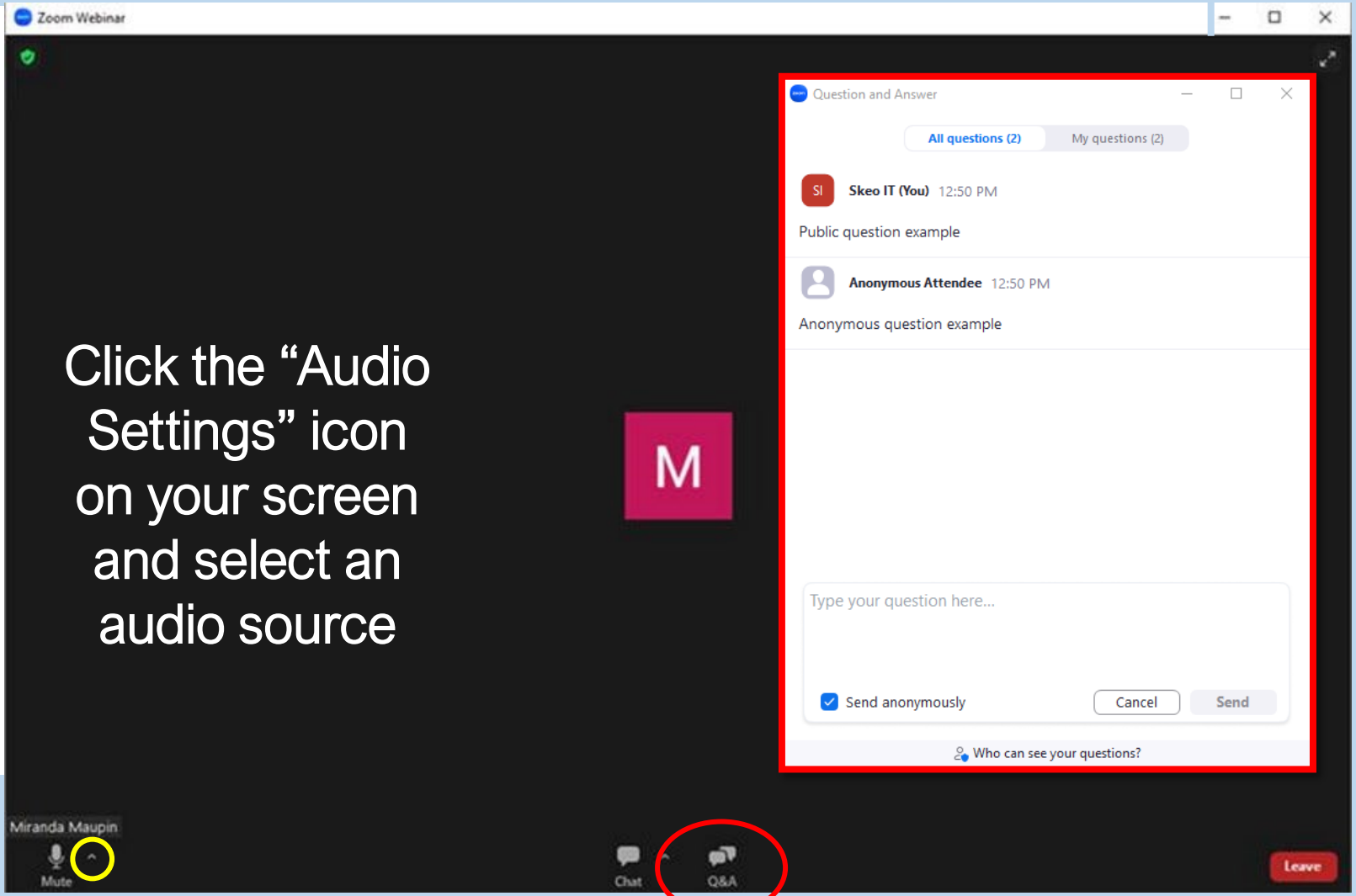
The U.S. Environmental Protection Agency and the Hawai'i Department of Health are hosting the Red Hill In Focus Webinar Series to present information to the public on what agencies are doing to address impacts to human health and the environment from Red Hill Bulk Fuel Storage Facility releases.

For webinar series information, visit
www.epa.gov/red-hill/red-hill-webinar-series

Zoom Webinar Functions

Please use the Q&A window to ask questions

If you have audio issues, try clicking the Audio Settings icon to choose a different audio source.



Webinar Agenda

1. Introduction (Dominique Smith, EPA)
2. EPA Role and Engagement (Corine Li, EPA)
3. Emergency Response & Long-Term Monitoring (Dennis Lopez/Roger Brewer, DOH)
4. Navy Online Tool Presentation (Tracy Maningas, NAVFAC Hawaii)
5. Resources (Dominique Smith, EPA)
6. Questions and Answers

Registration Questions

EPA Role & Engagement

Corine Li, P.E.
U.S. Environmental Protection Agency

Ensuring Provision of Safe Drinking Water

EPA United States Environmental Protection Agency


EPA

EPA's Mission is to "*Protect Human Health and the Environment*"

Over-arching objectives:

- ✓ Americans have access to clean air, land and water
- ✓ Reduce environmental and public health risks
- ✓ Ensure Federal laws are administered and enforced fairly and consistently

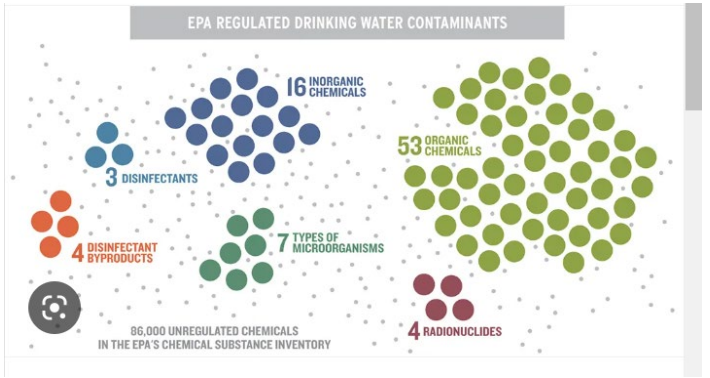
How does EPA accomplish its Mission?

- ✓ Develop national regulations, policies and guidance
- ✓ Partner with stakeholders to administer public health and environmental programs
- ✓ Provide technical and financial assistance
- ✓ Conduct oversight and enforcement

EPA and the Safe Drinking Water Act

Safe Drinking Water Act

- ✓ Established to protect drinking water quality in the U.S.
- ✓ Sets national standards for drinking water.
- ✓ Authorizes states to implement federal requirements.



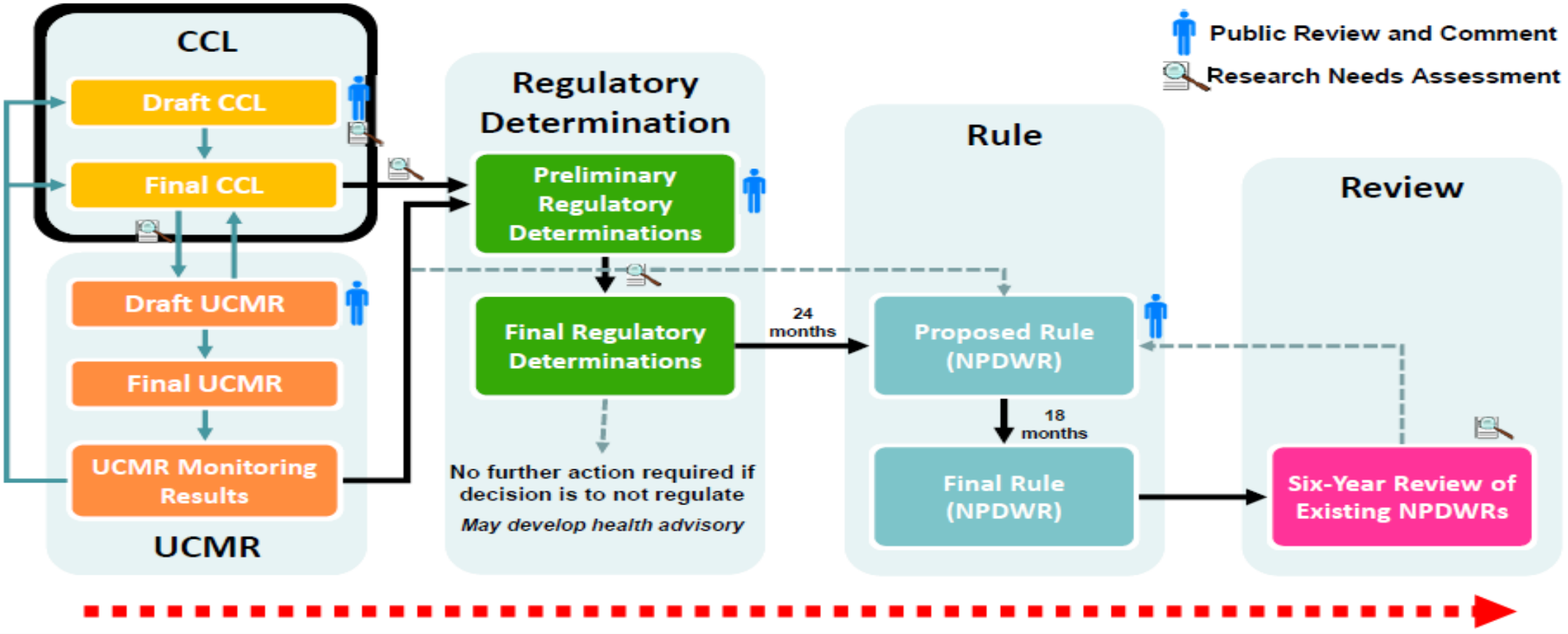
EPA Oversight

- ✓ State of Hawaii authorization in September 1977.
- ✓ National/regional performance metrics
- ✓ Annual program review, comprehensive onsite file audits

EPA regulates over 90 contaminants in drinking water that are known to: i) adversely affect public health, and ii) occur in drinking water at a frequency and at levels that pose a threat to public health

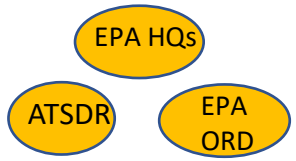
EPA REGULATORY PROCESS

General Flow of SDWA Regulatory Processes



Increased specificity and confidence in the type of supporting data used (e.g., health, occurrence, treatment) is needed at each stage

Drinking Water System Contamination Response: Timeline of EPA Involvement



Deployment of EPA On-Scene Coordinators

- Assess and characterize incident.
- Determine extent and type of response support needed.

Deployment of Drinking Water Subject Matter Experts

- Develop plans for data management, flushing, sampling and testing.
- Provide analytical services.

Joint Command (IDWST)

- Participate in daily Navy, State, EPA briefs and meetings.
- Participate in external media events.

Execution

- Oversee Navy execution of plans.
- Review and analyze data and findings.

Oversight and Accountability

- Monitor recovery activities under LTM plan.
- Monitor Navy actions under pending EPA final consent order.

December 2021 – March 2022 EPA On-Scene Coordinators & Water Emergency Team (Response)	March 2022 DOH LTM (Recovery)	2023 EPA CO

Navy Water System Emergency Response and Long Term Monitoring: November 2021 Fuel Release

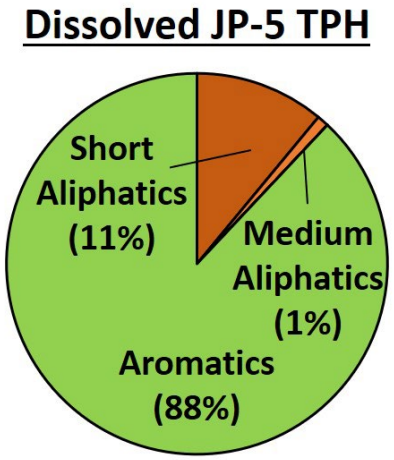
Hawai'i Department of Health Update

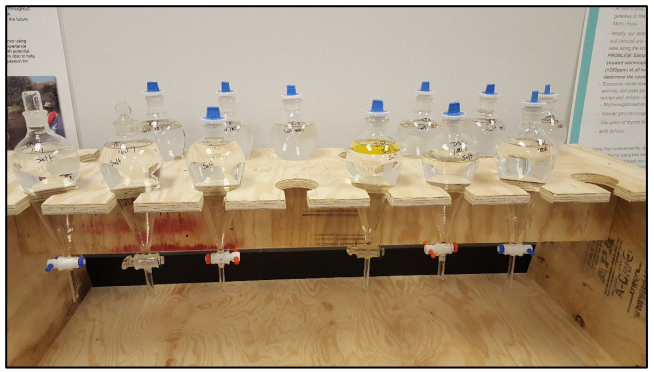
April 2023

Tapwater Action Levels for JP-5 Jet Fuel

Roger Brewer, PhD
Senior Environmental Scientist
Hawai'i Department of Health (HEER)
(roger.brewer@doh.hawaii.gov)

USEPA JBPHH Drinking Water Update
April 20, 2023





References

HIDOH JP-5 Drinking Water Action Levels:
Recommended Risk-Based Drinking Water Action Levels for Total Petroleum Hydrocarbons (TPH) Associated with Releases of JP-5 Jet Fuel **(updated April 20, 2022).**
https://health.hawaii.gov/heer/guidance/ehe-and-eals/

HIDOH Environmental Action Levels:
Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater **(Fall 2017 and updates):**
https://health.hawaii.gov/heer/guidance/ehe-and-eals/

TPH Action Levels (recorded presentation):
TPH and the Assessment of Petroleum Risk (September 2022)
https://health.hawaii.gov/heer/guidance/heer-webinars/

Makeup of Petroleum Fuels

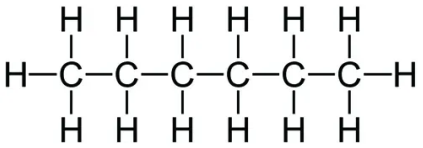
Terminology:

BTEX: Benzene, Toluene, Ethylbenzene, Xylenes } "Aromatics"

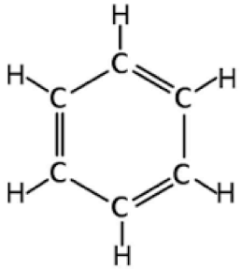
PAH: Polyaromatic Hydrocarbon

TPH: Total Petroleum Hydrocarbon (additional hundreds of compounds *plus degradation products or "HOPs"*)

BTEX-PAHs **TPH**



Aliphatics



Aromatics

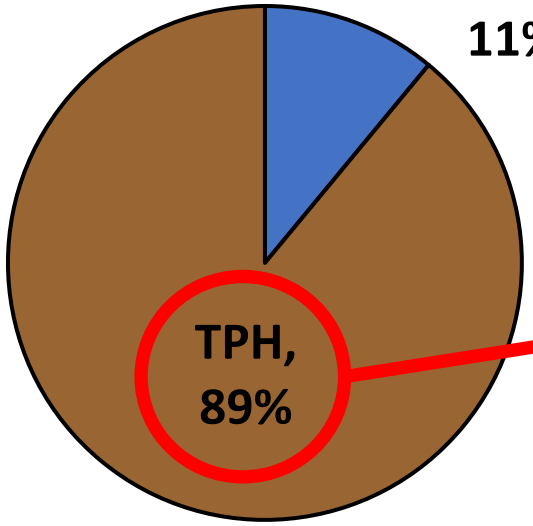
TPH:

- Short Chain Aliphatics
- Medium Chain Aliphatics
- Long Chain Aliphatics
- Other Aromatics

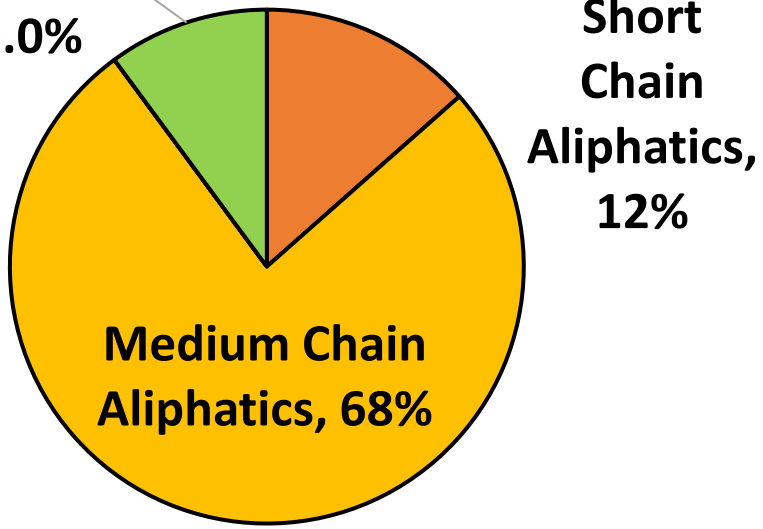
Step 1: Makeup of JP-5 Fuel

(published information; Table 6 in April 2022 JP-5 EAL Memorandum)

JP-5 Fuel



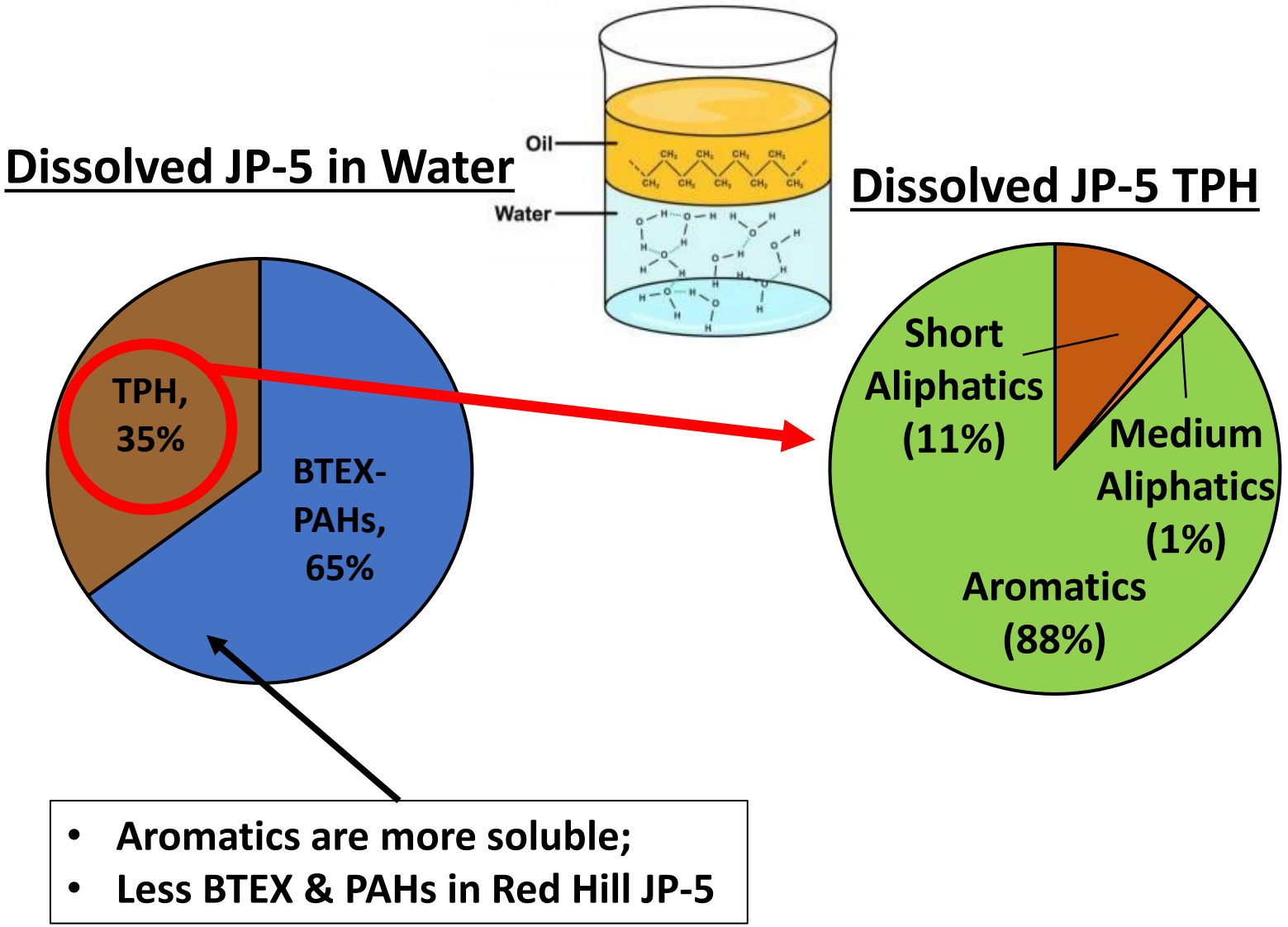
TPH Makeup of JP-5 fuel



- BTEX mostly xylenes;
- Less BTEX & PAHs in Red Hill JP-5

Step 2: Makeup of Dissolved JP-5 in Water

(predicted; Table 6 in April 2022 JP-5 EAL Memorandum)



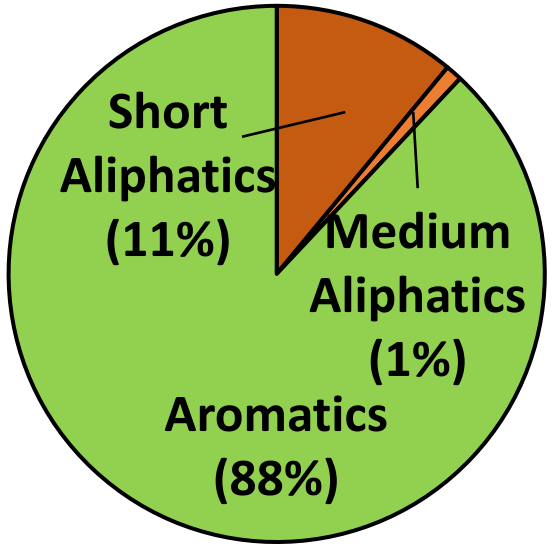
- Aromatics are more soluble;
- Less BTEX & PAHs in Red Hill JP-5

Step 3: TPH Mixture Toxicity and Tapwater Action Level

(based on aliphatic-aromatic makeup of dissolved TPH)

(one drop of jet fuel weights approximately 40 milligrams)

Dissolved JP-5 TPH



TPH "Carbon Ranges"	Published Toxicity Factors (no expected health risk to a 15 kg child)		
	Ingestion Exposure (µg/day)	Dermal Exposure (µg/day)	Inhalation Exposure (µg/m³)
Short Aliphatics	600	600	600
Medium Aliphatics	150	150	100
Long Aliphatics	45,000	45,000	na
Aromatics	450	450	100
Mixture Average:	**450**	**510**	**111**

$$TPH\ Mixture\ Toxicity = \frac{1}{\left(\frac{Fraction\ A}{\times Toxicity\ A}\right) + \left(\frac{Fraction\ B}{\times Toxicity\ B}\right) + etc\ \ldots}$$

Tapwater Action Level = Toxicity x Exposure Factors

USEPA Tapwater Screening Level Equation

(USEPA Default: Daily use of water by average 15 kg child for 6 years)

Ingestion

- ingestion of water

$$SL_{res\text{-}wat\text{-}nc\text{-}ing\text{-}c}\left(\mu g/L\right) = \frac{THQ \times AT_{res\text{-}c}\left(\frac{365\ days}{year} \times ED_{res\text{-}c}\left(6\ years\right)\right) \times BW_{res\text{-}c}\left(15\ kg\right) \times \left(\frac{1000\ \mu g}{mg}\right)}{EF_{res\text{-}c}\left(\frac{350\ days}{year}\right) \times ED_{res\text{-}c}\left(6\ years\right) \times \frac{1}{RfD_o\left(\frac{mg}{kg\text{-}d}\right)} \times IRW_{res\text{-}c}\left(\frac{0.78\ L}{day}\right)}$$

Dermal Absorption

- dermal

FOR INORGANICS:

$$SL_{res\text{-}wat\text{-}nc\text{-}der\text{-}c}\left(\mu g/L\right) = \frac{DA_{event}\left(\frac{ug}{cm^2\text{-}\ event}\right) \times \left(\frac{1000\ cm^3}{L}\right)}{K_p\left(\frac{cm}{hour}\right) \times ET_{event\text{-}res\text{-}c}\left(\frac{0.54\ hours}{event}\right)}$$

FOR ORGANICS:

$$IF\ ET_{event\text{-}res\text{-}c}\left(\frac{0.54\ hours}{event}\right) \le t^*\ (hours),\ then\ SL_{res\text{-}wat\text{-}nc\text{-}der}\left(\mu g/L\right) = \frac{DA_{event}\left(\frac{ug}{cm^2\text{-}\ event}\right) \times \left(\frac{1000\ cm^3}{L}\right)}{2 \times FA \times K_p\left(\frac{cm}{hour}\right) \sqrt{\frac{6 \times \tau_{event}\left(\frac{hours}{event}\right) \times ET_{event\text{-}res\text{-}c}\left(\frac{0.54\ hours}{event}\right)}{\pi}}}$$

or,

$$IF\ ET_{event\text{-}res\text{-}c}\left(\frac{0.54\ hours}{event}\right) > t^*\ (hours),\ then\ SL_{res\text{-}wat\text{-}nc\text{-}der}\left(\mu g/L\right) = \frac{DA_{event}\left(\frac{ug}{cm^2\text{-}\ event}\right) \times \left(\frac{1000\ cm^3}{L}\right)}{FA \times K_p\left(\frac{cm}{hour}\right) \times \left[\frac{ET_{event\text{-}res\text{-}c}\left(\frac{0.54\ hours}{event}\right)}{1+B} + 2 \times \tau_{event}\left(\frac{hours}{event}\right) \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]}$$

where:

$$DA_{event}\left(\frac{ug}{cm^2\text{-}\ event}\right) = \frac{THQ \times AT_{res\text{-}c}\left(\frac{365\ days}{year} \times ED_{res\text{-}c}\left(6\ years\right)\right) \times \left(\frac{1000\ \mu g}{mg}\right) \times BW_{res\text{-}c}\left(15\ kg\right)}{\left(\frac{1}{RfD_o\left(\frac{mg}{kg\text{-}day}\right) \times GIABS}\right) \times EV_{res\text{-}c}\left(\frac{1\ events}{day}\right) \times ED_{res\text{-}c}\left(6\ years\right) \times EF_{res\text{-}c}\left(\frac{350\ days}{year}\right) \times SA_{res\text{-}c}\left(6365\ cm^2\right)}$$

Inhalation

- inhalation of volatiles

$$SL_{res\text{-}wat\text{-}nc\text{-}inh\text{-}c}\left(\mu g/L\right) = \frac{THQ \times AT_{res\text{-}c}\left(\frac{365\ days}{year} \times ED_{res\text{-}c}\left(6\ years\right)\right) \times \left(\frac{1000\ \mu g}{mg}\right)}{EF_{res\text{-}c}\left(\frac{350\ days}{year}\right) \times ED_{res\text{-}c}\left(6\ years\right) \times ET_{res\text{-}c}\left(\frac{24\ hours}{day}\right) \times \left(\frac{1\ day}{24\ hours}\right) \times \frac{1}{RfC\left(\frac{mg}{m^3}\right)} \times K\left(\frac{0.5\ L}{m^3}\right)}$$

- Total

$$SL_{res\text{-}wat\text{-}nc\text{-}tot\text{-}c}\left(\mu g/L\right) = \frac{1}{\frac{1}{SL_{res\text{-}wat\text{-}nc\text{-}ing\text{-}c}} + \frac{1}{SL_{res\text{-}wat\text{-}nc\text{-}der\text{-}c}} + \frac{1}{SL_{res\text{-}wat\text{-}nc\text{-}inh\text{-}c}}}$$

DOH Drinking Water "Total TPH" Action Levels for JP-5

Basis	JP-5 TPH Action Level	Notes
Toxicity (February 2022)	211 µg/L	• Specific to fresh JP-5 fuel and fuel composition provided by Navy • Error discovered in spreadsheet
Toxicity (April 2022)	266 µg/L	• Error corrected in spreadsheet • Additional testing of JP-5 fuel from Red Hill facility underway
*Taste & Odors (February 2017)	500 µg/L	• Updated from previous 100 µg/L (USEPA 1980 document; based on mistranslation of Soviet Union study in 1940s)
**Final JP-5 EAL	266 µg/L	• Lowest of toxicity and Taste & Odor

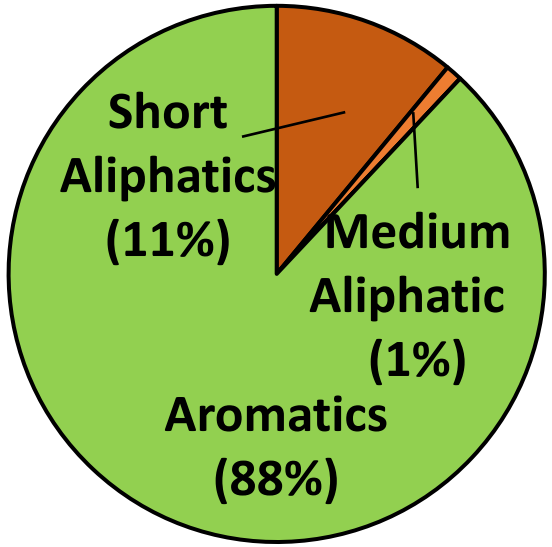
*Residents impacted by November 2021 release of JP-5 fuel at Red Hill unable to initially identify contamination of tapwater at apparent concentrations much higher than 500 µg/L.

**Equal to ingestion of approximately 1.8 drops of JP-5 fuel per year (1 drop = 40 mg).

Future Updates to TPH Tapwater Action Levels (requires change in makeup or change in toxicity)

(one drop of jet fuel weights approximately 40 milligrams)

Dissolved JP-5 TPH



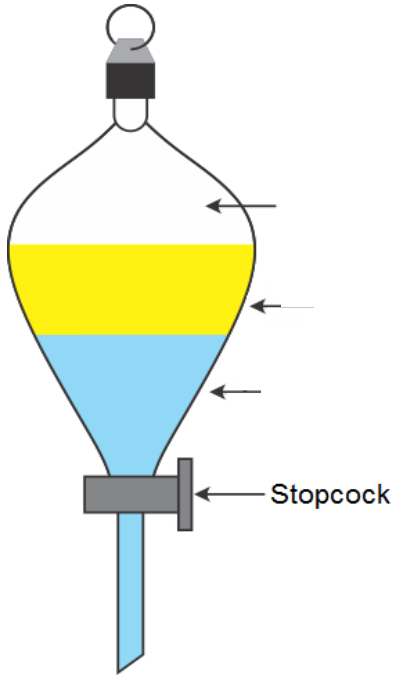
TPH "Carbon Ranges"	Published Toxicity Factors (no expected health risk to a 15 kg child)		
	Ingestion Exposure (µg/day)	Dermal Exposure (µg/day)	Inhalation Exposure (µg/m^3)
Short Aliphatics	600	600	600
Medium Aliphatics	150	150	100
Long Aliphatics	45,000	45,000	na
Aromatics	450	450	100
Mixture Average:	**450**	**510**	**111**

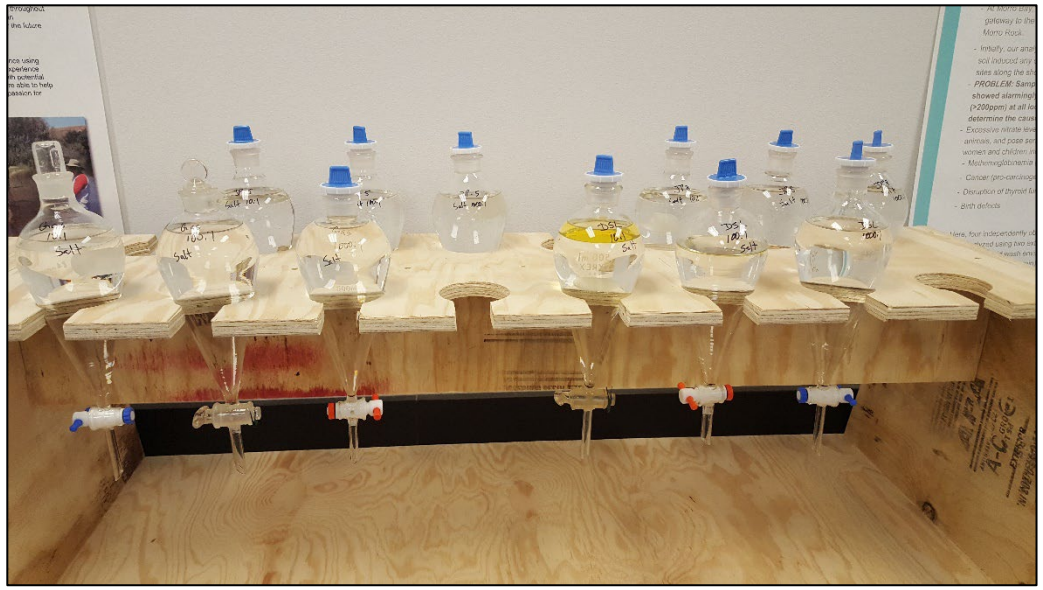
$$TPH\ Mixture\ Toxicity = \frac{1}{\left(\frac{Fraction\ A}{\times Toxicity\ A}\right) + \left(\frac{Fraction\ B}{\times Toxicity\ B}\right) + etc\ \ldots}$$

Tapwater Action Level = Toxicity x Exposure Factors

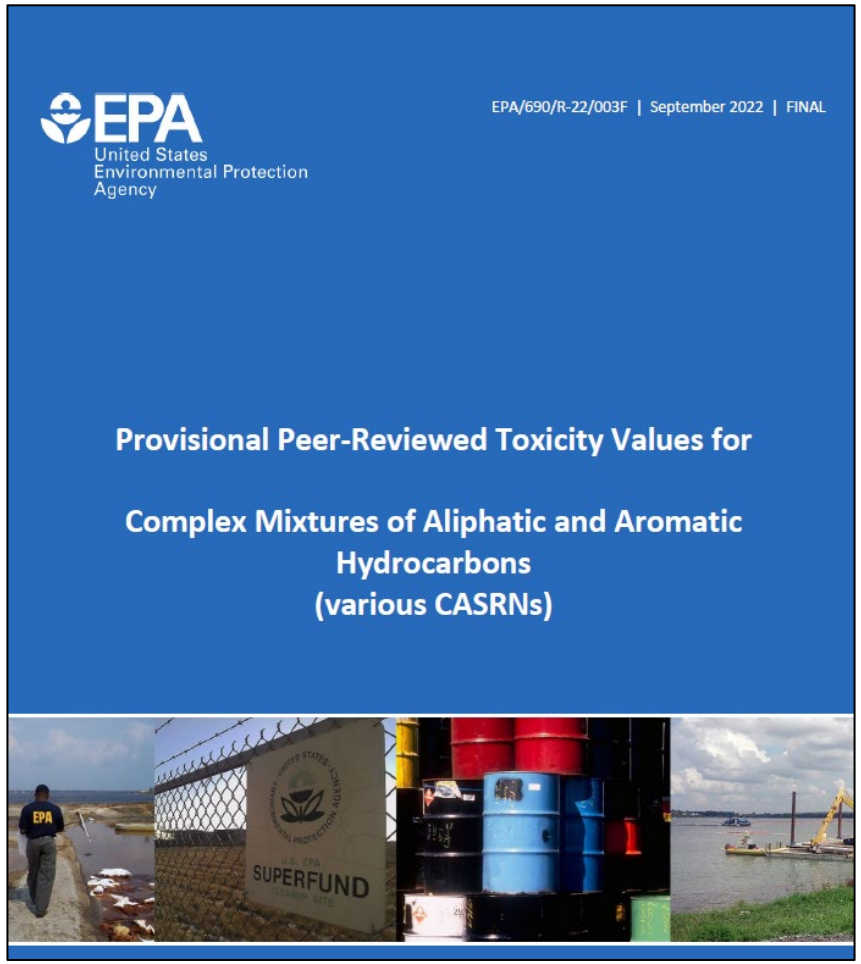
HIDOH Fuel Studies: Dissolved Mixture

- **Layer of fresh fuel placed on water;**
- **Allowed to equilibrate for 20 days;**
- **Water tested for TPH carbon range makeup of dissolved-phase hydrocarbons (earlier experiments didn't work);**
- **Weighted toxicity factors calculated for mixture;**
- **Can be used to develop toxicity-based tapwater action levels;**
- ***Anticipated May-June 2023.***





Updates to Aliphatic & Aromatic Toxicity Factors

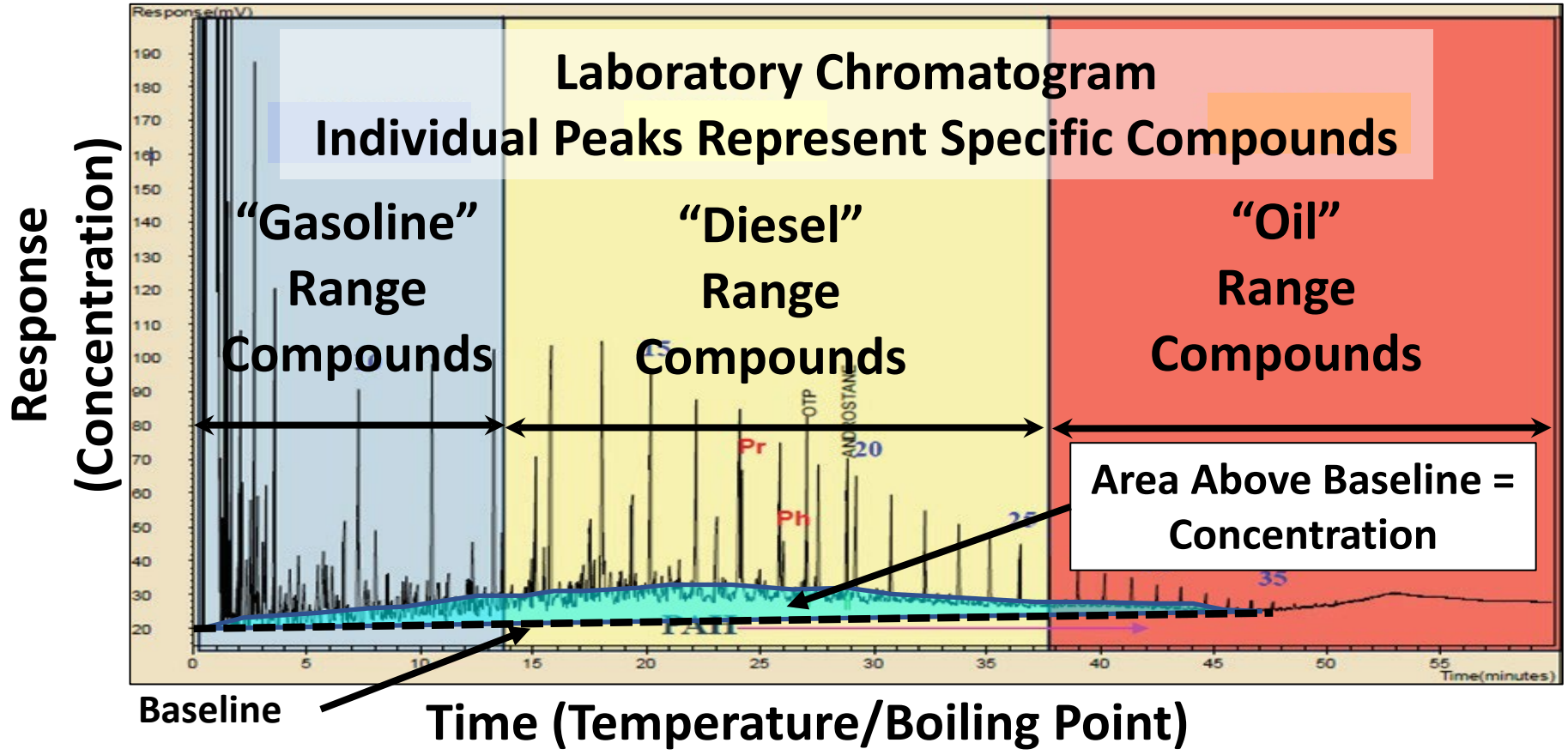


***Provisional Peer-Reviewed Toxicity Values for Complex Mixtures of Aliphatic and Aromatic Hydrocarbons*; USEPA September 2022. EPA/690/R-22/003F https://www.epa.gov/pprtv**

Under review for potential inclusion in HIDOH TPH guidance

Laboratory Measurement of "Total" TPH in Samples

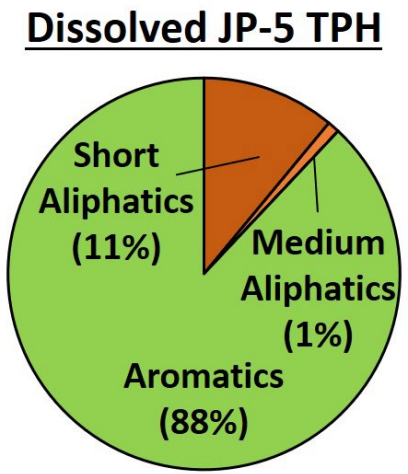
(*including degradation products*; lab methods imperfect but being improved)

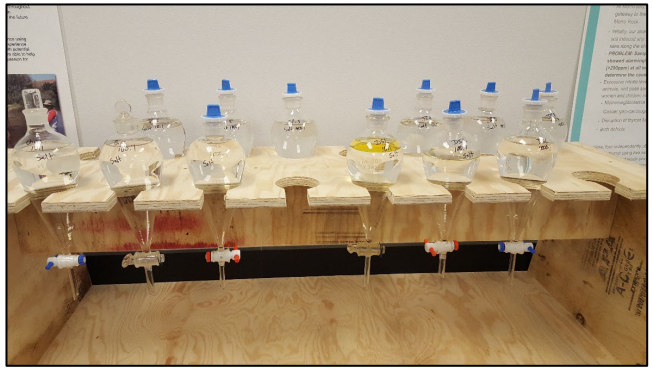


Total TPH Concentration for a Sample =
<u>Detected</u> "Gasoline Range" + "Diesel Range" + "Residual Range"

Laboratory JP-5 TPH "Detection Limit" (Method Reporting Limit) = 200 µg/L
(one drop of JP-5 dissolved in 200 liters of water)

Questions?


Dissolved JP-5 TPH
Short Aliphatics (11%)
Medium Aliphatics (1%)
Aromatics (88%)



NAVFAC
Naval Facilities Engineering Systems Command

Drinking Water Long Term Monitoring

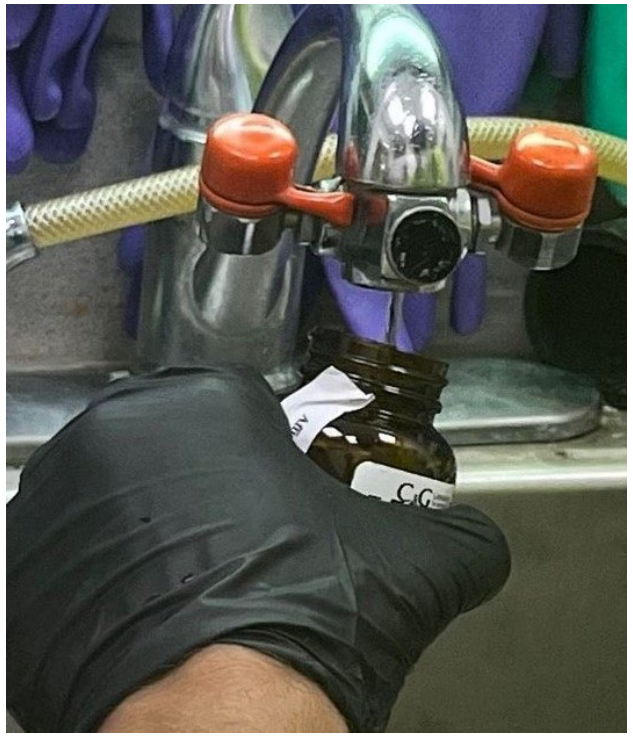
Safe Waters Website

How do I find my sample results?

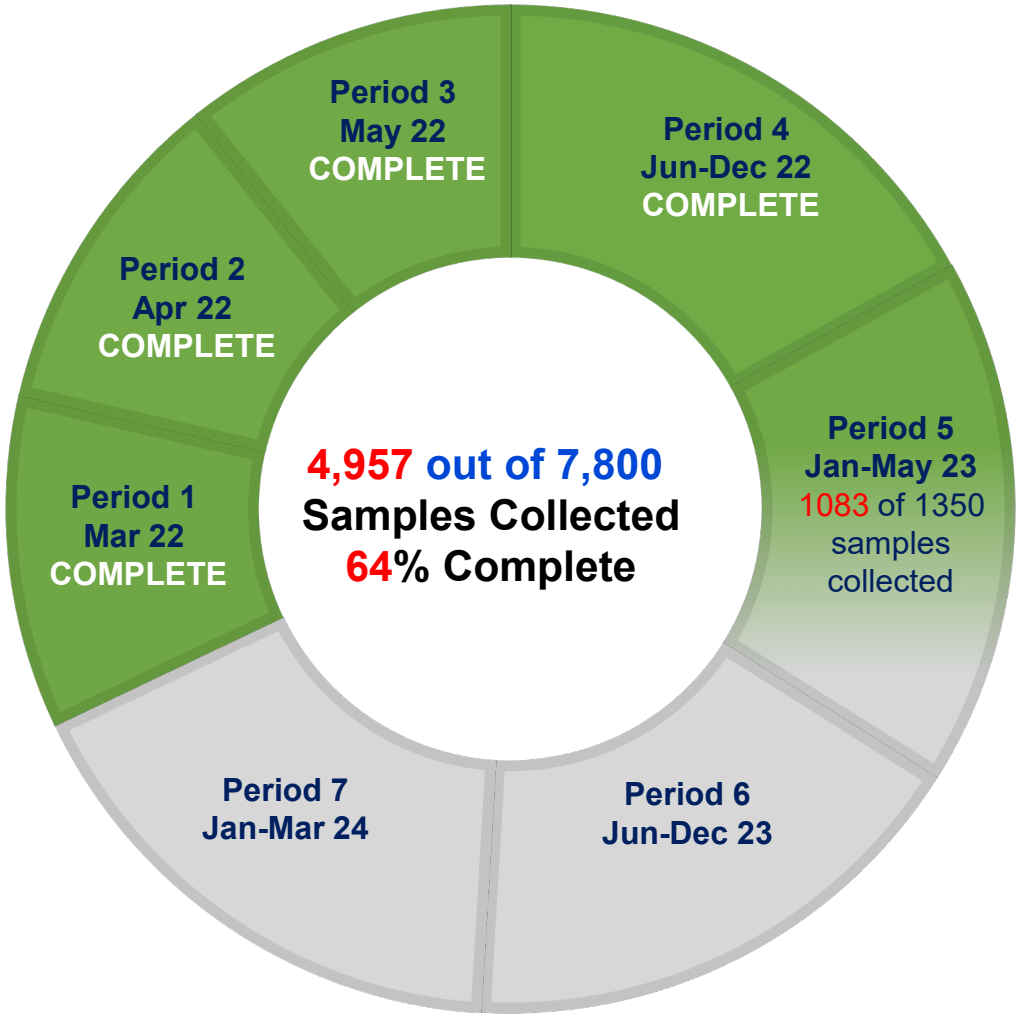
Drinking Water Long-Term Monitoring

Drinking Water Distribution Sampling:

- 24-month sampling continues until Mar 2024
- Zero detections of JP5
- 18 Exceedances:
  - 18 closed out:
    - 16 lead,1 mercury, 1 TPH (non-JP5)



Period 5 Sampling – dental office



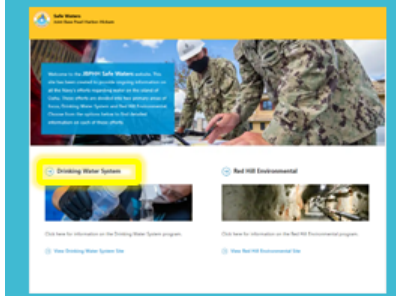
Rapid Response Team
804-920-3616

JBPHH Safe Waters Website

How do I find my results?

Search with Interactive Map

Step 1

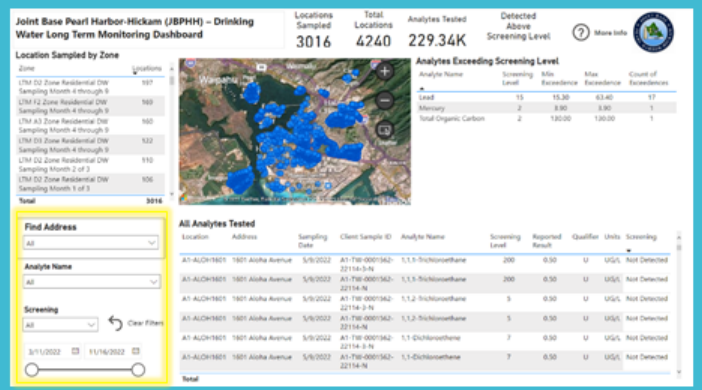


Visit www.jbphh-safewaters.org.
Click "Drinking Water System"

Step 2

Click "View Interactive Results Map"

Step 3



Use drop-down bars on the left of the screen to search by address, analyte (chemical) name, screening, and dates

OR

Search Lab Report

Step 1

Visit www.jbphh-safewaters.org

Step 2

Click "Drinking Water System"

Step 3

Click "View System Map"

Step 4

Select your zone

Step 5

For each Period, click on "Sampling Results for Zone"

Step 6

Hit ctrl+F and enter your address

www.jbphh-safewaters.org

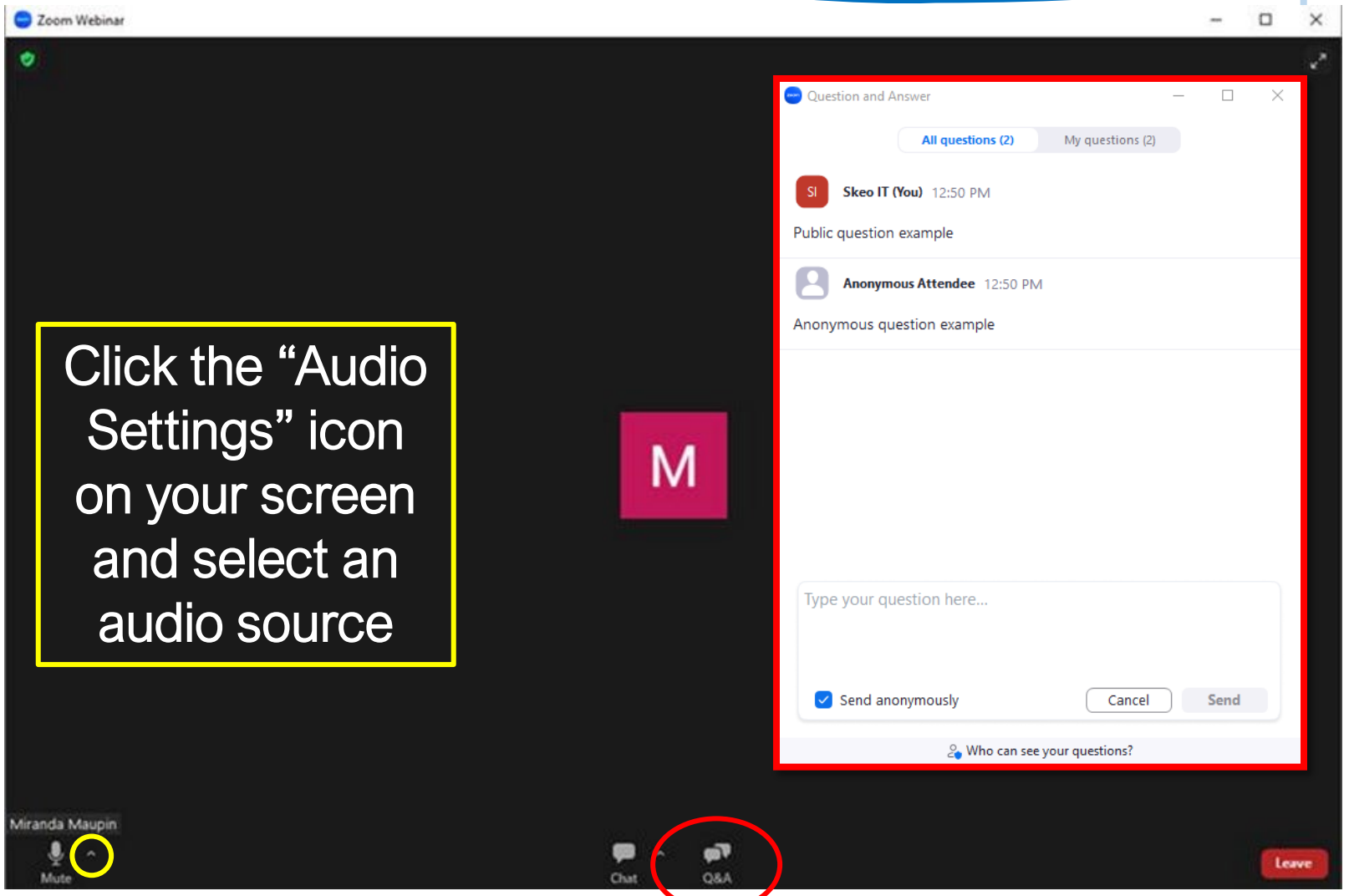
Questions and Answers

- Questions today will focus on presentation content.
- If you have issues with your water:
  - Contact DOH's Safe Water Drinking Branch at (808) 586-4258 or SDWB@doh.hawaii.gov
- If you need medical services:
  - Contact the Defense Enrollment Reporting System: 800-874-2273 Select Option 1 to speak with a nurse
- If you'd like your drinking water to be tested call this number:
  - At 804-920-3616 (Rapid Response Team)

Zoom Webinar Functions

Please use the Q&A window to ask questions.

If you have audio issues, try clicking the Audio Settings icon to choose a different audio source.



Questions?

Agency Contacts

- For information about EPA and DOH work on Red Hill:
  - Sign up for EPA's Red Hill email list: www.epa.gov/red-hill/forms/red-hill-email-distribution-list
  - Sign up for DOH's Red Hill email list: health.hawaii.gov/ust/ust-home-test/ust-red-hill-project-main/
  - Send messages to RedHill@epa.gov and/or Thu.Perry@doh.hawaii.gov
- NAVFAC contacts: Tracy Maningas, tracy.g.maningas.civ@us.navy.mil
  - Safewaters interactive map: JBPHH Drinking Water System (jbphh-safewaters.org)

Upcoming Webinars

Next webinar event will be announced shortly.

If there is a specific topic you would like covered in an upcoming webinar, please email RedHill@epa.gov with your suggestion.

For webinar series information, visit
www.epa.gov/red-hill/red-hill-webinar-series

Thank you