BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

August 20, 2018

Dr. Bruce S. Anderson
Director
State of Hawaii
Department of Health
1250 Punchbowl Street
Honolulu, Hawaii 96813

Dear Dr. Anderson:

Subject: Honolulu Board of Water Supply (BWS) Request to Hawaii Department of Health (DOH) for an Explanation of the Basis for the Increase in the Environmental Action Levels (EALs) for Total Petroleum Hydrocarbon Middle Distillate Fraction (TPH-d)

In November 2017, the DOH raised its groundwater EALs for TPH-d. The TPH-d EAL based on health protection was increased from 160 micrograms per liter (µg/L) to 400 µg/L and the EAL based on odor or taste was increased from 100 µg/L to 500 µg/L (DOH 2016, 2017).

These EALs are amounts of TPH-d in water that DOH considers to be "safe" for drinking water and household use of tap water. An increase in TPH-d EALs means that DOH is now allowing more TPH-d in tapwater at what it regards as a safe level.

The BWS considers these EALs for certain constituents that do not have drinking water standards to help ensure that the water we provide our customers is safe and free of objectionable qualities. Consequently, the BWS respectfully requests a detailed explanation of the scientific basis of these changes in TPH-d EALs. This will greatly assist us in responding to public comments and concerns regarding the safety and quality of our water.

The DOH (2017) report (Volume 2, Appendix 1, Section 6.6, p. 6-12, pdf page 66) states that the reason for the EAL increase is because:

> *...petroleum-related compounds reported in this range will be dominated by non-volatile, degradation compounds or "metabolites" of biogenic origin (Zemo*

et al. 2013, 2016). The resulting action level is therefore based on ingestion only and does not incorporate an inhalation pathway.

In other words, DOH is assuming that TPH-d in tapwater will be almost entirely changed into a form that will stay in the water such that it will not be released into the air nor will it be absorbed through the skin. DOH thus appears to assume TPH-d will not get into the human body by breathing it or by taking it up through the skin while showering, bathing, or washing dishes. By assuming less exposure from these sources, DOH is effectively allowing more TPH-d in drinking water at the higher EAL concentration. However, the studies used to support this assumption (Zemo et al. 2013, 2016) are studies of historical TPH release sites on the mainland.

The BWS has concerns about using TPH-d analyses from the mainland in the establishment of a TPH-d EAL for use in Hawaii. TPH-d in local groundwater may travel faster from a release to drinking water wells because of Hawaii's more hydraulically conductive volcanic soils and rock. As a result, there may also be less time for TPH-d to degrade into forms that stay in the water, particularly for sites with recent or ongoing releases.

The BWS would like to know whether the DOH considered in its evaluation the unique subsurface conditions in Hawaii that differ from those at petroleum release sites on the mainland. Please provide your data and analyses from sites in Hawaii, including those with recent or ongoing releases, that support DOH's key assumption of near 100% change of TPH-d into a form that results in less exposure.

Thank you for your assistance with this request. If you have any questions, please contact Mr. Erwin Kawata, Program Administrator of the Water Quality Division at (808) 748-5080.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

cc: Mr. Steve Linder, United States Environmental Protection Agency, Region IX
Mr. Mark Manfredi, NAVFAC Hawaii

References

Hawaii Department of Health (DOH). 2016. Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater. Summer.

2017. Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater. Fall.

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DAVID Y. IGE
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BRUCE S. ANDERSON, Ph.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
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In reply, please refer to:
File: 2018-315- RB

October 22, 2018

Mr. Ernest Y.W. Lau, P.E.
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

RE: Honolulu Board of Water Supply (BWS) Request to Hawaii Department of Health (DOH) for an Explanation of the Basis for the Increase in the Environmental Action Levels (EALs) for Total Petroleum Hydrocarbon Middle Distillate Fraction (TPH-d)

Dear Mr. Lau,

Thank you for your letter dated August 20, 2018, requesting clarification of the basis of 2017 updates to the Hawaii Department of Health's (HDOH) Environmental Action Level (EAL) for Total Petroleum Hydrocarbons (TPH) in groundwater that serves as a source of drinking water. Your question was specific to compounds associated with releases of middle distillate fuels such as diesel (TPHmd). Dr. Roger Brewer, Senior Environmental Scientist with the Hazard Evaluation and Emergency Response Office, has provided the following detailed technical response to your inquiry.

As discussed in the 2017 update of our office's EAL guidance, the increase in the HDOH drinking water action level for TPHmd from 0.10 mg/L to 0.40 mg/L was based on a review of original reference documents and a more up-to-date understanding of the physiochemical and toxicological nature of TPH-related compounds in groundwater following a release of fuel. Our office considers this action level to be highly conservative for screening of groundwater data at the majority of petroleum-release sites overseen by HDOH. Considerations incorporated into development of the TPHmd drinking water action level include:

- Use of an ingestion-based toxicity factor that reflects the most conservative value of recently published research for hydrocarbon compounds and their degradation products;

- Assumed continuous use of petroleum-impacted water source 350 days a year for a period of six years, reflecting the USEPA default, conservative exposure scenario for assessment of noncancer health hazards;
- No allowance for likely mixing and dilution of impacted groundwater with unimpacted groundwater as it is drawn into a production well.

The TPHmd action levels were revised to reflect the fact that hydrocarbon compounds measured in groundwater under this test method as well as related, biological degradation products are not significantly volatile. This negates the need to consider the risk posed by the inhalation of petroleum-related vapors during the use of tapwater.

The basis for this update was two-fold. "Diesel range" hydrocarbon compounds, typically considered to include compounds with 10 to 24 carbon molecules are, by definition, not considered to be significantly "volatile." This is why laboratory "extraction" methods are used to test for these compounds in groundwater (e.g., Method 8015-DRO). A focus of drinking water action levels for compounds collectively reported as "TPHmd" on ingestion only (i.e., drinking the water) is therefore appropriate. It is important to note that additional exposure via dermal absorption while bathing is insignificant in comparison to ingestion-based exposure.

"Gasoline range," volatile hydrocarbon compounds, normally characterized by having less than 10 to 12 carbon molecules, are collectively tested for and quantified as "TPHg" using "purge and trap" laboratory methods (e.g., Method 8015-GRO). Middle distillate fuels can contain small amounts of these compounds which, under some scenarios, can pose vapor emission concerns (Brewer et al. 2014). This requires that both TPHg and TPHmd be tested for at middle distillate release sites. Related volatile, degradation compounds, if present, would be captured by the same test method and incorporated into the reported concentration of TPHg. The HDOH drinking water action level for TPHg therefore considers inhalation of vapors during the use of tapwater for bathing, dishwashers, etc., in addition to direct ingestion of these compounds in drinking water (HDOH 2017; refer to Appendix 1, Section 6.6).

Hydrocarbon compounds are also highly susceptible to biological degradation once dissolved into groundwater and can be expected to rapidly degrade to oxidized, low-volatility "metabolites." These compounds will subsequently be reported as part of the non-volatile, TPHmd component of the impacted groundwater. This is why relatively high concentrations of TPHmd are often reported for groundwater samples collected at weathered, gasoline-only release sites and why both TPHg and TPHmd range contaminants should likewise be tested for under these scenarios. Degradation rates can be also expected to be enhanced in Hawaii in comparison to most areas of the mainland due to the relatively high, year-round temperature of the groundwater.

As one example, data for groundwater samples collected from immediately beneath the Red Hill Tank Farm complex tested with and without silica gel cleanup consistently indicate that the majority of TPH-related compounds present are heavily degraded (NAVFAC 2016, 2017, 2018). Volatile compounds collectively reported as TPHg were rarely detected in samples, and even when detected comprised less than 10% of the total, TPH-related compounds present.

It is possible that a higher percentage of dissolved-phase, volatile compounds could be present in groundwater immediately following a significant release of fuel, as you suggested in your letter. If so, then these compounds would again be captured and assessed as part of the TPHg data. In such cases it is important to consider and calculate the combined health risk posed by both TPHmd and TPHg, since cumulative risk is not considered in the individual action levels.

In conclusion, it is our opinion that drinking water action levels for both TPHg and TPHmd presented in the 2017 edition of the HDOH EAL guidance are highly protective of potential exposure to petroleum-impacted groundwater. HDOH staff are currently working with local experts and experts on the mainland to identify better test methods to quantify the "TPHmd" component of heavily degraded, petroleum-related compounds. Additional guidance on this subject will be forthcoming.

Should you have questions or require further technical clarification, please contact Dr. Brewer or Fenix Grange at the Hazard Evaluation and Emergency Response Office at (808) 586-4249 or by email at roger.brewer@doh.hawaii.gov or gabrielle.grange@doh.hawaii.gov.

Sincerely,

BRUCE S. ANDERSON, Ph.D.
Director of Health

c: Steven Linder, United States EPA Region IX
Mark Manfredi, NAVFAC Hawaii

Attachment: Board of Water Supply letter dated August 20, 2018

References

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BOARD OF WATER SUPPLY

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December 28, 2018

Dr. Bruce S. Anderson
Director
State of Hawaii, Department of Health
1250 Punchbowl Street
Honolulu, Hawaii 96813

Dear Dr. Anderson:

Subject: Response to Hawaii Department of Health (DOH) Reply to Honolulu Board of Water Supply (BWS) Request for an Explanation of the Basis for the Increase in the Environmental Action Levels (EALs) for Total Petroleum Hydrocarbon Middle Distillate Fraction (TPH-d)

Thank you for your letter (dated September 14, 2018) (Anderson, 2018a) in response to the BWS request (dated July 19, 2018) (Lau, 2018a) for detailed information regarding the scientific basis of the increase in the EALs for TPH-d. Our request noted that both the TPH-d EAL based on odor and taste and the EAL based on health protection for drinking water use were increased from 100 micrograms per liter (µg/L) to 500 µg/L and from 160 ug/L to 400 µg/L, respectively, in Fall 2017 (DOH, 2016; DOH, 2017).

Thank you also for your follow up letter (dated October 22, 2018) (Anderson, 2018b) in response to the BWS request (dated August 20, 2018) (Lau, 2018b) for additional clarification of the DOH's explanation for increasing the health-based EAL for TPH-d in Fall 2017 (DOH, 2016; DOH, 2017). Our letter also inquired as to whether the decision for raising the health-based EAL for TPH-d considered the unique subsurface conditions in Hawaii that differ from those in the mainland studies (Zemo et al. 2013, 2016) apparently used to support the key assumption that resulted in the increase in the EAL (Lau, 2018b).

In response to your September 14, 2018 letter, we request additional clarification from DOH as noted in our comments below and offer our rationale in support of a 160 µg/L health-based EAL, a 100 µg/L EAL for odor and taste, and our perspective on the purpose of groundwater screening levels.

Health-Based EAL

As noted by the BWS (Lau, 2018b), the DOH (2017) report (Volume 2, Appendix 1, Section 6.6, p. 6-12, pdf page 66) states that the reason for the EAL increase is because:

> *...petroleum-related compounds reported in this range will be dominated by non-volatile, degradation compounds or "metabolites" of biogenic origin (Zemo et al. 2013, 2016). The resulting action level is therefore based on ingestion only and does not incorporate an inhalation pathway.*

In other words, DOH is assuming that TPH-d in tap water will be entirely changed into a form that will stay in the water such that it will not be released into the air nor will it be absorbed through the skin. DOH thus assumes that exposures to TPH-d do not involve inhalation or absorption through the skin while showering, bathing, or washing dishes. By assuming less exposure from these sources, DOH is effectively allowing more TPH-d in drinking water at the higher EAL concentration. However, the studies used to support this assumption (Zemo et al. 2013, 2016) are studies of historical TPH release sites on the mainland.

According to the recent DOH response (Anderson 2018b), the TPH-d EAL was revised because DOH expects that 1) the hydrocarbon compounds measured in groundwater by the test method (Method 8015-DRO) will not be "significantly" volatile nor will they be absorbed through the skin, and 2) the biological degradation products are also not "significantly" volatile. Nevertheless, other information indicates that these assumptions are not necessarily correct, particularly for Hawaii.

Point 1: TPH-d Hydrocarbons Measured in Water will not be "Significantly" Volatile

This rationale was not previously provided by DOH (2017) in justifying the increase in the EAL. Although the laboratory method for quantifying the middle distillate fraction comprising TPH-d may include classes of compounds that are not significantly volatile (e.g., longer chain aliphatic hydrocarbons), not all of the various compounds quantified by this method will be soluble in water and therefore present in a groundwater sample.

The California State Water Resources Control Board, San Francisco Bay Region (Regional Water Board [RWB]) recognizes that only the fraction of TPH-d that is soluble in water will be quantified and reported in groundwater samples (RWB, 2016). RWB also notes that this soluble fraction of TPH-d, aromatic compounds with 9 to 16 carbon molecules, is also volatile (resulting in breathing vapors from water use) and passes through the skin (RWB, 2016). U.S. Environmental Protection Agency risk assessment calculations (U.S. EPA 2009, 2018) used by RWB (2016) indicate that exposure to TPH-d aromatic compounds via skin absorption is nearly equal exposure to that from the oral ingestion route of exposure. The inhalation route of exposure contributes nearly three times more exposure than the oral or dermal route of exposure. Thus, inhalation and dermal absorption are potentially very important routes for exposure to TPH-d in groundwater. RWB (2016) has accordingly derived a TPH-d screening level of

150 µg/L based on the soluble aromatic compounds in this hydrocarbon fraction, including oral, dermal, and inhalation exposure.

The DOH response notes that gasoline range volatile hydrocarbon compounds (less than 10-12 carbon molecules) are collectively tested for at sites along with TPH-d, and that this testing would pick up any volatile compounds that might pose vapor concerns. However, testing for TPH-g does not measure all of the middle distillate aromatic compounds (up to 16 carbon molecules) that are soluble and volatile. Thus, measurement of low TPH-g concentrations does not mean that elevated TPH-d concentrations in groundwater samples are not volatile.

Point 2: The Biological Degradation Products are not Significantly Volatile

The BWS is concerned about DOH's use of TPH-d data from the mainland to justify the TPH-d EAL in Hawaii (DOH 2017; Lau, 2018). DOH's response postulates that degradation may proceed faster in Hawaii because of higher year-round temperatures but does not address the likelihood that TPH-d in groundwater may travel faster from a release to drinking water wells in Hawaii because of its volcanic soils and rock. As a result, even with higher temperatures, there will be less time for TPH-d to degrade into forms that stay in the water and are not released to air or penetrate the skin. Sites with recent or ongoing releases will also have had less time for TPH-d to completely change.

The DOH response cites data collected from the Red Hill Tank Farm complex, noting that samples tested with and without silica gel cleanup (to remove biological degradation products) "consistently indicate that the majority of TPH-related compounds present are heavily degraded (NAVFAC 2016, 2017, 2018)". Nevertheless, the limited analysis with silica gel cleanup do not allow full characterization of the extent of degradation in these samples. Samples with and without silica gel cleanup for 2016, 2017 and 2018 for monitoring wells RHMW-01, RHMW-02, and RHMW-03 indicate between 14% to 100% of the TPH-d fraction is made up of hydrocarbons and not polar organic compounds as assumed by the DOH revised EAL (Table 1). For RHMW-02, concentrations of hydrocarbons after silica gel cleanup ranged from 230 to 640 µg/L (Table 1). All of these data except for three samples from 510 µg/L to 640 µg/L concentration would be screened out as not a health concern using the revised DOH health-based limit of 400 µg/L which assumes 100% non-volatile polar organic compounds. However, all of these concentrations would exceed health-based limits based on the soluble hydrocarbon fraction of TPH-d which is also volatile (e.g., 150 µg/L based on RWB 2016). They would also exceed the previous DOH health-based EAL of 160 µg/L. Thus, the revised EAL of 400 µg/L is not scientifically appropriate for evaluating whether the TPH-d results after silica gel cleanup pose health concerns. The revised EAL is also not appropriate for screening TPH-d results without silica gel cleanup given that site data in Hawaii indicate that samples are not 100% polar organics as assumed by DOH in the derivation of the revised EAL.

Table 1: Comparison of TPH-d concentrations, with and without Silica Gel Cleanup (SGC)*

Well ID	Sample Date	TPH (middle distillates), silica gel cleanup	TPH (middle distillates)
		concentration (ug/L)	
RHMW-01	10/17/2016	<25	120
	5/1/2017	<51	110
	6/5/2017	36	98
	7/5/2017	<25	110
	10/25/2017	<25	86
	3/12/2018	<25	150
	4/25/2018	-	<25
RHMW-02	10/19/2016	300	1300
	5/1/2017	<480	1000
	6/5/2017	570	1000
	7/6/2017	250	1000
	10/23/2017	230	1600
	3/13/2018	640	1900
	4/24/2018	510	2800
RHMW-03	10/19/2016	<25	65
	5/1/2017	<25	50
	6/6/2017	50	46
	7/6/2017	<25	49
	10/23/2017	<25	210
	3/12/2018	<25	190
	4/25/2018	<25	160

*Data from "Final Second Quarter 2018 – Quarterly Groundwater Monitoring Report" (NAVFAC, 2018; Table 4-1; page 39)

The DOH response also acknowledges the possibility of a sudden release of petroleum product but states that measurement of TPH-g along with TPH-d will be able to quantify the presence of volatiles after such a release. However, jet fuel has a limited amount of constituents in the carbon range measured by TPH-g (only those in the 9-12 carbon range). Larger aromatic compounds (up to 16 carbons) that are soluble and volatile will be measured as TPH-d and will not be detected by TPH-g analysis. The revised EAL for TPH-d thus will not be sufficiently protective in such a situation because it does not include exposure from airborne emissions or skin penetration by these soluble and volatile aromatic compounds.

EAL Based on Odor and Taste

Regarding the EAL for TPH-d based on odor and taste, thank you for pointing out the basis of this increase (DOH 2017 Volume 2, Appendix 1, Section 6.6). We note, however, the considerable uncertainty in studies used by DOH (2017) to increase this level from 100 to 500 µg/L. Therefore, DOH (2017) (Volume 2, Appendix 1, Section 6.6, p. 6-12, end of the third paragraph) notes:

> *The adequacy of this threshold* [500 µg/L] *should be verified if impacts to actively used sources of drinking water are identified.*

Please confirm that this new TPH-d odor and taste EAL of 500 µg/L cannot be used without verification in a situation in which an actively used source of drinking water has been impacted by a release. In addition, please provide details on who would be responsible for verifying the adequacy of this threshold in this situation.

Comment on the Purpose of Generic Groundwater Screening Levels

Screening levels are intended to be health protective of all possible conditions, such that if they are not exceeded, one is confident that no further action needs to be taken. Exceedance of screening levels triggers further investigation which then might determine whether chemical levels actually pose a concern for a specific situation. In this case, however, the revised EALs for TPH-d appear to be intended to be protective of expected or typical conditions (e.g., complete degradation whether that is actually the case or not, based on data from mainland sites), but not all possible conditions that might be occurring in Hawaii.

From our review of the available data and studies, we believe there is sufficient basis to warrant revision of the EALs for TPH-d that DOH set in 2017 to its former levels.

Thank you for the opportunity to comment and discuss this matter. If you have any questions, please contact Mr. Erwin Kawata, Program Administrator of the Water Quality Division at (808) 748-5080.

Very truly yours,

ERNEST Y.W. LAU, P.E.
Manager and Chief Engineer

cc: Mr. Steve Linder
United States Environmental Protection Agency
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75 Hawthorne Street
San Francisco, California 94105

Mr. Mark Manfredi
Red Hill Regional Program Director/Project Coordinator
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References

Anderson, B. 2018a. BWS Letter dated July 19, 2018. September 14.

_____. 2018b. Honolulu Board of Water Supply (BWS) Request to Hawaii Department of Health (DOH) for an Explanation of the Basis for the Increase in the Environmental Action Levels (EALs) for Total Petroleum Hydrocarbon Middle Distillate Fraction (TPH-d). October 22.

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_____. 2018b. Honolulu Board of Water Supply (BWS) Request to Hawaii Department of Health (DOH) for an Explanation of the Basis for the Increase in the Environmental Action Levels (EALs) for Total Petroleum Hydrocarbon Middle Distillate Fraction (TPH-d). August 20.

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_____. 2018. Regional Screening Levels. Last updated May 15. Available at https://www.epa.gov/risk/regional-screening-levels-rsls.

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Zemo, D.A., O'Reilly, K.T., Mohler, R.M., Magaw, R.I., Espino Devine, C., Ahn, S. and A.K. Tiwary. 2016. Life Cycle of Petroleum Biodegradation Metabolite Plumes, and Implications for Risk Management at Fuel Release Sites. Integrated Environmental Assessment and Management. DOI: 10.1002/ieam.1848.

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In reply, please refer to:
File: 2019-038 RB

August 26, 2019

Mr. Ernest Y.W. Lau, P.E.
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

RE: Response to Hawaii Department of Health (DOH) Reply to Honolulu Board of Water Supply (BWS) Request for an Explanation of the Basis for the Increase in the Environmental Action Levels (EALs) for the Total Hydrocarbon Middle Distillate Fraction (TPH-d)

Dear Mr. Lau:

First, let me begin by expressing my apologies for the untimely delay of our response to your letter, requesting DOH lower the TPH EAL. We take your concerns seriously, and immediately drafted a response, however, the original letter was inadvertently lost. To that end, we offer the following comments below for your review and consideration.

Your continued interest in the use of Total Petroleum Hydrocarbons (TPH) data to assess impacts to drinking water resources is both welcome and timely. Hawaii has been working with the United States Environmental Protection Agency and numerous other agencies on this issue for 25 years and is one of the few states with detailed guidance and risk-based action levels for TPH.

As discussed below, the Hazard Evaluation and Emergency Response Office (HEER) intends to update TPH action levels for soil and groundwater over the next year. The planned updates will address the issues that you discussed in your December 28, 2018 letter to our office. While the current TPH action levels incorporate a significant margin of safety and are considered to be protective of human health, technical adjustments to the action levels to better take into consideration these and other issues are warranted. Direct meetings with technical staff of your office to discuss the updates would be beneficial to both agencies.

The updates are being coordinated with staff of the San Francisco Bay Area Regional Water Quality Control Board (RWB), an office of the California Environmental Protection Agency. Dr. Roger Brewer of the HEER office is the original author of the RWB TPH guidance you reference in your December 28, 2018 letter, where he worked as a senior scientist 1999 to 2005 before returning to Hawaii. Dr. Brewer and RWB staff have routinely coordinated to update each agency's TPH guidance since that time (e.g., Hellmann-Blumberg et al. 2016).

Your letter highlights several issues raised within a national work group that recently published a technical document on the assessment of TPH risk for petroleum releases (ITRC 2018; see also HIDOH 2018). Dr. Brewer and RWB staff were key members of this work group. Many of the discussions focused on the chemistry and toxicity of dissolved-phase, diesel-related, hydrocarbon compounds in groundwater as well as the chemistry and toxicity of TPH-related degradation compounds. The volatility of these compounds in terms of potential vapor emissions to indoor air during tapwater use, as discussed in your letter, was also reviewed.

A detailed discussion of the technical issues associated with the planned updates is beyond the scope of this letter but will include:

- Chemistry, volatility, and toxicity of TPH-related compounds anticipated to partition from gasoline-range and diesel-range fuels into groundwater;
- Review of the "Volatilization Factor" component of the USEPA tap water screening level model in terms of the volatility of dissolved-phase, TPH-related compounds in groundwater;
- Review of exposure assumptions incorporated into the "Volatilization Factor" component of the USEPA tap water screening level model with respect to water use, building ventilation, and related factors appropriate to each state;
- Review of recent updates to USEPA's dermal exposure model for tap water;
- Publication of separate action levels for non-degraded versus degraded TPH-related compounds in groundwater;
- Identification of more reliable analytical methods for measurement of non-degraded and degraded TPH-related compounds in groundwater.

Adjustment of action levels for non-degraded TPH diesel-related compounds in tap water to take into account some degree of volatilization and emission to indoor air is being considered. The generic approach used to incorporate vapor emission into past TPH-d tap water action levels was likely overly conservative, however, due both to the toxicity factors applied (based on makeup of the parent fuel rather than compounds likely to partition into groundwater) and the model used to predict impacts to indoor air (based on building ventilation assumptions for cold, rather than tropical, climates). These issues will be re-evaluated as part of the update.

As noted in your letter, the HEER Office TPH taste and odor action level of 500 µg/L is predicted to be adequate under most circumstances. This should be confirmed on a case-specific basis by entities using the groundwater as a source of drinking water.

The Board of Water Supply's input during the review and update of the HDOH action levels for TPH is welcome. Please provide contact information to Dr. Brewer (roger.brewer@doh.hawaii.gov or 586-4249) at your earliest convenience so that an introductory meeting of technical staff can be scheduled and an outline for a pathway ahead developed, preferably within the next few weeks.

Again, we regret that this did not reach you in a timelier manner. Thank you for your interest and I look forward to our cooperative input on this matter.

Sincerely,

BRUCE S. ANDERSON, Ph.D.
Director of Health

References:

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c: Lene Ichinotsubo, Solid and Hazardous Waste Branch (SHWB)

BOARD OF WATER SUPPLY

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October 7, 2019

Bruce S. Anderson, Ph.D.
Director of Health
State of Hawaii, Department of Health
1250 Punchbowl Street
Honolulu, Hawaii 96813

Dear Dr. Anderson:

Subject: Response to Hawaii Department of Health (DOH) Reply to Honolulu Board of Water Supply (BWS) Request for an Explanation of the Basis for the Increase in the Environmental Action Levels (EALs) for Total Petroleum Hydrocarbon Middle Distillate Fraction (TPH-d)

Thank you for your August 26, 2019 letter (Anderson, 2019) in response to our request (Lau, 2018) for more clarification of the DOH's scientific basis for increasing the EALs for TPH-d. We also asked if DOH would consider an approach that we feel would be more applicable to Hawaii.

We appreciate DOH's willingness to consider updating the health-based EAL for TPH-d and to discuss the technical issues with the BWS. We would like to learn more about the approach you suggest and recommend we set up a conference call to discuss further and to establish a schedule for meeting in-person.

Regarding the EAL for TPH-d based on odor and taste, we wish to clarify that our letter (Lau, 2018) did not note that the 500 µg/L is predicted to be adequate under most circumstances. Instead, our letter noted considerable uncertainty in the studies used by DOH to increase the odor and taste EAL from 100 to 500 µg/L (DOH, 2017), and we requested confirmation that the new EAL of 500 µg/L cannot be used without verification in a situation in which an actively used source of drinking water has been impacted by a release. In addition, we asked for information on who would be responsible for verifying the adequacy of this threshold in such a situation.

Thank you for your response that the 500 µg/L EAL should be confirmed on a case-specific basis as adequate by entities using the groundwater as a source of drinking water. However, we request that DOH consider an approach in which the party that is threatening an actively used source of drinking water has the burden of demonstrating the adequacy of the 500 µg/L value before relying upon it. Otherwise, the drinking

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water source could be contaminated to a TPH-d concentration (i.e., 500 µg/L) that may later be determined to be objectionable for drinking water users. Such an approach would be more protective of Hawaii's irreplaceable drinking water supply.

Thank you for the opportunity to comment and discuss this matter. If you have any questions, please contact Mr. Erwin Kawata, Program Administrator of the Water Quality Division at (808) 748-5080.

Very truly yours,

ERNEST Y.W. LAU, P.E.
Manager and Chief Engineer

cc: Mr. Steve Linder
United States Environmental Protection Agency
Region IX
75 Hawthorne Street
San Francisco, California 94105

References

Anderson, B. 2019. Response to BWS letter dated December 28, 2018. State of Hawaii, Department of Health. August 26.

Hawaii Department of Health (DOH). 2017. Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater. Volume 2, Background Documentation for the Development of Tier 1 Environmental Action Levels. Appendix 1 Detailed Lookup Tables, Section 6.6. Hawaii Edition.

Lau, E.Y.W. 2018. Honolulu Board of Water Supply (BWS) Request to Hawaii Department of Health (DOH) for an Explanation of the Basis for the Increase in the Environmental Action Levels (EALs) for Total Petroleum Hydrocarbon Middle Distillate Fraction (TPH-d). December 28.

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DAVID Y. IGE
GOVERNOR OF HAWAII

BRUCE S. ANDERSON, Ph.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File: **2020-10 RB**

February 13, 2020

Mr. Ernest Y.W. Lau, P.E.
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

RE: Request for Additional Consideration of Toxicity-Based and Taste and Odor Threshold Action Levels for Total Petroleum Hydrocarbons (TPH) in Drinking Water.

Dear Mr. Lau:

Thank you for following up on DOH's 2017 updates to health-based and taste and odor-based environmental action levels (EALs) for Total Petroleum Hydrocarbons (TPH) in drinking water (Board of Water Supply (BWS) letter dated October 27, 2019). We appreciate your continuing technical engagement on Hazard Evaluation and Emergency Response (HEER) Office plans to further review TPH-d action levels for drinking water in 2020. As discussed, we recognize that additional guidance on the case-specific assessment of petroleum impacts to drinking water resources in high-risk areas is needed.

The following is noted in response to your letter:

- The TPH taste-and-odor threshold of 100 µg/L referenced in earlier EAL guidance was based on a mistranslation (Polish to English) of a 1940s era study that served as the sole reference in the 1982 USEPA document and was never valid;
- The updated DOH taste-and-odor action level for TPH of 500 µg/L is based on more recent studies and on the low side of published thresholds for fuel, which can be up to an order of magnitude higher;
- The BWS makes a reasonable point regarding the need for a drinking water, taste-and-odor threshold specific to the type of fuel stored at Red Hill, primarily JP-5;

- Specific protocols for the development of taste and odor will be compiled and referred to for a potential study of JP-5 in early 2020.

As a followup to our BWS letter dated August 26, 2019, Dr. Roger Brewer with our office has initiated a laboratory study to better define the chemistry and toxicity of dissolved TPH in groundwater underlying different types of fuel. Fuels being used in the study include gasoline, diesel, JP-5 and JP-8. The results of the study will be used to develop toxicity-based action levels for TPH in drinking water impacted by fresh releases of petroleum. These action levels are anticipated to be more stringent than current, default TPH action levels that assume degree of petroleum degradation before potential impacts to wells. The action levels can be used on a case-by-case basis to assess impacts in high-risk areas of the state, where the volume of fuel released and proximity to actively used water supply wells might preclude significant degradation before reaching a well.

The tests are anticipated to be completed within the next two months. Dr. Brewer will coordinate with local experts, including BWS staff, to review the results of the study and develop additional action levels. Downward adjustment of the default, TPH taste and odor threshold for assessment of groundwater in high-risk areas might also be appropriate and will be discussed.

The Board of Water Supply's input during the review and update of the HDOH action levels for TPH is again welcome. Please provide contact Dr. Roger Brewer (roger.brewer@doh.hawaii.gov) of my staff at your earliest convenience so that an introductory meeting of technical staff can be scheduled as soon as the new research data are available and to discuss possible interim measures for high-risk areas of vulnerable groundwater resources.

Thank you for your interest and I look forward to our cooperative input on this matter.

Sincerely,

BRUCE S. ANDERSON, Ph.D.
Director of Health

c: Joanna Seto, Safe Drinking Water Branch (SDWB)
Lene Ichinotsubo, Solid and Hazardous Waste Branch (SHWB)