Naval Facilities Engineering Systems Command Hawai'i, JBPHH, HI

Preliminary Premise Plumbing Assessment and Water Heater Sampling Summary

JOINT BASE PEARL HARBOR-HICKAM O'AHU, HI

February 24, 2024

TABLE OF CONTENTS

TABLE OF APPENDICES

ACRONYMS AND ABBREVIATIONS

°F	Degree Fahrenheit
AECOM	Architecture, Engineering, Construction, Operations, and Management
CPVC	Chlorinated Polyvinyl Chloride
DOH	Department of Health, State of Hawai'i
DRO	Diesel Range Organics
EDMS	Environmental Data Management System
EOC	Emergency Operations Center
EPA	Environmental Protection Agency, United States
EPDS	Entry Point to Distribution System
FH	Fire Hydrant
GC-FID	Gas Chromatography Flame Ionization Detector
GRO	Gas Range Organics
FH	Fire Hydrant
HDPE	High density polyethylene
ISP	Incident Specific Parameter
JP-5	Jet Propellant 5
JBPHH	Joint Base Pearl Harbor-Hickam
LTM	Long Term Monitoring
MCL	Maximum Contaminant Level
ORO	Oil Range Organics
ppb	Parts per billion
PM	Preventive Maintenance
PPV	Public Private Venture
PVC	Polyvinyl Chloride
RRT	Rapid Response Team
SDWA	Safe Drinking Water Act
TPH	Total petroleum hydrocarbons
TPH-d	Total petroleum hydrocarbons-diesel
TPH-g	Total petroleum hydrocarbons-gasoline
TPH-o	Total petroleum hydrocarbons-oil
UVF	Ultraviolet Fluorescence
WHO	World Health Organization

1. Executive Summary

A preliminary premise plumbing assessment was completed as a direct result of concerns reported to the United States Environmental Protection Agency (EPA) and the State of Hawai'i Department of Health (DOH) by six residents served by the Navy's Joint Base Pearl Harbor-Hickam (JBPHH) water distribution system. The assessment included condition investigations of premise plumbing in ten residences, Rapid Response Team (RRT) and Long-Term Monitoring (LTM) drinking water sampling, water heater assessment and sampling, and water distribution system sampling conducted at the appropriate fire hydrants.

While LTM monitoring included a lengthy list of analytes, total petroleum hydrocarbons (TPH) were the primary focus of this sampling investigation. With concurrence from EPA and DOH, the Navy used EPA Method 8015 for the analysis. To date, there have been no detections of TPH above the regulatory-approved 266-parts per billion (ppb) Incident Specific Parameter (ISP) throughout the course of the two-year LTM program and as part of the Navy's premise plumbing assessment. There have been detections of TPH below the ISP, which have occurred throughout all sample categories, zones, and not limited to residences. The potential causes of these low-level detections are under evaluation by a team that includes subject matter experts from EPA, DOH, Navy and Army. Sample chromatograms were compared to chromatograms from known standards of Jet Propellant 5 (JP-5) fuel and diesel fuel to complete advanced analysis, and they did not match for either. Additionally, during the premise plumbing assessment, visual observations of hot water heater effluent and plumbing fixtures did not demonstrate sheen or particulate matter consistent with JP-5, biological growth , or other potential water quality concerns.

Several recommendations were identified for additional action through the course of the premise plumbing assessment. The Navy has begun implementing these follow-on actions based on these recommendations for a more in-depth evaluation. Actions include:

- expansion of the chromatogram analysis,
- additional investigation of potential laboratory contamination,
- implementation of alternate laboratory analysis procedures,
- split-sampling analysis by alternate laboratories,
- convening a subject matter expert working group to investigate root causes and provide further recommendations for implementation; and
- additional evaluation of the JBPPH drinking water distribution system infrastructure, operation, maintenance, and repairs to identify potential TPH sources.

2. Introduction

In mid-October 2023, the EPA and the DOH were contacted by multiple residents served by the Navy's JBPHH water distribution system with drinking water concerns. Five residents reported health symptoms and three reported a sheen in the past year. These residents were referred to the Navy on October 19, 2023, and the Navy responded with offers to collect drinking water samples from within the residents' homes. Five of six residents referred by the regulatory agencies accepted the offer, and sampling was scheduled.

Between October 10, 2023, and November 3, 2023, Navy RRT and LTM drinking water samples were collected from the JBPHH entry point to distribution system (EPDS) Waiawa Shaft and the five residences. None of the analytes tested exceeded the Safe Drinking Water Act (SDWA) Maximum Contaminant Level (MCL). All TPH values detected were below the ISP.

Afterward, the Navy initiated a premise plumbing assessment, including investigating and collecting samples from water heaters from the concerned residences. The scope of the assessment expanded as the Navy evaluated the results of each subsequent action to determine the next course of action. Research was conducted at the referred residences, including housing water heater maintenance, plumbing maintenance records, material composition of

plumbing pipes, and water distribution system lateral line pipe composition and replacement. Six additional homes were also selected to expand the sample pool. Homes vacated within 4-9 days of scheduled sample collection were chosen due to accessibility and recent water system circulation. Additionally, samples were thereafter collected from fire hydrants across the distribution, as well as additional samples for comparative analysis by a second, independent laboratory. During this assessment, the Navy regularly coordinated with the EPA and DOH, sharing results as received. This report describes the activities and observations and includes the water sample results conducted as part of this assessment.

3. Methods

3.1 Approach

The resident concerns shared by EPA and DOH with the Navy in mid-October were the impetus for several investigatory steps incorporated into this assessment. The following table summarizes the Navy's actions and timeline throughout the investigation.

Premise Plumbing Activity Timeline			
Activity #	**Date**	**Activity**	**Notes**
1	18 October 2023	Navy receives notice from EPA/DOH regarding consumer complaints from six residents. Navy offers water sampling at all locations. Five residents provide consent to proceed.	
2	20 October 2023 - 03 November 2023	Navy collects RRT and LTM drinking water samples from all five residents from Activity #1, as well as LTM samples from Waiawa shaft.	The analytical results are summarized in Appendix E.
3	Mid-November 2023	Navy requests collection of water heater samples from the original six residents. Four out of five residents consent to water heater sampling.	
4	20 November 2023 - 08 December 2023	Navy collects RRT and LTM hot water samples from all four residents from Activity #3, and extends sampling to six nearby, vacant residences to increase the sample data pool.	For each of the ten hot water heaters, RRT, LTM pre-drain, LTM post-drain, and LTM post-flush samples were collected. A summary of the analytical results is provided in Appendix F.
5	15 December 2023 - 21 December 2023	Navy collects fire hydrant samples bracketing each of the ten residences from Activity #4, plus the two residences who did not consent to sampling from activities 1 and 3. Two fire hydrant samples per residence for a total of 24 fire hydrant samples collected.	The analytical results are summarized in Appendices K and N.
6	27 December 2023	Navy collects split samples at two vacant residences from Activity #4.	Samples analyzed at two separate labs to verify accuracy. Results provided in Appendix K.

Regularly scheduled meetings with the regulatory agencies continued throughout the process to discuss results and subsequent steps. Specific details and results follow in Sections 3.2 and 4.1 of this report. The Long-Term Monitoring Plan Zone Map and the List of Analytes are provided as references in Appendix A and B, respectively.

3.2 Drinking Water Sampling and Analysis

The Navy responded to the customer concerns with sample collection at five of the six locations, in accordance with

the 2022 Drinking Water LTM, established and approved by an Inter-agency Drinking Water Systems Team comprised of officials from the Navy, U.S. Army, EPA, and DOH. The JBPHH Emergency Operations Center (EOC) also fielded 43 resident calls from October 1, 2023, to December 31, 2023. The concerns were reviewed to identify if trends existed in specific zones or neighborhoods. Details of each EOC call are included in Appendix C, with findings discussed in the results and discussion sections.

As part of the established LTM Plan, Method 8015 for the analysis of total petroleum hydrocarbons (TPH) was implemented, as TPH is not generally analyzed for in drinking water. The detection limit of 50 ppb for this method is the lowest level at which the Gas Chromatography Flame Ionization Detector (GC-FID) can detect any potential TPH component. An incident specific parameter (ISP) of 266 parts per billion (ppb) for TPH was established by DOH during the JBPHH Drinking Water Health Advisory and applied to the Navy's Drinking Water LTM Plan.

The Drinking Water LTM Program was established to validate that the JBPHH Drinking Water System meets all drinking water standards and regulations and provides safe drinking water to its customers. As part of this 24-month program, residences and office buildings served by the JBPHH system and located within 19 geographically designated zones were sampled. This 24-month program was divided into seven testing periods. During each sample period and in every zone, all high-risk and/or sensitive areas (Child Development Centers, Child Development Homes, Medical/Dental Veterinary Offices, schools as well as and, fire hydrants) were also tested, although they do not contribute to the final percentage of locations sampled during each LTM period. LTM drinking water samples were sent to EPA-certified laboratories for analysis. The results of LTM sampling included in this premise plumbing assessment are discussed in Section 4 of this report.

TPH was the primary focus of the sampling and analysis portion of the investigation. TPH is a term used to describe a large family of many chemical compounds that originally come from crude oil, which is used to make petroleum products. These compounds are composed of carbon and hydrogen, hence the term "hydrocarbon," and include various constituents found in gasoline, fuels, mineral oils, and other petroleum-based products. Due to the vast number of chemicals in the hydrocarbon family, it is not practical to measure each separately. Therefore, they are grouped into common categories by carbon range (number of carbon elements in the individual compound). The laboratory method used can detect a wide range of hydrocarbons, to include organic materials. Water samples collected during LTM and through the course of this premise plumbing evaluation were tested for three hydrocarbon categories: Gasoline Range (TPH-g), Diesel Range (TPH-d), and Oil Range (TPH-o). Refer to Appendix D, for additional information on Total Petroleum Hydrocarbons.

3.2.1 Rapid Response Team Sampling and Analysis

From October 10, 2023, through November 3, 2023, the Navy RRT collected samples for TPH screening from cold water fixtures, as protocol recommends, at five residences pursuant to resident complaints. Analysis of samples collected by the RRT is performed at the Navy lab on-island with typical return results within 24 hours. The RRT team report test results by email, following a phone call to the resident or business. RRT testing screened for TPH-g and TPH-d. The summary of the results from these samples is provided in Appendix E and the results are discussed in Section 4.1.

The Navy RRT is an on-call team trained to respond to house calls if residents have water quality concerns. RRT sampling was performed by a siteLAB Ultraviolet Fluorescence (UVF)-Trilogy Hydrocarbon Analyzer, with detection limits of 100 ppb for TPH-Diesel Range Organics (DRO) and 200 ppb for TPH-Gas Range Organics (GRO). The results are provided quickly using siteLAB test kits with solvent extraction. Before batch sample analysis, a blank of hexane in a clean cuvette was placed in the instrument, with the specific snap-in ultraviolet module for the analysis type (DRO, GRO, etc.) to perform a pre-programmed factory calibration. If readings were high or a large negative number, the cuvette was cleaned and the calibration process with the blank was repeated. A specified volume of the sample was combined with hexane in a clean graduated extraction vial and shaken for two minutes. If present, petroleum hydrocarbons will dissolve into the solvent, which will separate from the remainder of the water sample. The solvent was transferred to the clean cuvette then placed in the instrument. A batch can be one or multiple samples analyzed in succession. Another calibration was performed if a second batch was analyzed later in the day.

3.2.2 LTM Sampling and Analysis

On October 19, 2023, one drinking water LTM sample from the Waiawa Shaft Entry Point to Distribution System (EPDS) was collected, and on October 20, 2023, four residential samples were collected by the Navy contractor, AECOM, with DOH oversight. Multiple attempts to schedule sampling with the fifth resident were made but were unsuccessful. The Navy's RRT collected samples concurrently with the Navy contractor. The Navy contractor returned to one of the four residences sampled on October 20, 2023, on October 25, 2023, to collect an additional requested sample from the kitchen sink. In early November, an additional resident was identified and sampled on November 3, 2023. A total of five of the six DOH-referred residents were sampled; the remaining resident did not respond to the Navy's offer to sample. All samples collected were submitted under proper chain-of custody procedures and analyzed in accordance with the LTM. A summary of the results from these samples is provided in Appendix E, alongside the RRT results for comparison.

3.2.3 Split Sampling and Analysis

The Navy's LTM contractor, AECOM, collected samples from two locations within each of the residences which remained vacant, collecting one sample for full-suite analysis at SGS Wheatridge, which is the usual lab contracted for analysis, and another sample for full-suite, drinking water and TPH analysis between Pace Analytical and Eurofins laboratories for comparative analysis. TPH analysis was conducted by Eurofins and all other drinking water analyses were conducted by Pace Analytical.

3.3 Water Heater Sampling and Analysis

The Navy tested water heaters related to continued complaints from specific residents regarding water quality. From November 20 to November 22, 2023, and from December 6 to December 8, 2023, the Navy investigated and sampled water heaters of multiple residences, including occupied and vacant homes. Of the five occupied residences that consented to LTM and RRT, only four responded to the Navy's offer to sample the water heater. For comparative analysis, the Navy also sampled the water heaters of six vacant homes located in zones across the JBPHH distribution system. Refer to Appendix A for zone identifications. Vacant homes were recently occupied, within a range of 4 to 9 days, providing the opportunity to sample from a recently cycled water system. The addition of vacant homes provided ease in accessibility for an expanded sample pool. Refer to Appendix F for the sample result summary and Appendix G for premise plumbing details, including maintenance. The procedure for the evaluation is provided in Appendix J.

3.3.1 Water Heaters: RRT Sampling and Analysis

The Navy RRT collected samples for TPH analysis from the first aliquot of water heater drainage at the above referenced 10 residences. The results of these samples were all non-detect, reported directly to the residents, and discussed in greater detail in Section 4.2.

3.3.2 Water Heaters: LTM Sampling and Analysis

From November 20, 2023, through December 8, 2023, the Navy contractor performed hot water sampling at the same 10 residences. Samples were collected for each water heater from the bottom drain valve at the beginning of the water heater draining action, at the end of water heater draining, and post water heater flushing; for a total of three distinct samples per residence. Each sample was tested for additional water quality parameters, including temperature and free chlorine concentration. The lower free chlorine testing limit is 0.02 mg/L. The maximum residual disinfectant level is 4.0 mg/L, as allowed per the EPA's national primary drinking water regulations. Visible observations were made for sheen, particulates, and biological growth. In addition to the water heater sampling, each interior water fixture and aerator at the residence was removed and visually inspected for mineral deposits and biological growth. Additional discussion follows in Section 4.2.

Samples collected were submitted under proper chain-of custody procedures and analyzed in accordance with the

LTM plan for TPH constituents and chlorine content. Free chlorine was measured in the field at the time of sample collection.

3.4 Fixture Maintenance and Inspections

Preventive Maintenance (PM) of plumbing fixtures was performed by trained technicians once per fiscal year and during resident change of occupancy. Housing technicians utilized a Preventive Maintenance Inspection (PMI) sheet (Appendix H) with prescribed steps required to complete the PM. The water heater portion of PMI includes checking for signs of leaks, checking temperature, resetting the element thermostat setting (120 degrees Fahrenheit - °F), ensuring the unit is properly secured and is free from combustible material, inspecting and repairing pipe insulation, flushing the tank (post-2015 installation), testing the pressure relief valve proper flow and shut off, adjusting and repairing as needed, checking for proper operation, seating and venting, as well as, validating the make, model and serial number.

Maintenance records, equipment, and fixture details were included in Appendix G. The Navy contractor inspected all premise plumbing fixtures and faucet aerators for visual observation of mineral deposits and biological growth, such as biofilm, secreted slime, or free-floating particles. No aerators or fixtures were replaced. The primary assessment for fixture inspections is that all fixtures were in working order and devoid of observable biological growth. A summary of visual observations per residence is included in Appendix I.

During inspections, the sampling teams noted occasional accumulation of particulates in fixture aerators. The sampling teams were instructed to rinse out aerators when debris was identified. Water quality data (temperature and free chlorine), visual observation notes, and photographs for each of the four sampled locations were provided in Appendices G and I.

For each water heater sample, a temperature reading was collected using a temperature probe, and an aliquot of water was collected directly from the water heater drain valve. The pre-drain temperature reading was collected from a valve at the bottom of the water heater. Both electric and gas water heaters utilize a dip tube located at the top of the tank. The cold-water supply line, connected to the dip tube, internally routes the cold-water supply so that it enters the tank at the bottom near the heating element. Cool water is denser than hot water and is therefore generally expected to collect at the bottom of the tank where the drain valve is located. This cold and hot water layering creates a thermocline, which is a significant factor in measured temperatures being lower than the set temperature of the water heater thermostat. Water heaters at the tested residences were also cycled off during the mid-day hours by timer as a method for energy savings. As the sampling was done when the water heaters were cycled off, lower observed temperature measurements were expected. Post-flush measured temperature readings were also expected to be significantly cooler than the water heater set temperature since the tank would have just recently been filled through the cold-water supply line and would not yet have had time to heat. The cold-water heater supply lines were shut off during pre-drain and post-drain sampling. Additional evaluation of the water heater temperature setting is recommended.

3.5 Fire Hydrant Sampling

Following the receipt of the water heater sampling, additional water samples were collected from 24 hydrants located upstream and downstream of the ten residences where water heater sampling took place, in addition to the two residences who did not consent to drinking water and/or water heater sampling. Samples were collected from hydrants to obtain data results representative of the JBPHH water distribution system for comparative analysis. The hydrant samples were analyzed for TPH only. Samples collected were submitted under proper chain-of-custody procedures and analyzed in accordance with the DW LTM Plan. Appendices K and N provide a summary of the hydrant sampling results pursuant to the hydrant investigation, and discussion is included in the results.

4. Results

4.1 Drinking Water Analytical Results

LTM results from October Waiawa Shaft sample were non-detect for TPH. Regarding the residential LTM samples collected, two residences had non-detect TPH results while the other three had low-level TPH detections ranging from 50.2 to 71.2 ppb, between the method detection limit (of 50 ppb) and method reporting limit (of 80 ppb), and well below the ISP of 266 ppb.

Further analysis of detections was conducted to determine whether Jet Propellant 5 (JP-5) was present in the samples collected. A comparison of the chromatograms from drinking water samples with TPH detections collected (sample results annotated in Appendixes E, F, and H) was completed to determine if the TPH result could be qualitatively attributed to JP-5 or any other common fuel products.

AECOM technical memos generated for LTM TPH, water heater and fire hydrant memos (Appendices L, M, and N), demonstrated the DRO and/or ORO measured in the samples are not attributable to JP-5 or other common fuels. The respective appendix tables summarize the results. The chromatographic data for detections were reviewed to determine if the DRO and/or ORO result could be qualitatively attributed to Jet Propellant 5 (JP-5) or any other common fuel products in the field samples. The detected TPH patterns are similar to the associated laboratory method blanks and cannot be reliably attributed to the hydrant samples collected in the field.

In conclusion, the organic compounds reported as TPH-DRO and/or TPH-ORO in the LTM, water heater, and fire hydrant samples are not attributable to JP-5 or any other common petroleum products and do not explain the observed hot water sheens. It is recommended to conduct detailed review of LTM data for trend analysis and further investigate instances where sheen is reported.

The organic compounds detected as TPH in the samples are assessed to be a result of suspected laboratory artifacts introduced by the equipment or technique(s) observed. This is supported by the split samples collected and analyzed by a second independent laboratory, which reported non-detections. Additional data collection and analysis is recommended.

4.2 Water Heater Analytical Results

Water heater set temperatures ranged from 130 degrees Fahrenheit (°F) to 135 °F. Measured water heater temperatures ranged from 79 °F to 105.4 °F (Appendix I). Water heater temperatures not measuring at the set temperature were referred to PPV housing partner representatives for action.

Free-chlorine was detected in all samples, with an overall range of 0.06 - 0.74 mg/L. The pre-drain free-chlorine range was 0.06 - 0.59 mg/L, the post-drain range was 0.09 - 0.74 mg/L, and the post-flush range was 0.15 - 0.6 mg/L.

TPH levels ranged from non-detect to 142.5 ppb. Of the four addresses where cold and hot water samples were collected, a TPH-d detection was reported at three addresses during cold water testing, and TPH-g and TPH-o detections were not reported. One of these address samples reported a TPH-d detection in pre-drain water heater testing. There were no reported TPH-d detections post-drain, but there were two addresses with TPH-o detections. Post-flushing, TPH-d detections were reported for two addresses, and TPH-o at one address.

TPH-d detections were reported in three locations pre-drain (50.5 – 66.6 ppb), two locations post-drain (51.2-55.2), and six locations post-flush (55.7 – 71.l7 ppb). TPH-g results were non-detect pre-drain and post-flush, with one detection post-drain at 68.5 ppb. TPH-o detections were reported in two locations pre-drain (66.4 – 75.9 ppb), six detections for post-drain (54.5 – 75.4 ppb) and four detections post-flush (60.4 – 89.2 ppb). The increased detections and concentrations reported for TPH-d and TPH-o may result from free chlorine or sediment flushed from the water heaters. Future analysis should account for this. Appendix F provides a summary of the results collected pursuant

to water heater sampling.

4.3 Fixture Inspections

The following data (Appendix G) was collected for each of the ten residences:

- Interior water line and water service lateral line composition
- Resident move-in date (or currently vacant)
- Date of latest water heater flushing
- Recent work orders and maintenance summary
- Visual observations of fixtures and faucet aerators

The following observations were made from the data presented:

- **Water line composition:** All lines were made of Copper, Polyvinyl Chloride (PVC), or Chlorinated Polyvinyl Chloride (CPVC). These are typical industry materials for residential plumbing applications. No contributing factors were discovered.
- **Resident move-in date (or currently vacant):** The earliest move-in date was 3.5 years ago for the occupied houses. No factors were determined from this data.
- **Date of latest water heater flushing:** The longest duration since flushing had occurred in the occupied residences was approximately two years.
- **Recent work orders and maintenance summary:** Two residences had numerous work orders related to reports of no hot water or minimal hot water.
- **Visual observations of fixtures and faucet aerators:** Two of the four occupied residences and three out of the six vacant residences had mineral deposits or solid particulates observed at the plumbing fixtures or faucet aerators. No associated causes could be determined from this data. No biological growth was observed at any locations.

Additional investigation of housing maintenance is recommended.

4.4 Fire Hydrant Analytical Results

Sample results from fire hydrants (FH) located along the distribution line network provided valuable information about the water distribution system, separate from results taken within a given residence. All FH samples reported non-detect for TPH-g, and 19 FH were non-detect for TPH-o. One hydrant located near Address I yielded a low-level TPH-o detection of 55.9 ppb, just above the method detection limit. All but one of the RRT samples were non-detect; one FH near Address D reported a detection of TPH-d, which prompted an immediate sample which reported non-detect. For LTM test results, two returned a non-detect value for total TPH, while the remaining hydrants returned values between 50.5 and 143.9 ppb for total TPH. Appendix K and N provide summaries of the sampling results.

In conclusion, results obtained throughout the LTM program for FHs were compared to those obtained from residences. Comparable detection values for TPH were reported for both residences and FHs distributed across the water system indicating that the TPH detections are not unique to residential locations, or associated premise plumbing.

4.5 Split Sampling Analytical Results

For the split sampling results of two vacant homes the primary laboratory (SGS) reported one residence of non-

detect, and 88.3 ppb for TPH-d. In contrast the second laboratory (Eurofins) reported both non-detects. Appendix K provides a summary of the sampling results collected pursuant to the vacant home split sample investigation. Additional data and analysis are recommended.

Samples collected were submitted under proper chain-of-custody procedures and analyzed in accordance with the DW LTM Plan.

4.6 EOC Call Data

The observations made from review of the EOC calls include:

- Out of 19 LTM zones, six had zero EOC calls recorded.
- Out of 19 LTM zones, nine had one or two EOC calls recorded.
- Out of 19 LTM zones, four had four or more EOC calls recorded – Zones D3 (twelve calls), F2 (eight calls), A3 (five calls), and D2 (four calls)
    - Zone D3: Eleven out of twelve calls came from the same street; eight of these calls came from two houses.
    - Zone F2: Four calls; two separate streets had two calls each.
    - Zone A3: Five calls; from different addresses on different streets.
    - Zone D2: Three out of four calls came from the same address.

5. Discussion and Conclusions

Total petroleum hydrocarbons (TPH) are not common drinking water constituents. There is no established drinking water standard for TPH. An incident specific parameter (ISP) of 266-ppb for TPH was established by DOH during the JBPHH Drinking Water Health Advisory and incorporated for the Navy's Drinking Water LTM program at JBPHH. As of February 2024, the JBPHH Safewaters website includes reports for over 7,900 drinking water samples analyzed for TPH collected from the 19 zones within the JBPHH water system during the six previous and current LTM periods, with multiple detections reported below and no detections of TPH above the ISP. Detections have been reported for all categories sampled and not isolated to any one type of location (e.g., homes).

This premise plumbing assessment incorporated samples collected from the Waiawa shaft (the Navy's sole source of drinking water at JBPHH since the incident, located over six miles from the RHBFSF), individual residences, and fire hydrants distributed across and served by the JBPHH water distribution system. Access to sample locations was coordinated with current residents or the housing point-of-contact. During the Navy's LTM program, samples are not collected from fixtures that are not regularly in use (e.g., laundry/utility room sinks or outside spigots), and the same was applied throughout this premise plumbing assessment.

Water sample results range from non-detect to low level detections, many observed near the limit of detection. The sample chromatograms evaluated for advanced analysis of all premise plumbing samples were compared to chromatograms from known standards of JP-5 fuel and diesel fuel and they did not match. Visual observations of water heater effluent and plumbing fixtures conducted during the premise plumbing assessment sampling did not indicate a sheen or particulate matter consistent with JP-5, or biological growth. The Navy will continue to assess materials common to water distribution systems and residential plumbing (PVC, CPVC and HDPE piping, etc.), and is working with subject matter experts to identify whether such materials may be a factor for TPH detections.

Throughout this assessment, the Navy closely coordinated with Drinking Water officials from the EPA and DOH. Specifically, from November 2023 through February 2024, Navy experts met with the regulators routinely to seek feedback for the investigatory and sampling strategies applied to the Navy's premise plumbing assessment. While detections reported remain below the ISP, the Navy remains committed to determining the cause of TPH detections

and will continue to closely coordinate with the EPA and DOH to continue providing safe drinking water.

6. Recommendations

Several recommendations were identified through the course of this premise plumbing assessment to further investigate the matter. These recommendations include:

a) Expansion of chromatogram analysis to include additional compounds of interest
b) Further investigation of potential laboratory contamination
c) Implementation of alternative laboratory analysis and extraction methods
d) Evaluate continued use of split-sampling analysis by alternative laboratories
e) Additional evaluation of the JBPHH distribution system infrastructure, operations, maintenance, and repairs to identify prospective TPH sources
f) Improve publicly available information on water sampling procedures including educational information on TPH and updated handouts
g) Convene a subject matter expert working group to deliberately investigate a root cause and provide recommendations for follow-on action
h) Further investigate water heaters for operating temperature, flushing, maintenance, and replacement
i) Expand response capability to further investigate water quality concerns such as odor, color, and sheen

Accordingly, the Navy has initiated a root cause analysis of TPH detections and begun taking actions on recommendations identified.

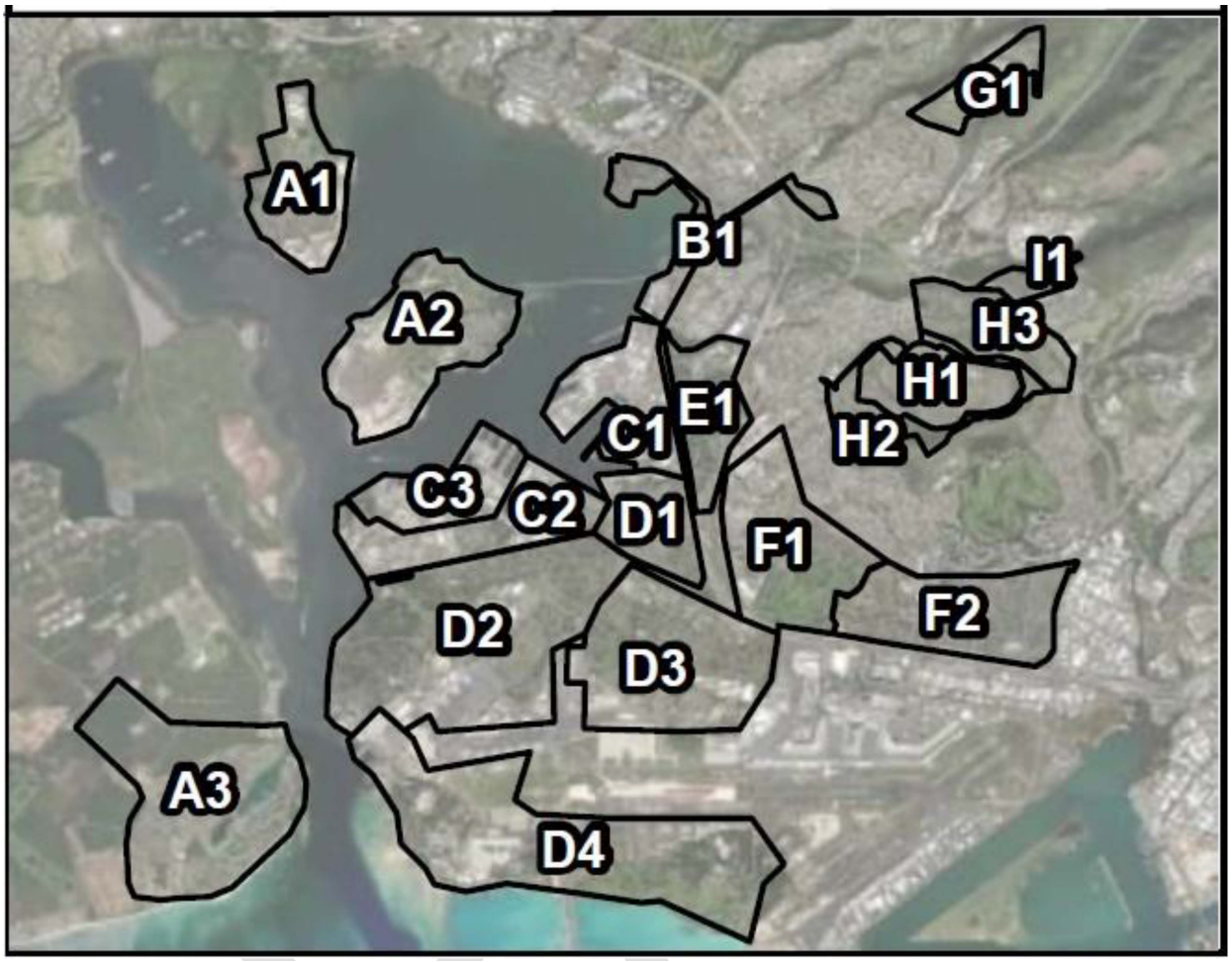
7. References

Department of Health, State of Hawaii; Department of the Navy, United States; and Department of the Army, United States, Aliamanu Military Reservation (DOH, DON, and DA). 2022. *Drinking Water Long-Term Monitoring Plan, Joint Base Pearl Harbor-Hickam Public Water System #HI0000360 and Aliamanu Military Reservation PWS #HI0000337, O'ahu, Hawai'i*. June

Appendix A

JBPHH Drinking Water System Zone Map

JBPHH Drinking Water System Zone Map



Appendix B

Long Term Monitoring List of Analytes

Long Term Monitoring List of Analytes

Field Tests (mg/L)

Free Chlorine

GENCHEM (mg/L)

Total Organic Carbon

HC (µg/L)

Petroleum Hydrocarbons (as Diesel)

Petroleum Hydrocarbons (as Gasoline)

Petroleum Hydrocarbons (as Oil)

METAL (µg/L)

Antimony

Arsenic

Barium

Beryllium

Cadmium

Chromium

Copper

Lead

Mercury

Selenium

Thallium

ORG_GC (µg/L)

Total Haloacetic Acids: (sum)

Bromoacetic acid

Chloroacetic acid

Dibromoacetic acid

Dichloroacetic acid Total

Haloacetic acids

Trichloroacetic acid

VOC (µg/L)

Benzene

Toluene

Ethylbenzene

Xylenes (total)

1,1,1-Trichloroethane

1,1,2-Trichloroethane

1,1-Dichloroethylene

1,2,4-Trichlorobenzene

1,2-Dichlorobenzene

1,2-Dichloroethane (EDC)

1,2-Dichloropropane (DCP)

1,4-Dichlorobenzene

Carbon Tetrachloride (CTC)

Chlorobenzene

cis-1,2-Dichloroethylene

Dichloromethane (aka methylene chloride)

Styrene

Tetrachloroethylene

trans-1,2-Dichloromethylene

Trichloroethylene (TCE)

Vinyl chloride

Total Trihalomethanes: Bromodichloromethane,

Bromoform, Chloroform m

Dibromochloromethane

SVOC (µg/L)

Benzo(a)pyrene

Bis(2-ethylhexyl)phthalate

Naphthalene

1-Methylnaphthalene

2-Methylnaphthalene

Appendix C

Summary of EOC Calls from 01Oct2023 to 31Dec2023

Summary of EOC Calls from 01OCT2023 to 31DEC2023

Address	Zone	Call Date/ Time	Navy RRT Date	LTM Date	Date Resident Notified of Initial Results	Notes[1]
Address M	D3	2023-10-03 18:32	10/4/2023	10/23/2023	10/4/2023	Reported water odor and skin irritation.
Address D	D3	2023-10-10 10:35	10/10/2023	10/20/2023	10/27/2023	Reported sheen on water from sink. Requested sample.
Address C	D3	2023-10-16 11:40	10/16/2023	10/20/2023	10/27/2023	Concerns reported directly to EPA/DOH. RRT confirmed with resident that the sample recommendation was made by the Primary Care physician due to the children's recent illnesses.
Address B	D2	2023-10-19 10:36	10/19/2023	10/20/2023	10/27/2023	Reported skin rash and itchiness for duration of 3 days, with worst symptom after showering. No report of odor or observation of sheen.
Address C	D3	2023-10-20 13:22	10/10/2023	10/20/2023	10/27/2023	Concerns reported directly to EPA/DOH.
Address D	D3	2023-10-20 13:38	10/25/2023	10/25/2023	11/3/2023	Concerns reported directly to EPA/DOH.
Address B	D2	2023-10-20 13:48	10/19/2023	10/20/2023	10/27/2023	Concerns were reported directly to EPA/DOH.
Address E	F2	2023-10-23 11:52	10/24/2023	11/3/2023	11/13/2023	Concerns reported directly to EPA/DOH. During sample resident reported odor from upstairs bathroom.
Address N	F2	2023-10-23 12:11	10/25/2023	10/30/2023	11/7/2023	Requested water sample collection and analysis.
Address O	A3	2023-10-23 12:19	10/25/2023	Not Requested	10/25/2023	Resident does not report odor or sheen. Reported illnesses include nose bleeds, children unwell with rashes.

Summary of EOC Calls from 01OCT2023 to 31DEC2023

Address	Zone	Call Date/ Time	Navy RRT Date	LTM Date	Date Resident Notified of Initial Results	Notes[1]
Address P	A3	2023-10-23 12:23	10/25/2023	Not Requested	10/25/2023	Requested sample for peace of mind. Reports young child with skin rash and wonders if it is the water.
Address Q	H1	2023-10-24 12:39	10/25/2023	10/25/2023	10/25/2023	LTM team contacted RRT to collect this sample on the same day as the (re)sample collection.
Address D	D3	2023-10-24 14:39	10/25/2023	10/25/2023	11/3/2023	Resident reports sheen observation in the morning.
Address R	B1	2023-10-26 08:47	10/27/2023	10/31/2023	11/8/2023	Resident reported itchy eyes (self) and skin rashes on all the children. Resident requested all faucets be sampled. RRT inquired if resident wanted to talk to Preventive Medicine Resident agreed and reported she was "denied being seen at the Red Hill clinic because they arrived after the date."
Address S	B1	2023-10-27 15:02	11/2/2023	11/2/2023	11/13/2024	Received routine LTM results with one result close to threshold. Concerned, resident requested RRT and LTM sample for more data.
Address A	A1	2023-10-20	10/20/2023	10/20/2023	10/27/2023	Concerns reported directly to EPA/DOH.
Address D	D3	2023-11-03 13:57	11/3/2023	11/3/2023	11/3/2023	Resident reported repeated observation of sheen in the morning. Resident reports children experience burning sensation after showering. Residence's kitchen sink and all showers have inline filters, installed for a couple months. Resident reports use of 1–2-year-old dishwasher.
Address T	D1	2023-11-06 06:19	11/13/2023	11/21/2023	12/4/2023	Sheen observed on cooking pot. Sample requested.
Address U	F2	2023-11-09 07:24	11/9/2023	11/14/2023	11/22/2023	Resident reported child's eczema flaring up, observable sheen on water, and red eyes after showering.
Address V	F2	2023-11-09 11:50	11/9/2023	11/15/2023	11/22/2023	Resident reported illnesses, burning and itchy eyes and ear infection.

Summary of EOC Calls from 01OCT2023 to 31DEC2023

Address	Zone	Call Date/ Time	Navy RRT Date	LTM Date	Date Resident Notified of Initial Results	Notes[1]
Address W	F2	2023-11-13 08:04	11/15/2023	11/15/2023	11/22/2023	Reports rash on child.
Address Y	A3	2023-11-13 08:20	11/14/2023	11/14/2023	11/22/2023	Sample request submitted via LTM informational booth outreach program.
Address Z	A3	2023-11-13 08:24	11/14/2023	11/14/2023	11/22/2023	Sample request submitted via LTM informational booth outreach program.
Address AA	A3	2023-11-13 08:27	11/14/2023	11/14/2023	11/22/2023	Sample request submitted via LTM informational booth outreach program.
Address E	F2	2023-11-03 06:38	11/3/2023	11/3/2023	11/13/2023	Concerns reported directly to EPA/DOH.
Address AB	D3	2023-11-28 06:38	11/28/2023	11/30/2023	12/8/2023	Resident reports spouse and neighbor has skin rash. Spouse has not yet seen medical.
Address AC	F1	2023-12-05	12/22/2023	12/22/2023	1/5/2024	EPA/DOH referral sample due to reported Sulphur smell.
Address AD	D3	2023-12-23	12/24/2023	12/24/2023	1/3/2024	EPA/DOH referral sample in response to Resident report that they cannot touch the water due to rashes appearing quickly.
Address AE	D2	2023-12-26 09:26	12/27/2023	12/27/2023	1/4/2024	Resident reports toilet water not clear, red eyes after showing and skin rashes. Resident has not yet seen medical.
Address AF	I1	2023-12-26 11:09	12/28/2023	12/28/2023	1/5/2024	Resident reports sheen/headaches/hair loss. Resident has not yet seen medical.
Address AG	H2	2023-12-29 11:35	1/5/2024	1/5/2024	2/5/2024	Resident reports slime in drain hose from washing machine. Sample requested.
Address AH	H1	2023-12-29 12:05	1/5/2024	1/5/2024	2/6/2024	Resident requests sample due to EPA news. Resident reported skin issues.

[1] Comments abbreviated/modified to fit purpose of this report.

Appendix D

Total Petroleum Hydrocarbons Information

What Are Petroleum Hydrocarbons?

Petroleum Hydrocarbons are a large class of chemicals made up of carbon and hydrogen that are the primary compounds found in common fuels such as kerosene, gasoline, diesel, motor oil, and different jet fuels, including JP-5. Each type of fuel consists of a slightly different mixture of hundreds of types of petroleum hydrocarbons.

Petroleum Hydrocarbons are organized in categories based on their size and chemical properties. They are measured in different ranges such as TPH-g, TPH-d, and TPH-o. All petroleum products and fuels consist of hydrocarbons in these ranges but with different amounts in each range.

Total Petroleum Hydrocarbons – Gasoline Range (TPH-g) are relatively short hydrocarbons that easily evaporate and are flammable.

Total Petroleum Hydrocarbons – Diesel Range (TPH-d) are medium length hydrocarbons that don't evaporate as well as the smaller compounds, but do produce a lot of energy when burned. These compounds are sometimes referred to as "middle distillates."

Total Petroleum Hydrocarbons – Oil Range (TPH-o) are larger hydrocarbons that don't evaporate and don't burn very well. They are commonly used to make lubricants and greases.

BTEX stands for benzene, toluene, ethylbenzene, and xylene. These are four specific compounds found in the **TPH-g category.** BTEX chemicals are used in many products.

Jet Propellant-5 (JP-5) is one type of jet fuel used by the military. It consists of many different hydrocarbons mostly in the **mid-sized (TPH-d) range.** JP-5 may also contain very small amounts of the smaller hydrocarbons in the **TPH-g category.** JP-5 does not contain lead.

Testing

Measuring petroleum hydrocarbons in water is difficult and requires special training and laboratory equipment. The testing is complicated by other organic compounds found in the environment that can also produce a hydrocarbon signal in the TPH-g, TPH-d, and TPH-o ranges. Examination and interpretation of the results needs to be thorough and requires expertise.

More information:

Agency for Toxic Substances and Disease Registry (ATSDR)
https://wwwn.cdc.gov/TSP/ToxFAQs/ToxFAQsDetails.aspx?faqid=423&toxid=75

Interstate Technology Regulatory Council (ITRC)
https://tphrisk-1.itrcweb.org/wp-content/uploads/2018/11/tph_fact_sheet_a5_chromatograms__11_4_18.pdf

For more information, visit health.hawaii.gov/NavyWater

TOTAL PETROLEUM **HYDROCARBONS**

WHAT ARE THEY?

Total Petroleum Hydrocarbons (TPH) is a term used to describe a large family of many chemical compounds that originally come from crude oil, which is used to make petroleum products.

These compounds are composed of carbon and hydrogen, which is why they are called 'hydrocarbons', and include various constituents found in gasoline, jet fuels, mineral oils, and other petroleum products used on a daily basis.

Because there are so many different chemicals in the hydrocarbon family, it is not practical to measure each one separately; so instead they are grouped into common categories by 'carbon range' meaning the number of carbon elements in the individual compound.

People could be exposed to TPHs from many sources on a daily basis **One of the most common ways people are exposed is by breathing in air while fueling their vehicles at gas stations.**

Red Hill drinking water samples are primarily tested for three hydrocarbon categories: Gasoline Range (TPH-g), Diesel Range (TPH-d), and Motor Oil Range (TPH-o). These three categories of hydrocarbons are further described at right.

HOW DOES THIS RELATE TO RED HILL?

It is important to recognize that these drinking water tests are not for gasoline, diesel fuel, or oil specifically, but rather petroleum hydrocarbons that are in the "range" of those found in gasoline, diesel fuel, or oil. Because petroleum hydrocarbons are complex to categorize, it is important that testing, analysis, and interpretation of TPH results are taken into careful consideration. **Not all detections of TPH equate to the presence of JP-5 in drinking water.**

TPH-g

Total Petroleum Hydrocarbons – GASOLINE RANGE

are relatively short hydrocarbons that easily evaporate and are flammable. The TPH-Gasoline Range Organics analysis is used to measure the amount of hydrocarbon compounds with six to ten carbons (abbreviated C6-C10). These compounds are commonly associated with an unpleasant odor. **These are commonly found in solvents and motor vehicle gasoline fuel.**

TPH-d

Total Petroleum Hydrocarbons – DIESEL RANGE

are medium length hydrocarbons that don't evaporate as well as the smaller compounds. The TPH-Diesel Range Organics analysis is used to measure the amount of hydrocarbon compounds with 10 to 24 carbons (C10-C24). These compounds are generally flammable and produce a lot of energy when burned. **These are commonly found in many household, biological, and industrial products, such as mothballs, cooking oils, and diesel or kerosene fuels.**

TPH-o

Total Petroleum Hydrocarbons – OIL RANGE

are larger hydrocarbons that don't evaporate. The TPH-Oil Range Organics analysis is used to measure the amount of hydrocarbon compounds with 24 to 40 carbons (C24-C40). **These are commonly found in lotions, lubricants, and greases.**

TOTAL PETROLEUM **HYDROCARBONS**

PROTECTION OF HUMAN HEALTH

Health effects from exposure to TPHs depend on many factors, such as the type of compounds in the TPH mixture, how long the exposure lasts, and the amount of TPHs a person was exposed to. The compounds in each of the TPH ranges affect the body differently.

The federal government develops regulations and guidelines intended to protect human health. These regulations and guidelines often include exposure levels in air, soil, water, or food that may not be exceeded. Exposure levels are developed based on information provided by the United States Environmental Protection Agency (USEPA), ATSDR, Centers for Disease Control and Prevention (CDC), and the National Institute for Occupational Safety and Health (NIOSH).

There are currently no drinking water federal regulations or guidelines for TPHs in general; however, the EPA has developed regulations, guidelines, and risk-based screening levels for TPH fractions and individual compounds that make up TPH mixtures. These include:

Maximum contaminant levels (MCLs) established under the Safe Drinking Water Act (SDWA) to limit the amount of contamination in public drinking water.

Regional screening levels (RSLs) established as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for determining if a chemical poses an unnacceptable risk to human health.

Nearly all states, including Hawaii, have developed guidance and standards for TPHs, TPH fractions, and/or individual compounds that make up TPH mixtures.

Environmental Action Levels (EALs) established by the Hawaii Department of Health for determining if a chemical poses an unacceptable risk to human and ecological health taking in consideration environmental conditions in Hawaii.

HOW COULD I BE EXPOSED TO TPHs?

People could be exposed to TPHs from many sources on a daily basis. Potential everyday sources include:

- *Breathing in air at gasoline stations*
- *Using chemicals at home or work*
- *Using certain pesticides*
- *Working in occupations that use petroleum products, such as manufacturing*

While TPHs are commonly associated with the fuel and motor oil for your car, petroleum chemicals are used to make over 6,000 everyday products. These products include asphalt, plastic products, cosmetics, clothing, heat and electricity, electronics, paint, and many more.

TPHs ARE USED IN EVERYDAY PRODUCTS SUCH AS

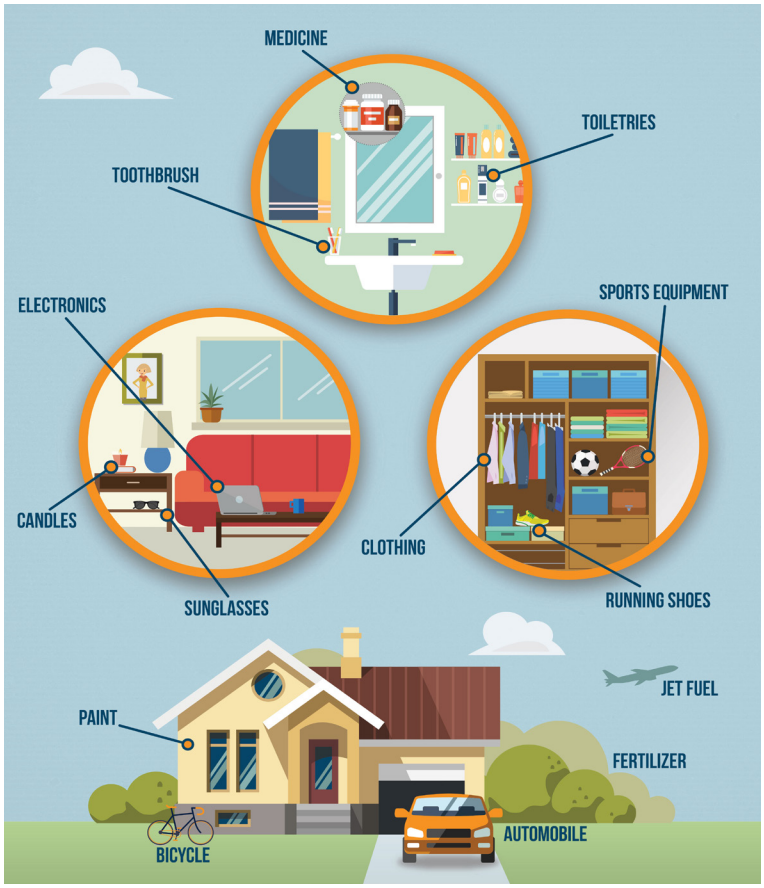


Image Source: https://iprb.org/wp-content/uploads/2019/04/Petroleum-and-You-Final.jpg

Appendix E

Summary of Drinking Water Sample Results

Summary of Drinking Water Sample Results

Address	Zone	Dates	RRT TPH Results	Navy Contractor TPH Results			
				TPH-d (ppb)	TPH-g (ppb)	TPH-o (ppb)	Total TPH (ppb)
Waiawa Shaft	----	10/19/2023	ND	ND	ND	ND	ND
Address A	A1	10/20/2023	ND	71.2	ND	ND	71.2
Address B	D2	10/19/2023 (RRT) and 10/20/2023 (RRT and Navy Contractor)	ND	50.2	ND	ND	50.2
Address C	D3	10/16/2023 (RRT) and 10/20/2023 (RRT and Navy Contractor)	ND	ND	ND	ND	ND
Address D	D3	10/10/2023 (RRT) and 10/20/2023 (RRT and Navy Contractor)	ND	56.0	ND	ND	56.0
Address D	D3	10/25/2023 (RRT and Navy Contractor) and 11/03/2023 (RRT)	ND	65.9	ND	ND	65.9
Address E	F2	10/23/2023 (RRT) and 11/03/2023 (Navy Contractor)	ND. However; tupperware with water collected by resident with a sheen.	ND	ND	ND	ND
Address F	----	Not scheduled, no response from resident					

Appendix F

Summary of Water Heater Sample Results

Summary of Water Heater Sample Results

Address	Zone	Sample Date	RRT TPH Results	Navy Contractor TPH Results															
				Pre-Drain					Post-Drain					Post-Flush					
				TPH-d (ppb)	TPH-g (ppb)	TPH-o (ppb)	Total TPH (ppb)	Free Chlorine (mg/L)	TPH-d (ppb)	TPH-g (ppb)	TPH-o (ppb)	Total TPH (ppb)	Free Chlorine (mg/L)	TPH-d (ppb)	TPH-g (ppb)	TPH-o (ppb)	Total TPH (ppb)	Free Chlorine (mg/L)
Address A	A1	11/22/2023	ND	ND	ND	ND	ND	0.59	ND	ND	54.8	54.8	0.20	ND	ND	ND	ND	0.20
Address B	D2	12/7/2023	ND	64.3	ND	ND	64.3	0.44	ND	ND	ND	ND	0.34	ND	ND	ND	ND	0.60
Address C	D3	11/21/2023	ND	ND	ND	ND	ND	0.41	ND	ND	54.5	54.5	0.43	71.7	ND	63.9	135.6	0.47
Address D	D3	11/21/2023	ND	ND	ND	ND	ND	0.57	ND	ND	ND	ND	0.74	70.6	ND	ND	70.6	0.59
Address G	D3	11/20/2023	ND	66.6	ND	75.9	142.5	0.53	55.2	ND	56.7	111.9	0.09	55.7	ND	81.1	136.8	0.59
Address H	A2	12/6/2023	ND	50.5	ND	ND	50.5	0.12	51.2	ND	ND	51.2	0.12	102	ND	ND	102	0.38
Address I	D1	12/7/2023	ND	ND	ND	ND	ND	0.18	ND	68.5	ND	68.5	0.17	59.5	ND	ND	59.5	0.27
Address J	E1	12/6/2023	ND	ND	ND	ND	ND	0.06	ND	ND	ND	ND	0.27	59.7	ND	ND	59.7	0.50
Address K	F1	12/8/2023	ND	ND	ND	ND	ND	0.16	ND	ND	75.4	75.4	0.24	ND	ND	89.2	89.2	0.15
Address L	F2	12/8/2023	ND	ND	ND	66.4	66.4	0.12	ND	ND	ND	ND	0.17	ND	ND	60.4	60.4	0.54

Appendix G

Summary of Residential Premise Plumbing Information

Summary of Residential Premise Plumbing Information

Residence Identification	Interior Water Line Composition	Water Service Lateral Composition	Water Heater Specifics	Occupation Date	Last Water Heater Flush	Premise Plumbing Maintenance			Visual Observations of Fixtures and Faucet Aerators	
						Work Order Numbers	Dates	Maintenance Summary	Date	Visual Observations
Address A	Copper	Copper	Sun Earth SE80-6 SUI1410R483926	7/1/2021	12/30/2021	WO#4732151	N/A	Toilet – Details N/A	11/22/2023	Corrosion and mineral deposits were observed at two bathroom sink aerators located on floor 1 and floor 2 of the residence.
						WO#4953265	3/18/2021	HVAC - OMC checked pressure, checked ac filter, cleared drain line.		
						WO#4985055	4/15/2021	Tub - OMC re-caulked tub.		
						WO#4999585	4/22/2021	Tub - OMC installed cartridge.		
						WO#5139403	8/16/2021	HVAC - Canceled because resident picked filters up from self help.		
						WO#5146101	8/27/2021	HVAC - Compressor not turning on, OMC repaired.		
						WO#6241132	12/30/2021	Full Home Water Flushing		
						WO#5720202	1/24/2022	Water leak in road - NAVFAC completed work on main line.		
						WO#5967151	7/7/2022	Annual PM		
						WO#6441903	6/6/2023	Annual PM		
						WO#6701775	11/24/2023	Water flushing completed.		
Address B	PVC	PVC	A.O. Smith PCT-80-200 L04J002527	8/31/2020	1/11/2022	WO#9600551	1/11/2022	Water flushing completed.	12/7/2023	No mineral deposits or biological growth observed.
						WO#10317494	4/3/2022, 4/23/2023	Replaced exterior hose bib.		
						WO#9802021	5/16/2022	Verified the water heaters are operating in the correct temperature band		
						WO#9869592	6/28/2022	Toilet leaking, replaced wax ring.		
						WO#9919464	7/22/2022	Replaced toilet flush handle and flapper.		
						WO#10170398	1/4/2023	Replaced shower head and waste arm in kitchen.		
						WO#10361501	4/26/2023	Verified the water heaters are operating in the correct temperature band.		
						WO#10539515	8/17/2023	Aerator replaced in kitchen sink.		
						WO#10795576	1/23/2024	Low water pressure, changed out all aerators to increase pressure.		

Summary of Residential Premise Plumbing Information

Residence Identification	Interior Water Line Composition	Water Service Lateral Composition	Water Heater Specifics	Occupation Date	Last Water Heater Flush	Premise Plumbing Maintenance			Visual Observations of Fixtures and Faucet Aerators	
						Work Order Numbers	Dates	Maintenance Summary	Date	Visual Observations
Address C	PVC	PVC	Ruud RSPER-80-1 RU0907R09569	11/6/2020	1/20/2022	WO#9608821	1/20/2022	Water flushing completed.	11/21/2023	No mineral deposits or biological growth observed.
						WO#9715905	3/31/2022	Toilet valve replacement.		
						WO#9790898	5/31/2022	HVAC duct cleaning.		
						WO#10091151	11/4/2022	HC tested water pressure to all sinks following ESS upgrade and all were strong.		
						WO#10091921	11/8/2022	Toilet Leak (downstairs) - Re-aligned tank spout gasket. Tested for no further leak.		
						WO#10096422	11/8/2022	Toilet Leak (upstairs) - Re-aligned the spout gasket and tested for no further leak.		
						WO#10120489	11/22/2022	Toilet Leak - HC tightened bolts and nuts, flushed the toilet and didn't see any leak. Mrs. stated it only happened once.		
						WO#10230610	2/7/2023	Verified the water heaters are operating in the correct temperature band.		
						WO#10192310	2/7/2023	Duct cleaning - resident requested to clean vents. The house is making them sick. HC went out an annotated Ameresco unit. Opened supply duct and checked entire system, which was clean.		
						WO#10401580	5/25/2023	Dishwasher - HC replaced the sprayer with the correct model.		
						WO#10575928	8/24/2023	Water supply switch hose for washing machine replaced. Washing machine tested and no longer leaking.		
						WO#10725932	11/29/2023	Replaced aerator in bathroom sink.		
						WO#10795382	1/24/2024	Verified the water heaters are operating in the correct temperature band.		

Summary of Residential Premise Plumbing Information

Residence Identification	Interior Water Line Composition	Water Service Lateral Composition	Water Heater Specifics	Occupation Date	Last Water Heater Flush	Premise Plumbing Maintenance			Visual Observations of Fixtures and Faucet Aerators	
						Work Order Numbers	Dates	Maintenance Summary	Date	Visual Observations
Address D	PVC	PVC	Ruud RSPER-80-1 RU0108R00256	2/13/2021	1/20/2022	WO#10110060	11/21/2022	Fixed water leak occurring from dishwasher return hose. HC replaced air gap and inspected hose.	11/21/2023	Kitchen sink aerator had several black particulates embedded in the green mesh aerator material. Small piece of plastic-like material observed in the WH post flush visual sample.
						WO#9608321	1/20/2022	Water flushing completed.		
						WO#10235478	2/6/2023	Water heater - resident cancelled work order stating hot water is being generated.		
						WO#10239495	2/9/2023	Verified the water heaters are operating in the correct temperature band.		
						WO#10571573	8/31/2023	Cold water valve for washing machine not shutting off. HC replaced the valve.		
						WO#10630424	9/29/2023	Water heater - hot water doesn't last for a long time. HC noted the time clock was off by 1/2 an hour. Timer was re-programmed. Resident declined draining and flushing the water heater water.		
						WO#10653875	10/16/2023	Water heater - hot water doesn't last for a long time. HC adjusted thermostat and tested water.		
						WO#10678819	10/31/2023	No hot water, turned the mixing valve and bypassed timer.		
						WO#10715760	12/8/2023	Water flushing completed.		
						WO#10776635	1/10/2024	Water heater tested per SP request and working properly. SP indicated the Navy instructed her to call in a WO for water heater replacement due to positive TPHD result.		
						WO#10795393	1/24/2024	Verified the water heaters are operating in the correct temperature band.		

Summary of Residential Premise Plumbing Information

Residence Identification	Interior Water Line Composition	Water Service Lateral Composition	Water Heater Specifics	Occupation Date	Last Water Heater Flush	Premise Plumbing Maintenance			Visual Observations of Fixtures and Faucet Aerators	
						Work Order Numbers	Dates	Maintenance Summary	Date	Visual Observations
Address G	PVC	PVC	Sun Earth SE80-1 SU0310R02500	Vacant	1/24/2022	WO#9606777	1/19/2022	Home flushing	11/20/2023	No mineral deposits or biological growth observed.
						N/A	1/24/2022	Home flushing		
						WO#9576873	2/1/2022	Repaired main water line by cutting and capping.		
						WO#1082855	10/28/2022	Repaired main water line by cutting and capping.		
						WO#10166894	12/20/2022	Replaced kitchen faucet and hose.		
						WO#10166542	1/9/2023	Bypassed timer and replaced thermostat.		
						WO#10204414	1/17/2023	No hot water, repaired thermostat.		
						N/A	1/19/2023	Water heater repair for water not hot enough.		
						WO#10703344	1/21/2023	Verified the water heaters are operating in the correct temperature band.		
						WO#1023010	2/6/2023	No hot water, adjusted thermostat and temperature setting.		
						WO#10252003	2/17/2023	No hot water, adjusted thermostat.		
						N/A	3/2/2023	Water heater repair for no hot water		
						WO#10288563	3/10/2023	No hot water.		
						WO#10363436	5/11/2023	Dishwasher water pump replacement.		
						WO#10714179	11/20/2023	Home flushing		

Summary of Residential Premise Plumbing Information

Residence Identification	Interior Water Line Composition	Water Service Lateral Composition	Water Heater Specifics	Occupation Date	Last Water Heater Flush	Premise Plumbing Maintenance			Visual Observations of Fixtures and Faucet Aerators	
						Work Order Numbers	Dates	Maintenance Summary	Date	Visual Observations
Address H	CPVC	Copper (HDPE replaced in Aug-2020)	American SE62-80H-045S 0815T412926	Vacant	12/14/2023	WO#6244235	1/7/2022	Full Home Water Flushing	12/06/2023	No mineral deposits or biological growth observed.
						WO#6016122	8/15/2022	Annual PM Completed		
						WO#6511279	7/20/2023	Annual PM Completed		
						WO#6616200	9/22/2023	Hot water heater leaking		
						WO#6660008	10/24/2023	Toilet running - replaced flapper and fluid master		
						N/A	12/14/2023	Annual PM completed with water heater flush		
						WO#6677787	12/18/2023	COM (Change of Occupancy)		
Address I	Copper	Copper	Ruud RSPER-80-01 RU1299C05885	Vacant	12/20/2023	WO#6242006	1/2/2022	Full Home Water Flushing	12/07/2023	No mineral deposits or biological growth observed other than what's noted below. Rust-colored water noted while collecting the post-drain sample. Particles observed in kitchen sink aerator. Mineral deposits observed at all premise fixtures.
						WO#5992570	7/25/2022	The water heater has corrosion and water stains leading from the TPR valve and anode.		
						WO#6045337	8/24/2022	Annual PM Completed		
						WO#6485294	7/3/2023	HVAC - Overflow switch was clogged and flushed with nitrogen.		
						WO#6512234	7/18/2023	Bathroom upstairs is flooded, water is leaking through the ceiling downstairs in the garage		
						WO#6570517	8/25/2023	Annual PM Completed		
						N/A	12/20/2023	Annual PM completed with water heater flush		
						WO#6676165	12/29/2023	COM (Change of Occupancy)		

Summary of Residential Premise Plumbing Information

Residence Identification	Interior Water Line Composition	Water Service Lateral Composition	Water Heater Specifics	Occupation Date	Last Water Heater Flush	Premise Plumbing Maintenance			Visual Observations of Fixtures and Faucet Aerators	
						Work Order Numbers	Dates	Maintenance Summary	Date	Visual Observations
Address J	Copper	Copper	Rheem XG40T06EC36U0 RHLNM071407818	Vacant	12/18/2023	WO#5689828	12/21/2021	Annual PM Completed	12/06/2023	No mineral deposits or biological growth observed.
						WO#6240863	1/20/2022	Full Home Water Flushing Completed		
						WO#5900299	6/17/2022	HVAC PM Completed (Clean all split systems interior also clean all condensers for splits exterior)		
						WO#6572739	8/24/2023	Dishwasher won't drain, OMC cleared out debris in drain line.		
						WO#6597052	9/12/2023	HVAC - unit had a communication problem, replaced all boards and fan motor and blade.		
						WO#6607854	10/3/2023	Annual PM Completed		
						WO# 6647980	11/3/2023	HVAC - AC unit was loose from wall and making noise, secured and changed boards.		
						WO#6647981	10/16/2023	“Cold water has started leaking by when the faucet is off. Master bathroom sink. Please also check to see if the sink leaks underneath. It was previously leaking and was repaired but I think it still slow drips underneath. A very small amount”		
						WO#6679084	12/14/2023	HVAC - multiple leaks in AC repaired.		
						WO#6668924	12/19/2023	COM (Change of Occupancy)		
						N/A	12/18/2023	Annual PM Completed with water heater flush		

Summary of Residential Premise Plumbing Information

Residence Identification	Interior Water Line Composition	Water Service Lateral Composition	Water Heater Specifics	Occupation Date	Last Water Heater Flush	Premise Plumbing Maintenance			Visual Observations of Fixtures and Faucet Aerators	
						Work Order Numbers	Dates	Maintenance Summary	Date	Visual Observations
Address K	CPVC	Copper	American SE62-80H-045S 2003117805569	Vacant	1/10/2024	WO#6244063	1/8/2022	Full Home Water Flushing Completed	12/08/2023	No mineral deposits or biological growth observed other than what's noted below. Particles observed while collecting the pre- and post-drain samples.
						WO#5755263	2/15/2022	HVAC Annual PM - cleaned condenser and evaporator coil, cleared drain, painted registers, vacuumed return duct, checked pressures.		
						WO#5908178	6/3/2022	Fixed solar timer.		
						WO#6302685	3/2/2023	HVAC Annual PM - cleaned condenser and evaporator coil, cleared drain, painted registers, vacuumed return duct, checked pressures.		
						WO#6718687	12/11/2023	Annual PM completed		
						WO#6689613	11/13/2023	Internal Work Order - inlet drain repairs across from Address K.		
						WO#6713202	12/20/2023	COM (Change of Occupancy)		
						WO#6741523	1/10/2024	Full Home Water Flushing Completed		
Address L	CPVC	HDPE: Replacement with Copper scheduled in CY24	American SE62-80H0945S 0728101877	Vacant	1/10/2024	WO#6242745	1/22/2022	Full Home Water Flushing Completed	12/08/2023	No mineral deposits or biological growth observed other than what's noted below. Particles observed while collecting the pre-drain sample. Rust-colored water noted while collecting the post-drain sample.
						WO#5804692	3/22/2022	Annual PM completed		
						WO#5955054	7/6/2022	HVAC Annual PM - cleaned condenser and evaporator coil, cleared drain, painted registers, vacuumed return duct, checked pressures.		
						WO#6424672	6/8/2023	HVAC Annual PM - cleaned condenser and evaporator coil, cleared drain, painted registers, vacuumed return duct, checked pressures.		
						WO#6515292	7/20/2023	Sprinklers - reinstalled solenoid on irrigation sprinkler heads.		
						WO#6611759	9/20/2023	Ice machine - repaired auger motor.		
						WO#6713150	12/6/2023	Annual PM completed		
						WO#6680845	12/12/2023	COM (Change of Occupancy)		
						WO#6741518	1/10/2024	Water flushing completed		

Appendix H

Hunt Public Private Venture Housing Annual Prevenative Maintenance Checklist

and

Hickam Communities Water Heater Annual Preventive Maintenance Checklist

HUNT MILITARY COMMUNITIES

Preventative Maintenance

Hunt Military Communities

ANNUAL PM

Address: **Technician:**

Community: **Work Order #:** **Date:**

Area/Item		Description	Follow-Up Maintenance			Parts Used	
			Room/Location	Description	Work Order #	Part #	Quantity
Living Areas (living room, dining room, hallways, bedrooms, family/play rooms)							
Windows	☐	**Fall Warning** stickers on ***ALL*** upstairs windows					
	☐	Hardware/locks work properly					
	☐	Inspect for moisture intrusion and that weep holes are clear					
	☐	Window Opening Control Devices installed and working properly on all windows where required					
	☐	Blind cords are cut to 6" in length and are not tied together or cordless					
Flooring	☐	Flooring is free from **trip hazards**, tears or other permanent damage					
Interior Doors	☐	Door hardware/locks operating					
Closets	☐	Check for water intrusion along baseboards, walls and ceilings					
Kitchen/Bathroom (plumbing)							
Sinks	☐	Sink drains freely					
	☐	Stopper/plunger operable					
	☐	Faucets operate properly, no leaks					
	☐	Supply lines and shutoffs have no leaks					
	☐	Shut offs are exercised and have no leaks (only exercised during COM)					
		P-trap and piping are leak free					
	☐	Check all caulk for proper application to prevent water penetration					
Tub/Shower	☐	Check all caulk for proper application to prevent water penetration					
	☐	Shower head operate properly, no leaks					
	☐	Faucet valves are exercised and have no leaks (only exercised during COM)					
	☐	Tub drains properly					
Toilet	☐	Bowl and tank free from damage, no leaks					
	☐	Supply lines and shutoffs are secure, no leaks					
	☐	Angle stops/valves are exercised and have no leaks (only exercised during COM)					
	☐	Bolts are tight, bowl is not loose					
	☐	Toilet seat is secure					
	☐	Flush/fill devices work properly					
Exhaust Fans	☐	Check for proper and effective operation					
	☐	Turn off electricity and clean the cover, motor and housing of all lint buildup					
Pantry/Closets	☐	Check for water intrusion along baseboards, walls and ceilings					
Kitchen Appliances							
Stove	☐	Use gas detector to inspect for leaks around appliance fittings					
	☐	Check and ensure anti tip device is installed if required by manufacturer					
	☐	Test all burners, oven and broiler					
	☐	All control knobs in place					
	Record	**Make/Model**					
	Record	**Serial #**					
Refrigerator	☐	Check door seals and handles					
	☐	Clean coils					
	☐	Supply lines and shutoffs are secure, no leaks					
	☐	Angle stops/valves are exercised and have no leaks (only exercised during COM)					
	Record	**Make/Model**					
	Record	**Serial #**					
Dishwasher	☐	Check seal for leaks					
	☐	Element is damage free					
	☐	Inspect air gap for blockage if installed					
	☐	Supply lines and shutoffs are secure, no leaks					
	☐	Angle stops/valves are exercised and have no leaks (only exercised during COM)					
	Record	**Make/Model**					
	Record	**Serial #**					
Microwave Mark N/A if unit does not have a Microwave	☐	N/A					
	☐	Test functionality of fan and lighting if applicable					
	☐	Replace filter as needed if applicable					
Vent Hood	☐	Test functionality of fan and lighting					
	☐	Replace filter as needed					
Basement/Crawlspace							
Basement	☐	No signs of visible water intrusion					
	☐	Test sump pump (if applicable)					
	☐	Dehumidifer working properly if installed					
Crawlspace	☐	Visual inspection to ensure ductwork is attached and damage free					
	☐	Visual inspection for signs of plumbing leaks or visible water intrusion					
Electrical & Life Safety							
Breaker Panel	☐	Accessible, can be reached in emergency					
	☐	No open ports					
	☐	No scorching on wires or damaged breakers and they are labeled					
Outlets and Switches (visible)	☐	Faceplates on all switches/outlets					
	☐	No cracks/damage to faceplates					
	☐	Outlets/switches damage free					
	☐	Outlets/extension cords not overloaded					

GFCI Outlets	☐	Test interior and exterir GFCI with testing device and rewire or replace immediately if defective. (GFCI or GFCI breaker may be required in wet areas, garages and basements depending on the year of construction)					
Smoke and CO Detectors	etc.	**Ambient CO Level (ppm reading) >9ppm follow Hunt CO Plan**					
	☐	Smoke - Remove and replace battery, verify age - **replace at manufacturer recommendation** (typically 10 years from date of manufacture)					
	☐	CO - Remove and replace battery, verify age - **replace at manufacturer recommendation** (typically 5 - 7 - 10 years from date of manufacture depending on type installed)					
	☐	Test and replace immediately if fails to activate					
Fireplace, Chimney, Water Heater and HVAC Venting	☐	Inspect Vented gas water heaters, furnaces and boilers for Carbon Monoxide leaks					
	☐	Vented chimney/fireplace will be inspected during COM or annually whichever comes first, by licensed contractor.					
	☐	Inspect Ventless gas appliances for gas leaks					
Exterior and Interior Mechanical Rooms and Equipment							
Water Heater	☐	Flush 2 gallons from tank					
	☐	Check TPR valve operation					
	☐	TPR ext. pipe 4" from ground or plumbed in					
	☐	Use gas detector to inspect for leaks around appliance fittings					
	☐	Water temp off tank is 120 max					
	☐	Scald warning label in clear view					
	☐	Manufacture/Install date is marked in clear view					
	☐	Free from combustible material					
	☐	Add stabilization straps when required by State /Local regulations					
	☐	Shut offs on Hot & Cold lines, no leaks					
	☐	Shut offs are exercised and have no leaks (only exercised during COM)					
	☐	Inspect electrical wiring on electric/power vent models					
Fire Extinguisher (If required)	☐	Extinguisher in designated location and date of last inpsction annotated					
	☐	Pressure/charge correct (in green)					
	☐	Pin is in place					
Fire Suppression System	☐	Current annual fire suppression system inspection by certified contractor if required by local code					
HVAC Equipment/Boilers/ Ducts and Registers	☐	Semi ridgid gas line (flex) protected by rubber grommet through furnace housing					
	☐	Check registers and ducts for (dirt, debris growth, damage etc.) schedule cleaning if necessary					
	☐	Check combustion flame is blue, if yellow follow-up required					
	☐	Inspect pumps for excessive noise, vibration or leaks					
	☐	Inspect boiler insulation and repair if necessary					
	☐	Replace filters (initial and date)					
	☐	Clean furnace/air handler evaporator coils and condensing unit coils					
	☐	Check thermostats					
	☐	Lubricate motors if applicable					
	☐	Check drain pan and condensate lines are clear					
	☐	Condenser - stable, level platform					
	☐	Good air flow around condenser					
	☐	Refrigeration line is fully insulated					
	☐	Holes for lines/wiring is properly sealed					
Dryer Exhaust Vent	☐	Inspect and clean exhaust vent ductwork					
	☐	Inspect/clean exterior vent cap					
	☐	Ensure proper connection					
Mechanical Rooms	☐	No visible signs of mold growth					
	☐	No visible signs of water intrusion or leaks					
	☐	All electrical and plumbing penetrations are sealed					
Exterior							
Exterior Doors	☐	Door hardware/locks operating					
	☐	Surface/glazing damage free					
	☐	Check threshold/perimeter seal					
	☐	Keys are accurate in KeyTrak					
Window Screens	☐	Installed where required and damaged free					
Roof (Visual from ground)	☐	Service entry/weatherheads secure & sealed					
	☐	Roof covering is damage free					
	☐	Soffits/fascia/rake trim damage free					
Gutter/Downspout	☐	Gutters and downspouts are operating properly					
	☐	Splash blocks installed where required					
Exterior Walls/Siding	☐	No loose, damaged or missing sections/pieces					
	☐	Min 6" from ground to lowest course of siding					
	☐	No areas of unpainted/exposed siding					
Exterior Lights	☐	Lights are securely mounted to exterior/pole					
	☐	Globes are intact and lights are operable					
Garage	☐	Test keypad & remote controls					
	☐	Test re-opening/impact devices					
	☐	Test quick-release mechanism					
	☐	Check seal at bottom of door					
	☐	Check walls for signs of water intrusion					
	☐	Check check ceiling for signs of water intrusion					
Cleanouts	☐	Cleanout is accessible					
	☐	Cap provided and can be secured					
Hose Bibs	☐	Hose bibs are free from damage and have no leaks					
Irrigation Systems	☐	Heads directed away from structure and doorways					

Walkways, Driveways & Stairs	☐	Stairs - firm and stable, handrails are secure					
	☐	Surfaces are stable, free from trip hazards,					
	☐	No potholes and cracks >1/4" wide					
Fences, Gates, Balconies, Decks & Retaining Walls	☐	Balcony decking and rails are stable and in good condition					
	☐	Fences are properly supported and not leaning					
	☐	Proper and operational hardware					
☐ **Resident Owned**	☐	Ret. walls are stable, pose no safety threat					
Kitchen/Bathroom/Laundry Visual Inspection For Mold Growth							
Mold Growth	☐	Visual inspection in all kitchen, bathroom, laundryrooms (when accessable)					
Mold Growth	☐	Visual inspection under/behind dishwasher/refrigerator for signs of water damage					
Mold Growth	☐	Visual inspection around all tubs, showers, sinks and laundry washer boxes					
Flaking/Peeling Paint (LBP)							
Flaking Paint (LBP)	☐	Pre 1978 homes have no interior flaking or peeling paint					
Pest Infestations							
Pest Infestations	☐	No visible signs of any exterior/interior pest infestations or termite damage					
	☐	Check for points of entry and seal as needed					
Radon Systems							
Manometers	☐	U-tube is showing pressure differential					
Follow Up		**Property Management Follow-up required**					
Comments:							

Maintenance/Vendor Signature: _____ **Date:** _____

Maintenance QC Signature: _____ **Date:** _____

Property Management Signature: _____ **Date:** _____

Core Change	
Yes ☐	**No** ☐
Date:	

Hickam Communities Water Heater Annual Preventive Maintenance Checklist

Water Heater	Description	Results	Follow-Up Action Required
Leaks	☐ Check on and around tank for signs of leaking; drainage pipe extends appropriately	Pass ☐ Fail ☐	
Thermostat & Water Temperature	☐ Check/reset element thermostat setting; Scald warning/Tamper is present and in clear view; Set at 110-120 degrees; Water temperature at nearest faucet/outlet does not exceed 120 degrees.	Pass ☐ Fail ☐	
Safely Secured	☐ Insure appliance is properly secured to prevent tipping and free from combustable material.	Pass ☐ Fail ☐	
Insulation	☐ Inspect / Repair pipe insulation	Pass ☐ Fail ☐	
Flush	☐ Flush tank (for those Installed after 2015)	Pass ☐ Fail ☐	
Press Relief Valve	☐ Test PRV proper flow and shut off, adjust/repair as needed	Pass ☐ Fail ☐	
Flue	☐ Check for proper operation, seating and venting	Pass ☐ Fail ☐	
	☐ Validate Make, Model & Serial # in GIS		

Appendix I

Premise Plumbing Sampling Observations and Photographs

Zone A1 – Address A

Premise Plumbing Inspection and water heater sampling completed on November 22, 2023, between 1325 and 1525 by [redacted] and [redacted] of AECOM.

Summary of Water Heater Information

Loc ID	ADDRESS A
Address	Address A
Sample Date	11/22/2023
Make	Sun Earth, Inc.
Model	SE80-6
Serial No.	1410R483926
Manufacture Date	Unknown
Capacity (gal)	80
Set temp (F°)	130

°F degree Fahrenheit
gal gallon
ID identification
No. number

Summary of Water Heater Sampling Water Quality Parameters

Loc ID: ADDRESS A
Address: Address A
Sample Date: 11/22/2023

	Pre-drain	Post-drain	Post-flush
Sample ID	A1-TW-[redacted]	A1-TW-[redacted]	A1-TW-[redacted]
Sample Time	13:45	14:15	15:00
PID (ppm)	0.2	0.2	0.3
Measured temp (F°)	85.8	86	86
Chlorine (mg/L)	0.59	0.2	0.2
Sheen/Particulates/Odor	None	None	None

mg/L milliliter per liter
ppm part per million

Zone D3 – Address G

Premise Plumbing Inspection and water heater sampling completed on November 20, 2023, between 1255 and 1550 by [redacted] and [redacted] of AECOM Technical Services Inc. (AECOM).

Summary of Water Heater Information

Loc ID	ADDRESS G
Address	Address G
Sample Date	11/20/2023
Make	Sun Earth, Inc.
Model	SU80-1
Serial No.	SU 0310R02500
Manufacture Date	03/2010
Capacity (gal)	80
Set temp (F°)	135

Summary of Water Heater Sampling Water Quality Parameters

Loc ID: ADDRESS G
Address: Address G Sample
Date: 11/20/2023

	Pre-drain	Post-drain	Post-flush
Sample ID	D3-TW-[redacted]	D3-TW-[redacted]	D3-TW-[redacted]
Sample Time	13:55	14:23	15:40
PID (ppm)	0.3	0.2	0.3
Measured temp (F°)	95.5	95	88.2
Chlorine (mg/L)	0.53	0.09	0.59
Sheen/Particulates/Odor	None	None	None

Zone D3 – Address D

Premise Plumbing Inspection and water heater sampling completed on November 21, 2023, between 0855 and 1101 by [redacted], [redacted], and [redacted] of AECOM.

Summary of Water Heater Information

Loc ID	ADDRESS D
Address	Address D
Sample Date	11/21/2023
Make	Ruud
Model	RSPER-80-1
Serial No.	RU 0108R00256
Manufacture Date	01/2008
Capacity (gal)	80
Set temp (F°)	145

Summary of Water Heater Sampling Water Quality Parameters

Loc ID: ADDRESS D
Address: Address D Sample
Date: 11/21/2023

	Pre-drain	Post-drain	Post-flush
Sample ID	D3-TW-[redacted]	D3-TW-[redacted]	D3-TW[redacted]
Sample time	9:30	10:00	10:40
PID (ppm)	0	0	0
Measured temp (F°)	79	78.3	91.8
Chlorine (mg/L)	0.57	0.74	0.59
Sheen/Particulates/Odor	None	None	A single “chunk” of yellow-orange particulate material. The field team inspected the chunk and said that it appeared to be made of plastic.

Zone D3 – Address C

Premise Plumbing Inspection and water heater sampling completed on November 21, 2023, between 1202 and 1345 by [redacted] and [redacted] of AECOM.

Summary of Water Heater Information

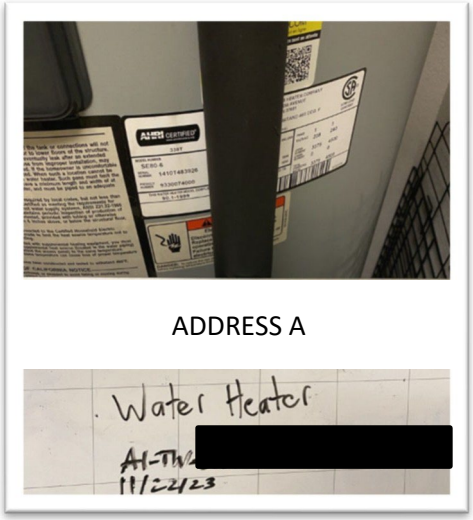
Loc ID	ADDRESS C
Address	Address C
Sample Date	11/21/2023
Make	Ruud
Model	RSPER-80-1
Serial No.	RU 0907R09569
Manufacture Date	09/2007
Capacity (gal)	80
Set temp (F°)	130

Summary of Water Heater Sampling Water Quality Parameters

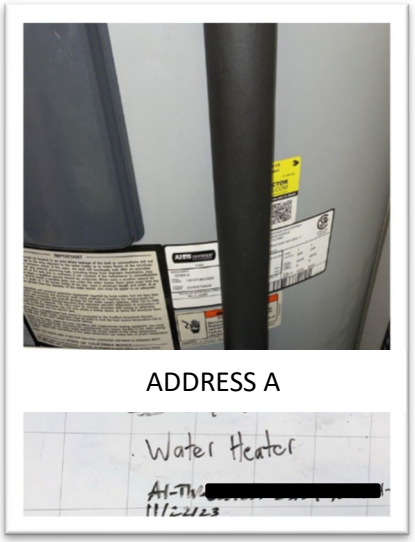
Loc ID: ADDRESS C
Address: Address C Sample
Date: 11/21/2023

	Pre-drain	Post-drain	Post-flush
Sample ID	D3-TW-[redacted]	D3-TW-[redacted]	D3-TW-[redacted]
Sample Time	12:15	12:45	13:30
PID (ppm)	0	0	0
Measured temp (F°)	103.5	105.4	79
Chlorine (mg/L)	0.41	0.43	0.47
Sheen/Particulates/Odor	None	None	None

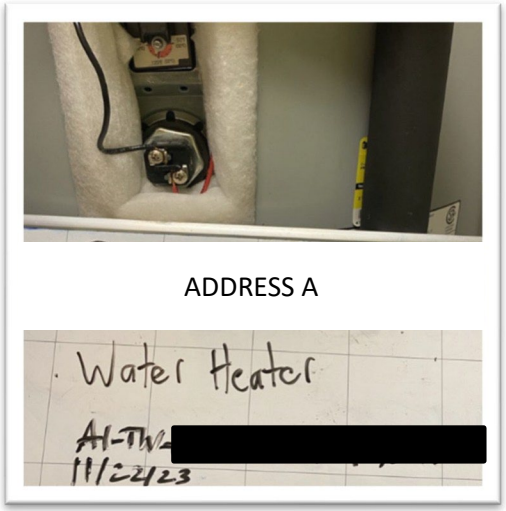
Loc ID: ADDRESS A
2023.11.21



2023.11.21 / ADDRESS A Water Heater

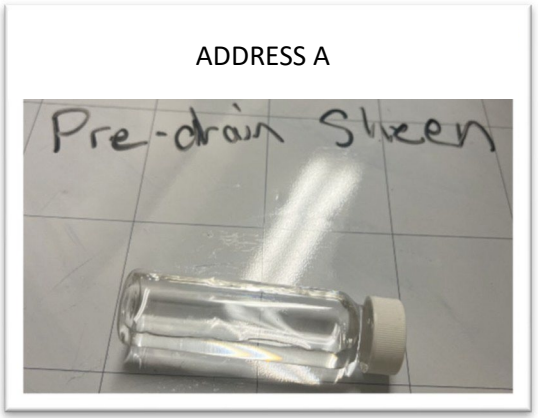


2023.11.21 / ADDRESS A Water Heater

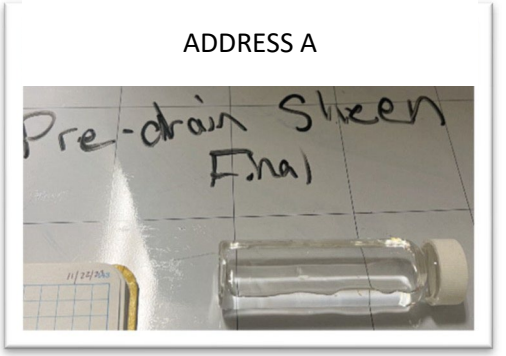


2023.11.21 / ADDRESS A Water Heater Thermostat

2023.11.21 / ADDRESS A Water Heater Valve

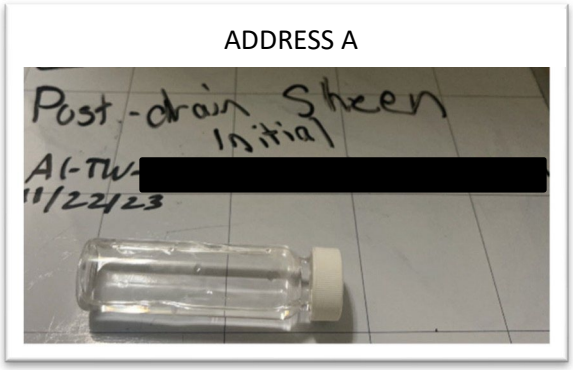


2023.11.21 / ADDRESS A Pre-drain Initial Sheen

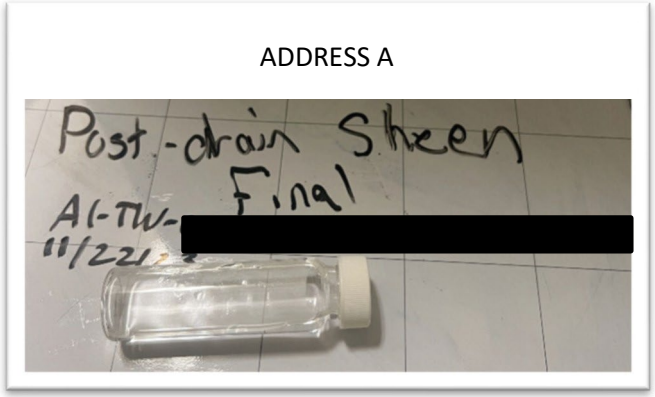


2023.11.21 / ADDRESS A Pre-drain Final Sheen

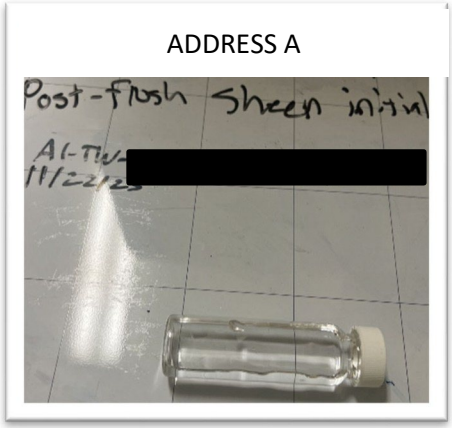
Loc ID: ADDRESS A
2023.11.21



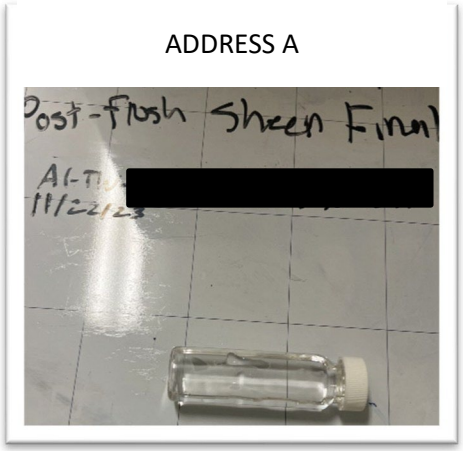
2023.11.21 / ADDRESS A Post-drain Initial Sheen



2023.11.21 / ADDRESS A Post-drain Final Sheen

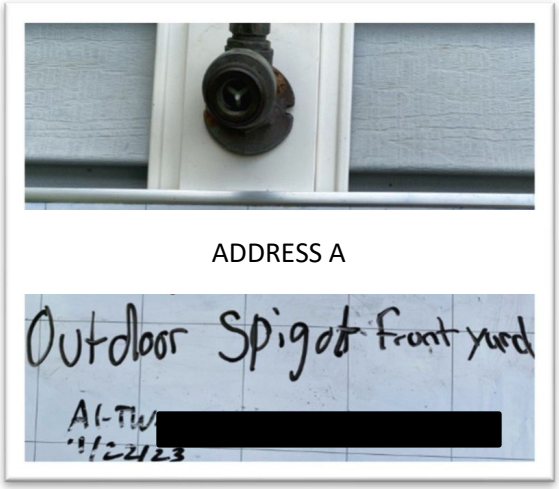


2023.11.21 / ADDRESS A Post Flush Initial Sheen



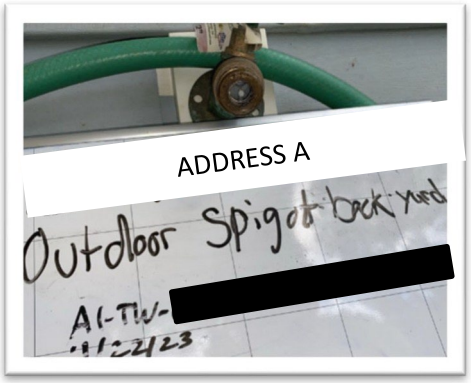
2023.11.21 / ADDRESS A Post Flush Final Sheen

2023.11.21 / ADDRESS A Outdoor Spigot Front Yard



2023.11.21 / ADDRESS A Outdoor Spigot Front Yard

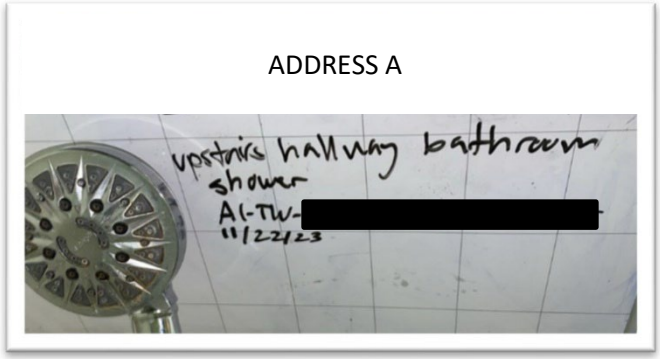
Loc ID: ADDRESS A
2023.11.21



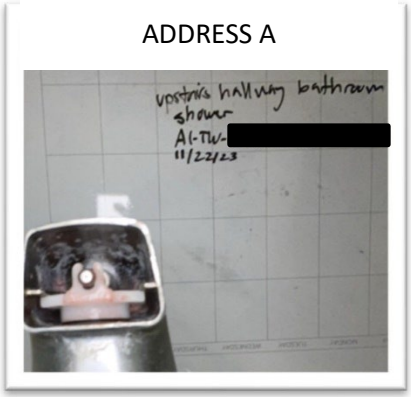
2023.11.21 / ADDRESS A Outdoor Spigot Back Yard

2023.11.21 / ADDRESS A Outdoor Spigot Back Yard

2023.11.21 / ADDRESS A Upstairs Hallway Bathroom Shower



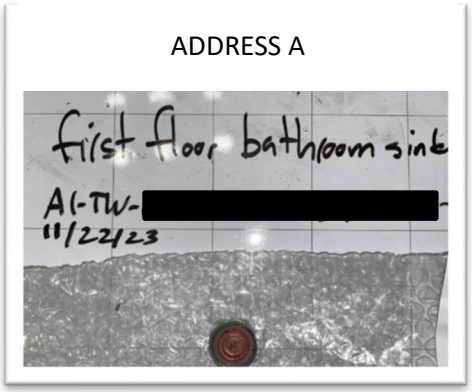
2023.11.21 / ADDRESS A Upstairs Hallway Bathroom Shower



2023.11.21 / ADDRESS A Upstairs Hallway Bathroom Shower

2023.11.21 / ADDRESS A Upstairs Hallway Bathroom Sink (inferred)

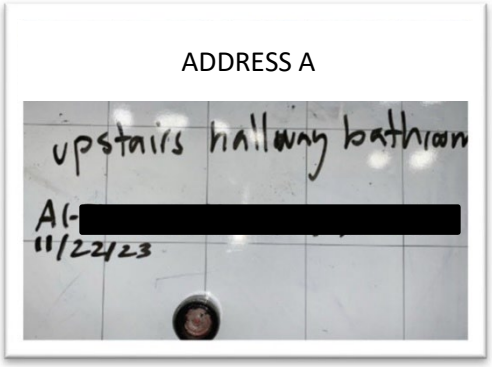
Loc ID: ADDRESS A
2023.11.21



2023.11.21/ ADDRESS A First Floor Bathroom Sink

2023.11.21/ ADDRESS A First Floor Bathroom Sink

2023.11.21 / ADDRESS A First Floor Bathroom Shower



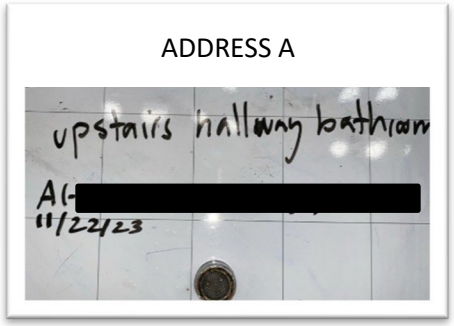
2023.11.21/ ADDRESS A Upstairs Bathroom Sink

2023.11.21/ ADDRESS A First Floor Bathroom Sink

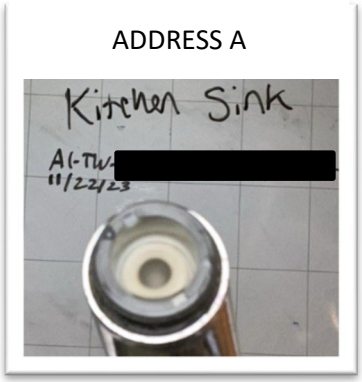
2023.11.21 / ADDRESS A Upstairs Bathroom Sink

Loc ID: ADDRESS A
2023.11.21

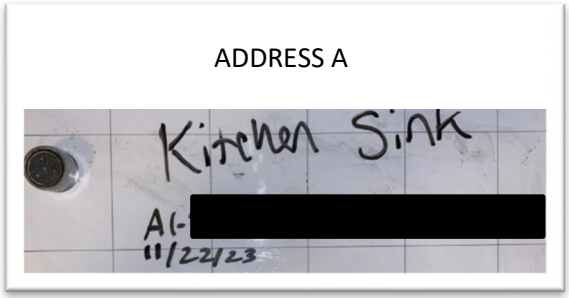
2023.11.21 / ADDRESS A Upstairs Hallway Bathroom



2023.11.21 / ADDRESS A Upstairs Hallway

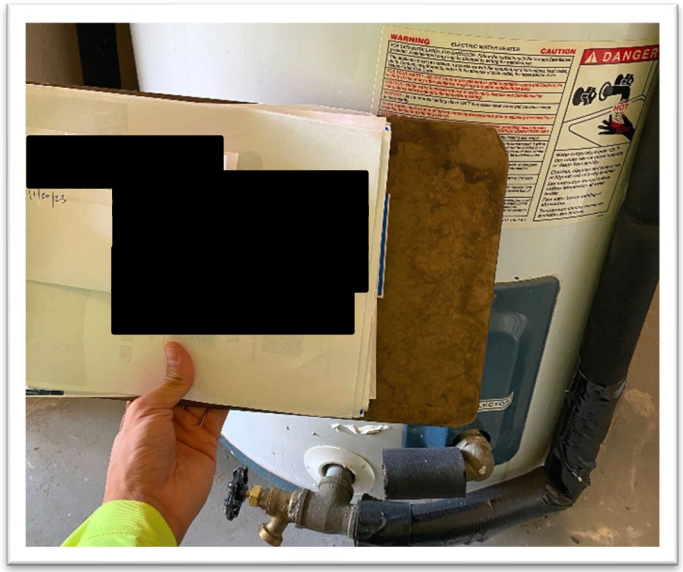


2023.11.21 / ADDRESS A Kitchen Sink



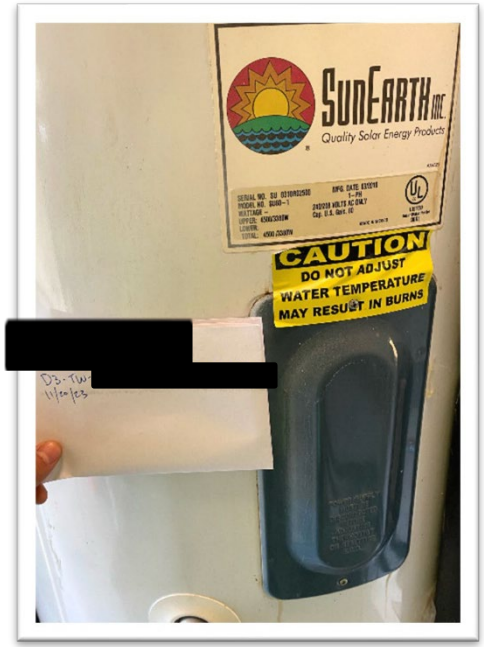
2023.11.21 / ADDRESS A Kitchen Sink

Loc ID: ADDRESS G
2023.11.20

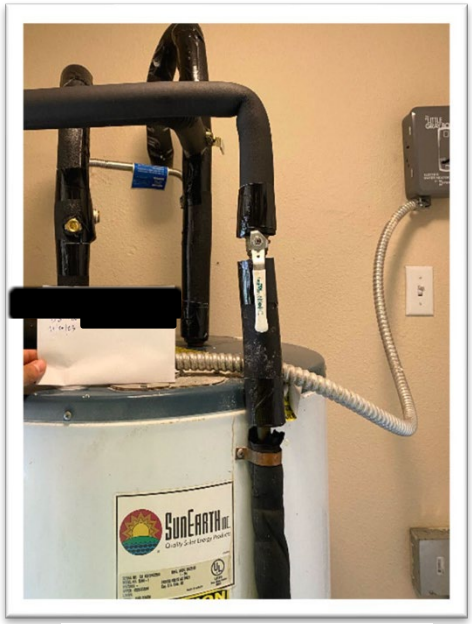


2023.11.20 / ADDRESS G
Water Heater

2023.11.20 / ADDRESS G
Water Heater Thermostat

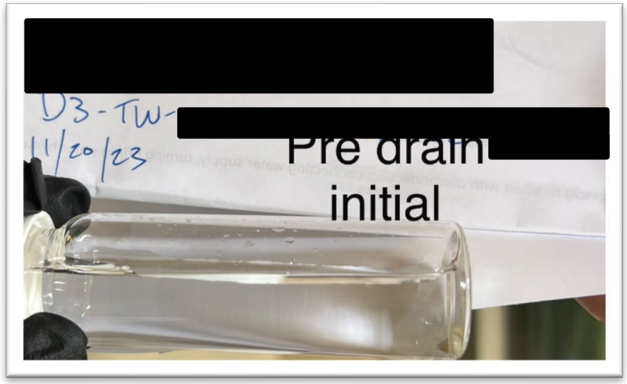


2023.11.20 / ADDRESS G
Water Heater



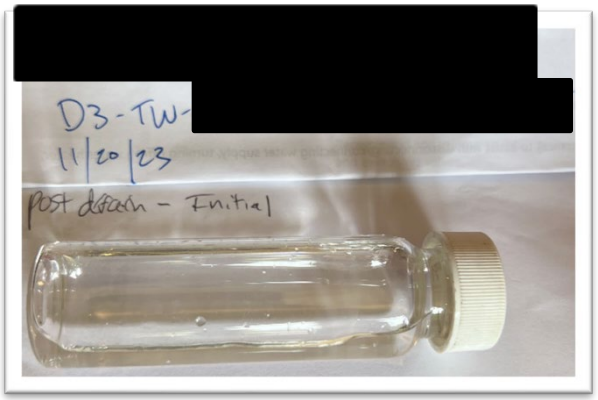
2023.11.20 / ADDRESS G
Water Heater

Loc ID: ADDRESS G
2023.11.20

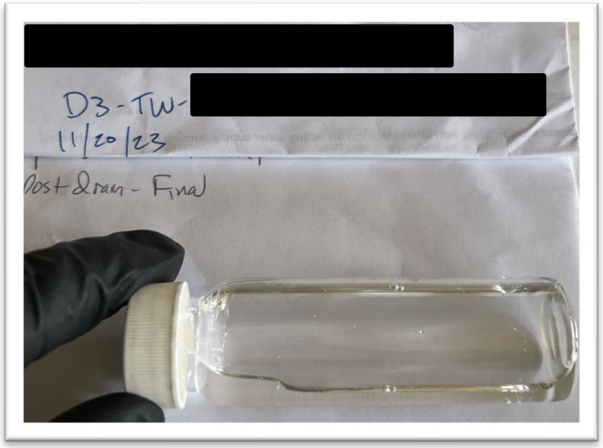


2023.11.20 / ADDRESS G
Pre-drain Initial Sheen

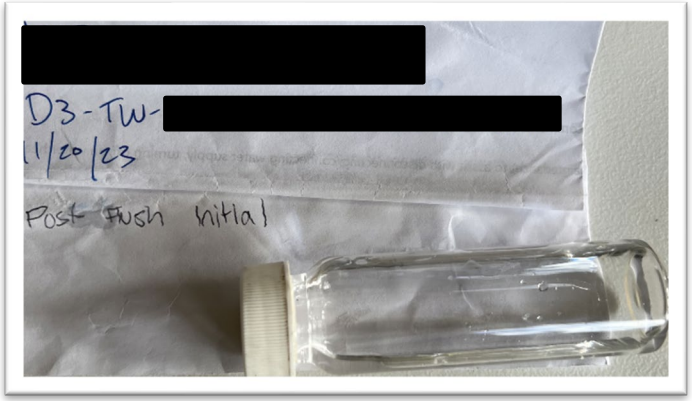
2023.11.20 / ADDRESS G
Pre-drain Final Sheen



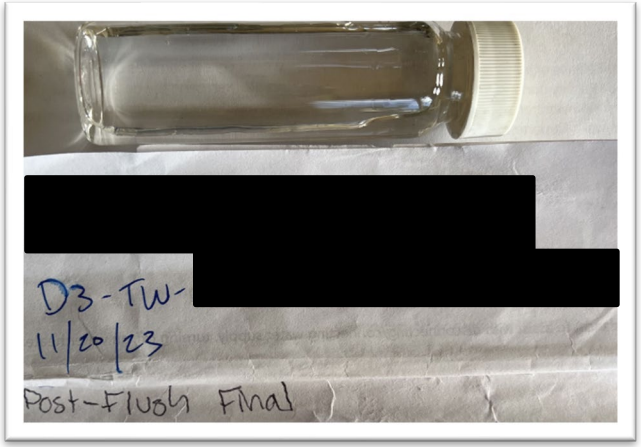
2023.11.20 / ADDRESS G
Post-drain Initial Sheen



2023.11.20 / ADDRESS G
Post-drain Final Sheen

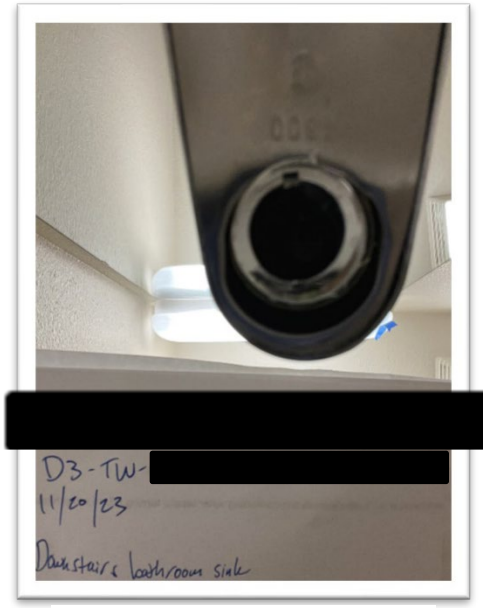


2023.11.20 / ADDRESS G
Post-flush Initial Sheen

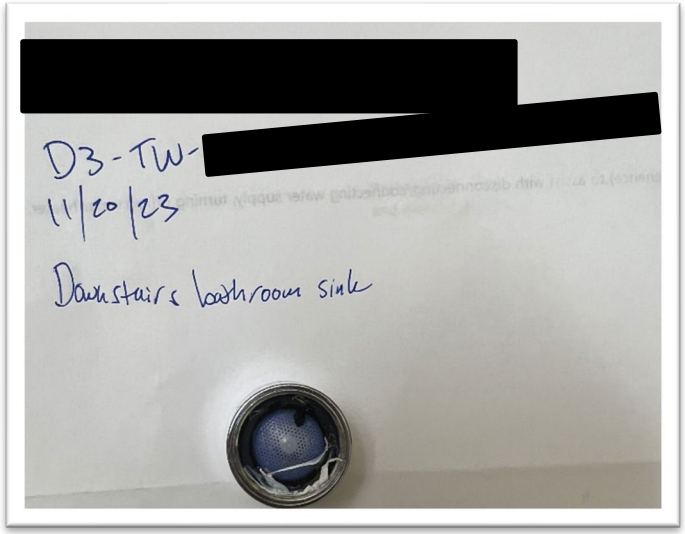


2023.11.20 / ADDRESS G
Post- flush Final Sheen

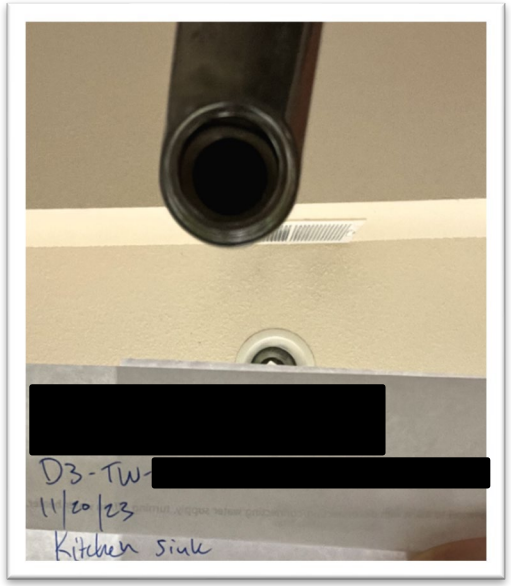
Loc ID: ADDRESS G
2023.11.21



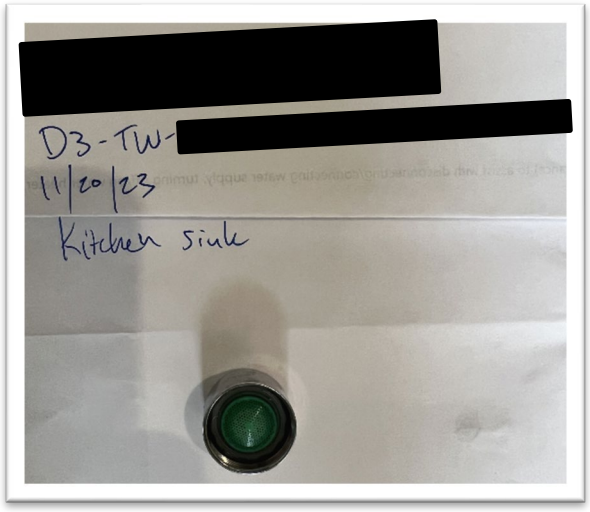
2023.11.20 / ADDRESS G
Downstairs bathroom sink



2023.11.20 / ADDRESS G
Downstairs bathroom sink

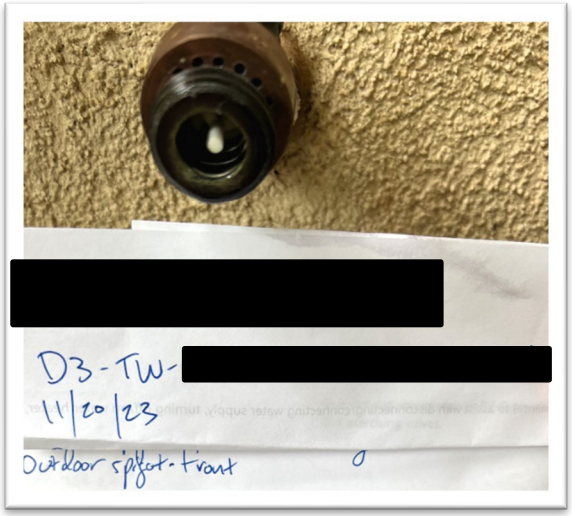


2023.11.20 / ADDRESS G
Kitchen sink



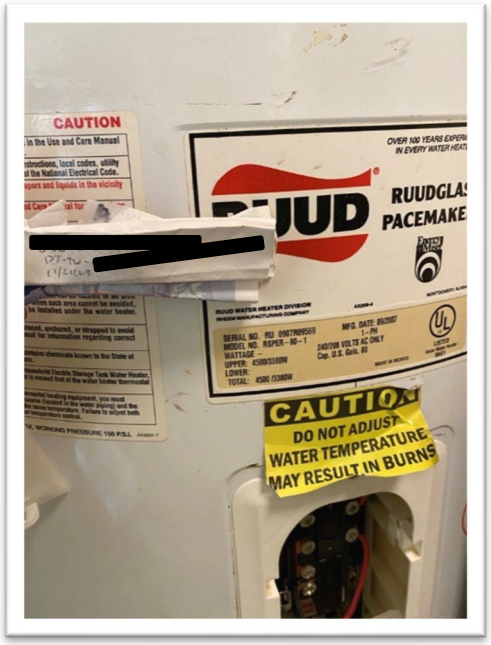
2023.11.20 / ADDRESS G
Kitchen sink

2023.11.20 / ADDRESS G
Outdoor spigot next to rear sliding door

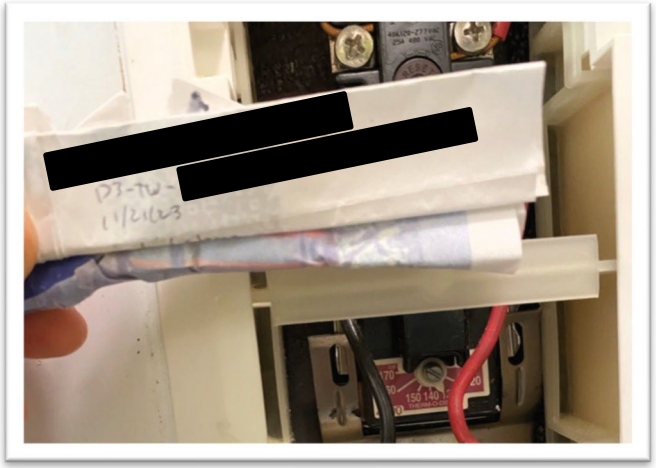


2023.11.20 / ADDRESS G
Outdoor spigot next to rear sliding door

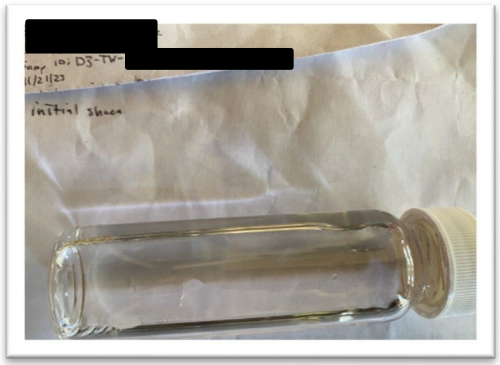
Loc ID: Address C
2023.11.21



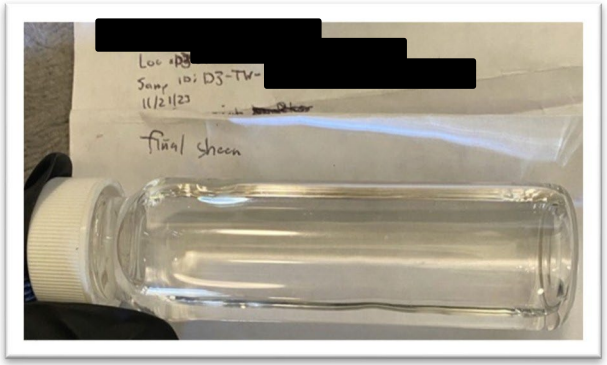
2023.11.21 / ADDRESS C Water Heater



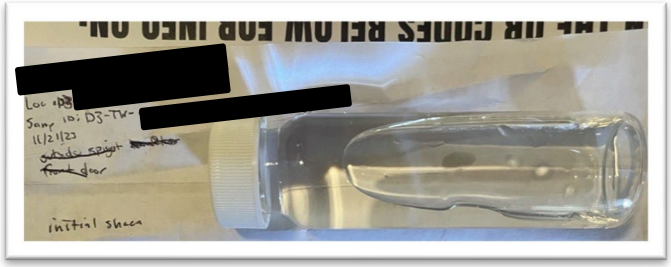
2023.11.21 / ADDRESS C Water Heater Thermostat



2023.11.21 / ADDRESS C Initial Sheen



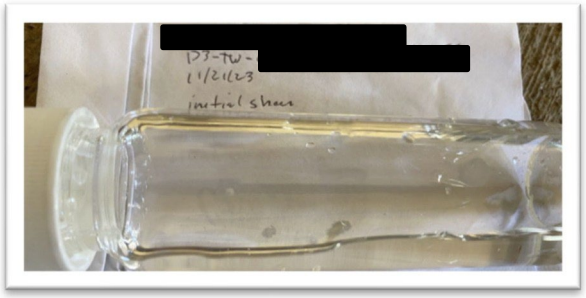
2023.11.21 / ADDRESS C Final Sheen



2023.11.21 / ADDRESS C Initial Sheen

Loc ID: Address C
2023.11.21

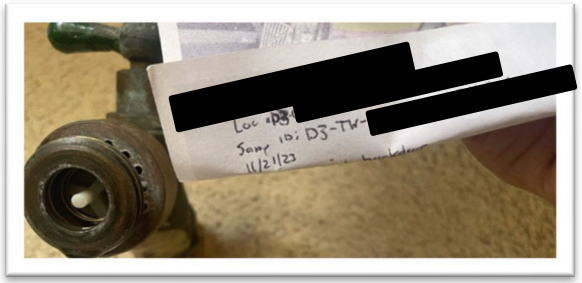
2023.11.21 / ADDRESS C Final Sheen



2023.11.21 / ADDRESS C Initial Sheen

2023.11.21 / ADDRESS C Final Sheen

2023.11.21 / ADDRESS C Outdoor Spigot Front Door

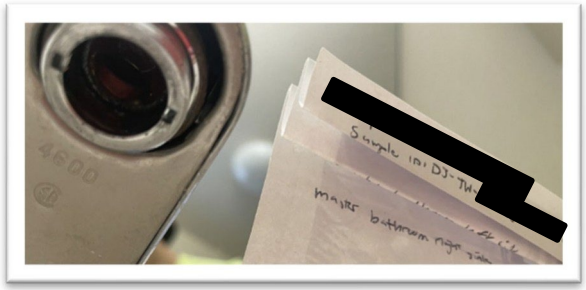


2023.11.21 / ADDRESS C Outdoor Spigot Back Door

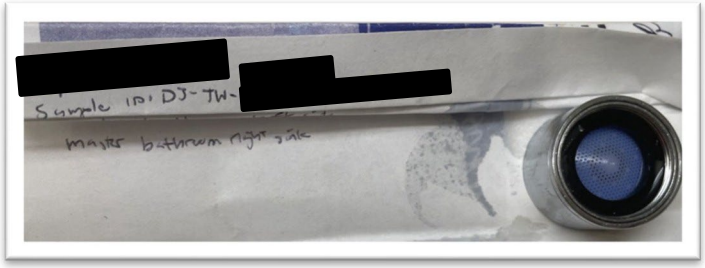
2023.11.21 / ADDRESS C Master Bathroom Shower

Loc ID: Address C
2023.11.21

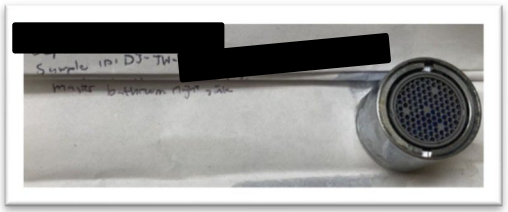
2023.11.21 / ADDRESS C Master Bathroom Shower



2023.11.21 / ADDRESS C Master Bathroom Right Sink



2023.11.21 / ADDRESS C Master Bathroom Right Sink

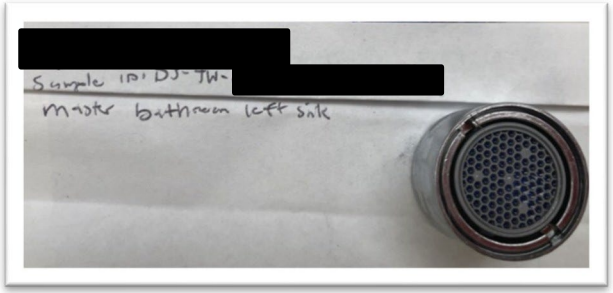


2023.11.21 / ADDRESS C Master Bathroom Right Sink

2023.11.21 / ADDRESS C Master Bathroom Left Sink

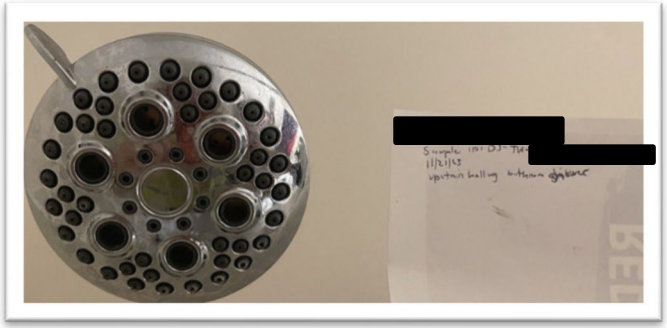
2023.11.21 / ADDRESS C Master Bathroom Left Sink

Loc ID: Address C
2023.11.21



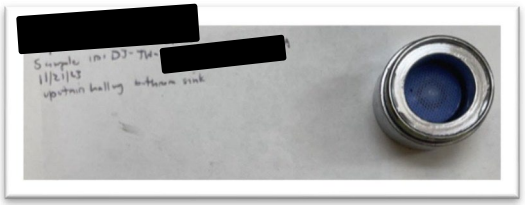
2023.11.21 / ADDRESS C Master Bathroom Left Sink

2023.11.21 / ADDRESS C Upstairs Hallway Bathroom Shower

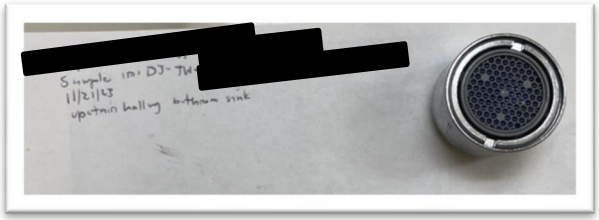


2023.11.21 / ADDRESS C Upstairs Hallway Bathroom Shower

2023.11.21 / ADDRESS C Upstairs Hallway Bathroom Sink



2023.11.21 / ADDRESS C Upstairs Hallway Bathroom Sink

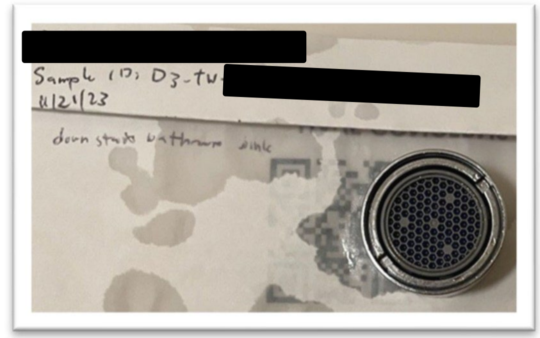


2023.11.21 / ADDRESS C Upstairs Hallway Bathroom Sink

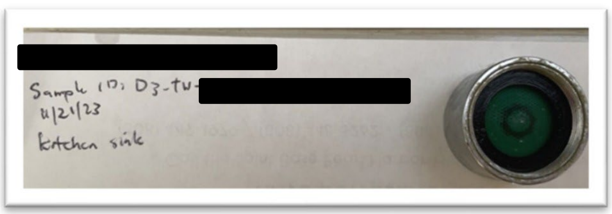
Loc ID: Address C
2023.11.21

2023.11.21 / ADDRESS C Downstairs Bathroom Sink

2023.11.21 / ADDRESS C Downstairs Bathroom Sink

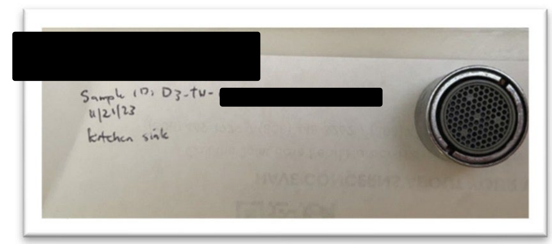


2023.11.21 / ADDRESS C Downstairs Bathroom Sink



2023.11.21 / ADDRESS C Downstairs Bathroom Sink

2023.11.21 / ADDRESS C Kitchen Sink



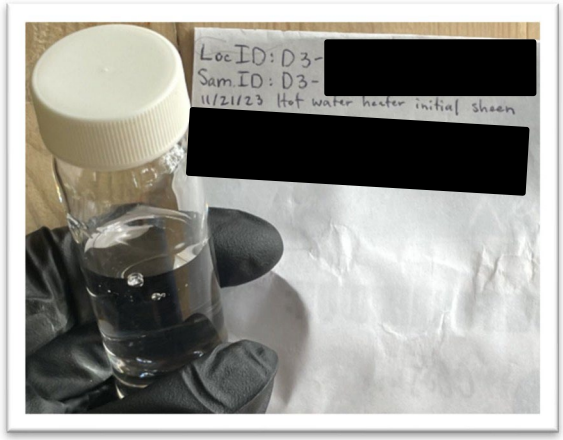
2023.11.21 / ADDRESS C Kitchen Sink

Loc ID: ADDRESS D
11.21.2023

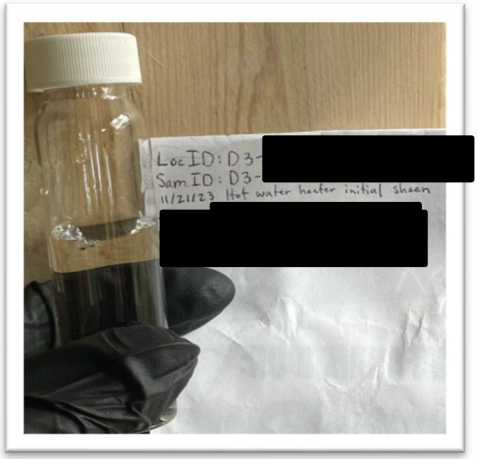
2023.11.21 / ADDRESS D Water Heater Label

2023.11.21 / ADDRESS D Water Heater Spigot

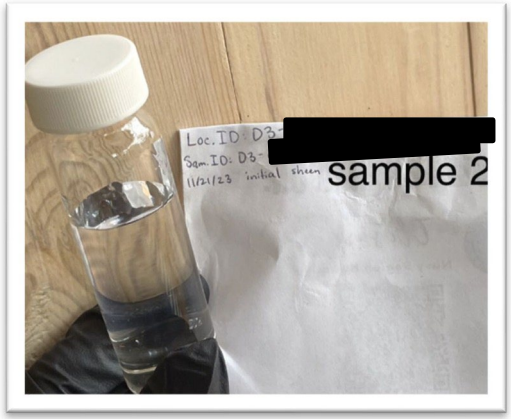
2023.11.21 / ADDRESS D Water Heater Thermostat reading



2023.11.21 / ADDRESS D Hot water heater initial sheen

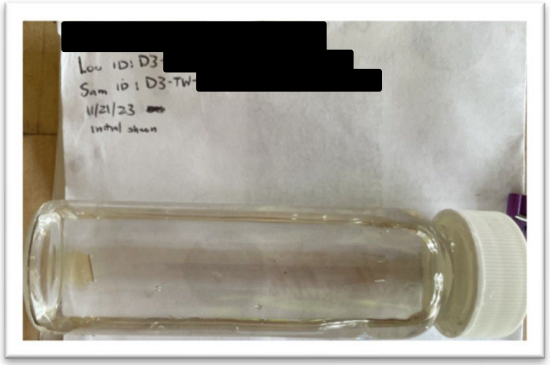


2023.11.21 / ADDRESS D Hot water heater initial sheen

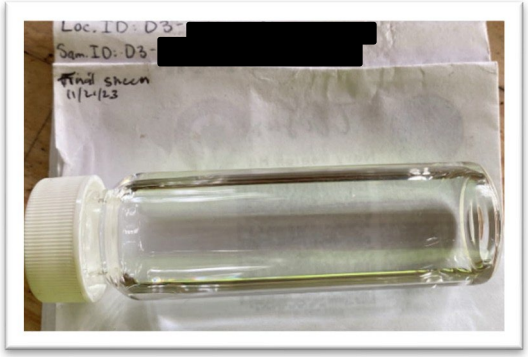


2023.11.21 / ADDRESS D Initial Sheen

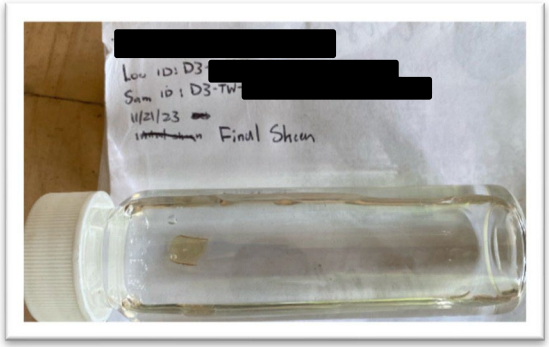
Loc ID: ADDRESS D
11.21.2023



2023.11.21 / ADDRESS D Initial Sheen

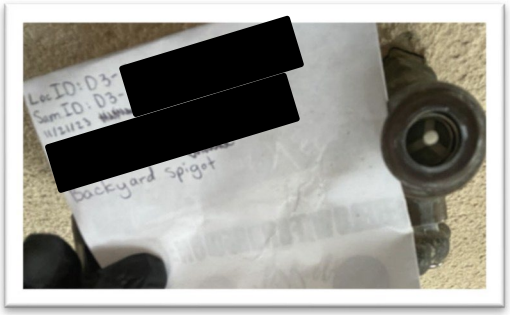


2023.11.21 / ADDRESS D Final Sheen

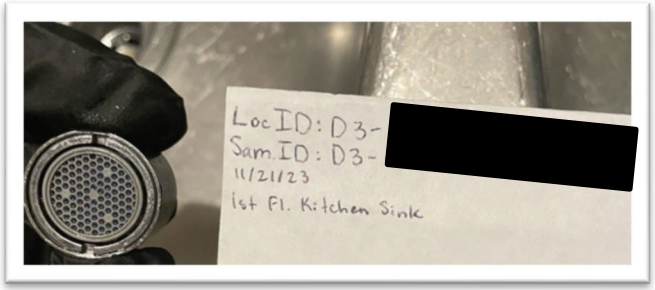


2023.11.21 / ADDRESS D Final Sheen

2023.11.21 / ADDRESS D Spigot Front Yard

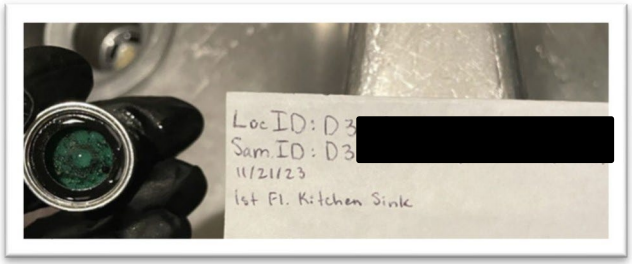


2023.11.21 / ADDRESS D Spigot Back Yard

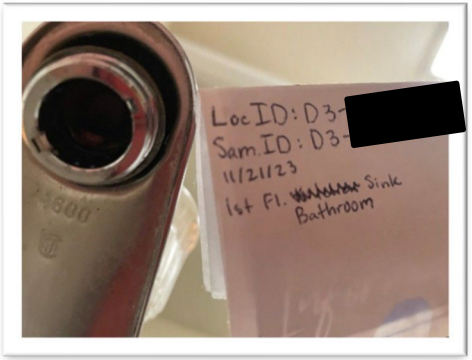


2023.11.21 / ADDRESS D 1st Fl. Kitchen Sink

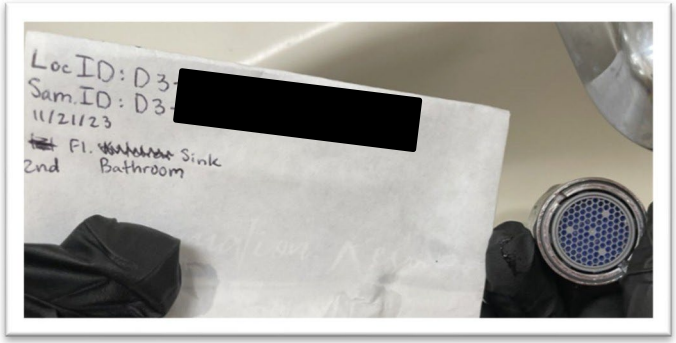
Loc ID: ADDRESS D
11.21.2023



2023.11.21 / ADDRESS D 1st Fl. Kitchen Sink

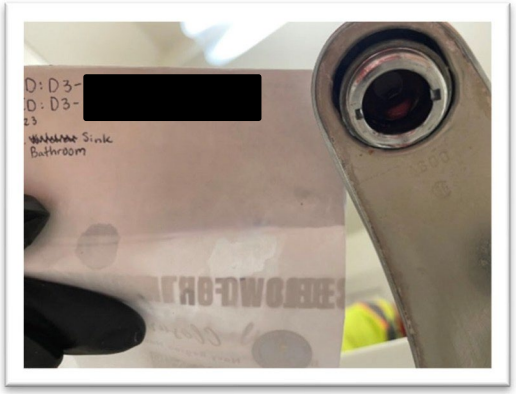


2023.11.21 / ADDRESS D 1st Fl. Bathroom Sink



2023.11.21 / ADDRESS D 2nd Fl. Bathroom Sink

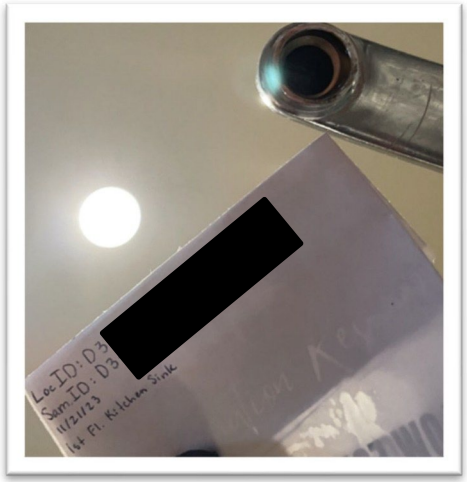
2023.11.21 / ADDRESS D 2nd Fl. Bathroom Sink



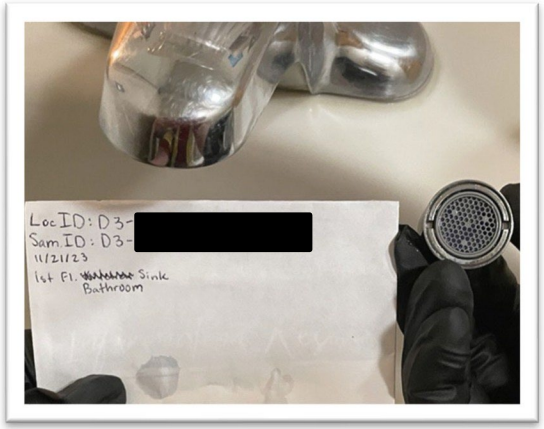
2023.11.21 / ADDRESS D Bathroom Sink

2023.11.21 / ADDRESS D Bathroom Shower

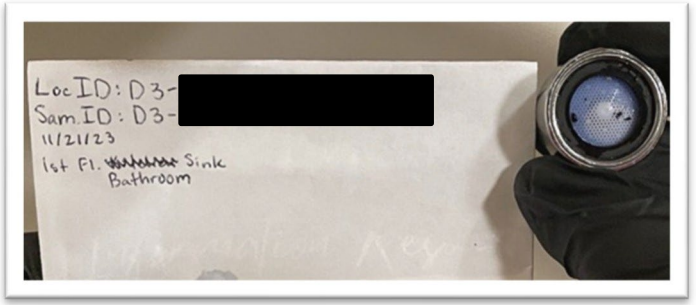
Loc ID: ADDRESS D
11.21.2023



2023.11.21 / ADDRESS D 1st Fl. Kitchen Sink



2023.11.21 / ADDRESS D 1st Fl. Bathroom Sink



2023.11.21 / ADDRESS D 1st Fl. Bathroom Sink

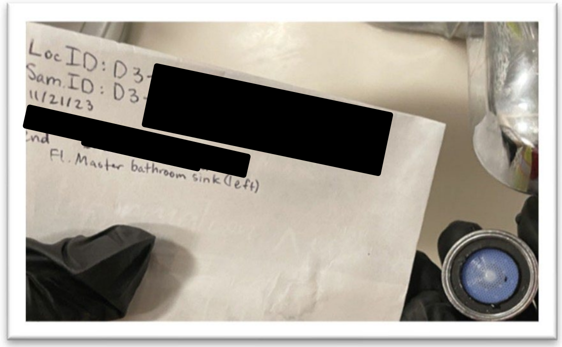
2023.11.21 / ADDRESS D 2nd Fl. Bathroom Shower

2023.11.21 / ADDRESS D 2nd Fl. Bathroom Shower

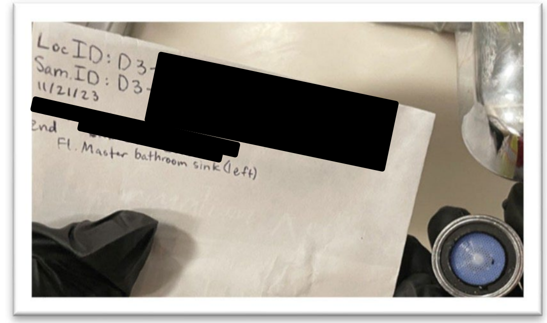
2023.11.21 / ADDRESS D Kitchen Sink Aerator

Loc ID: ADDRESS D
11.21.2023

2023.11.21 / ADDRESS D 2nd Fl. Master Bathroom Sink (left)

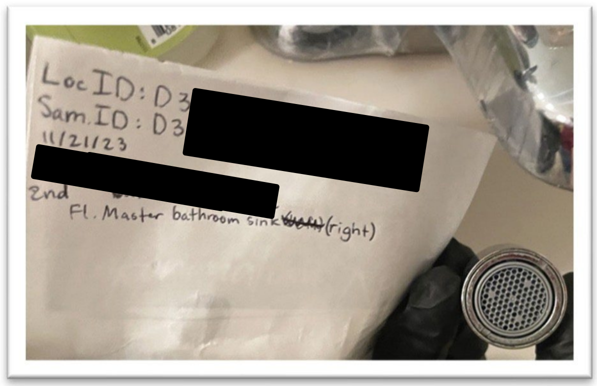


2023.11.21 / ADDRESS D 2nd Fl. Master Bathroom Sink (left)

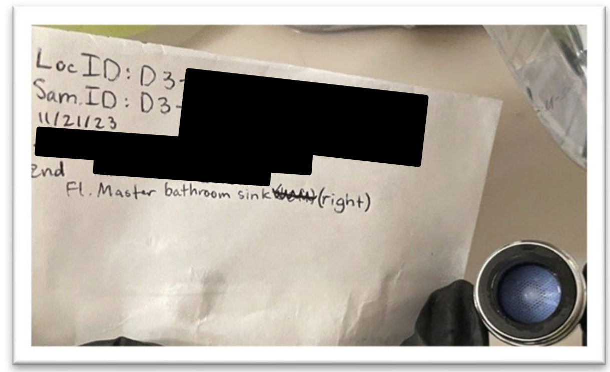


2023.11.21 / ADDRESS D 2nd Fl. Master Bathroom Sink (left)

2023.11.21 / ADDRESS D Bathroom Sink (left)

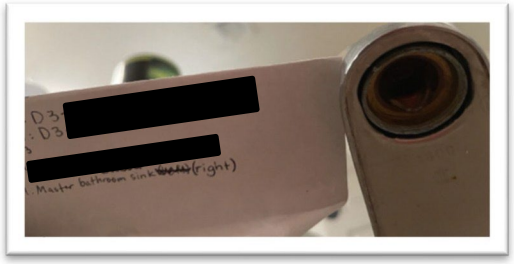


2023.11.21 / ADDRESS D 2nd Fl. Master Bathroom Sink (right)



2023.11.21 / ADDRESS D 2nd Fl. Master Bathroom Sink (right)

Loc ID: ADDRESS D
11.21.2023



2023.11.21 / ADDRESS D 2nd Fl. Master Bathroom Sink (right)

2023.11.21 / ADDRESS D 2nd Fl. Bathroom Shower

Appendix J

Premise Plumbing Sampling and Assessment Procedure

Premise Plumbing Investigation
JBPHH Drinking Water System

1- Research

- Review Housing water heater (WH) purchase/installation date and maintenance records (i.e. anode replacement)
- Identify home premise plumbing pipe material type
- Review premise and water distribution system for maintenance; for potential cross-contamination concerns

2- Flush Hot Water Heater

Observe, note & photograph water heater temperature before flushing

Record temperature with independent thermometer

Test, record chlorine level (cold, hot water)

Collect LTM, RRT sample for TPH analysis from first aliquot of WH water drained. Take picture and note whether sediment or film is present.

At end of drain, collect additional LTM sample for analysis from bottom valve

- Take picture and note whether sediment or film is present.
- Flush water heater 1-2 volumes IAW maintenance
- Take 1 additional LTM sample

3- Inspect Faucets/Shower Heads

Inspect faucets/shower heads for biological growth.

- Take picture and note whether film or biological material is present due to flushing and likely accumulation of debris causing a potential biofilm
- Clean and/or replace aerators, particularly post-flushing
- Inspect and flush exterior hose bibs, and note observations
- Discuss with resident to flush any fixtures that are not regularly used prior to use, and anytime they are away from home for few days

4- Conduct Trend Analysis of LTM Data

EOC Calls/Concerns versus LTM results by Zone

Residential TPH detects over time by period

TPH mean by LTM period

5- Review Results

If TPH results exceed ISP – replace water heater

- Flush home
- Collect LTM sample to validate

If biological growth found on showerhead or faucet, replace fixture

Start root cause analysis

6- Additional Samples

- Sample fire hydrants near sampled homes to compare TPH results
- Collect split-samples: sample vacant homes with dual samples and send to two labs for concurrent, independent analysis

Note: Additional water heater samples taken from recently vacated homes for comparison and reference to samples collected from occupied homes

Premise Plumbing Sampling Procedure

Scope – The purpose of this SOP is to ensure the sample collection and observation process is performed in a consistent manner.

Procedure:

- Water heater investigation.
  - Record site address.
  - Record water heater make, model, serial number, date of manufacture, and capacity.
  - Remove thermostat cover and record temperature setting.
  - Take photographs of water heater tank, drain valve, thermostat setting, and identification label.
- Plumbing fixture investigation.
  - Conduct visual inspection of all premise plumbing fixtures including all faucets, tub spout, showerhead, and outdoor spigots (i.e. hose bibs).
  - Remove and inspect all faucet aerators.
  - Visual inspect for evidence of mineral deposits and biological growth (i.e. biofilm formation).
  - Take photographs of fixtures and aerators.
- Discuss with residents about flushing fixtures for a period of time (e.g. five (5) minutes) before use if the fixture hasn't been used for a while (e.g. a week of stagnation).
- Prepare water heater for sampling.
  - Don appropriate personal protective equipment (Operational Safety and Health Administration Hazardous Waste Operations and Emergency Response Level D including eye protection and nitrile gloves. Refer to accident and prevention plan for complete list of required personal protective equipment).
  - Disconnect water and power supply (completed by maintenance).
  - Remove potential volatile sources from sampling area (e.g. soaps, aerosols, cleaning agents, air fresheners, etc.).
  - Place absorbent pads around water heater sampling spigot.
  - Open vent at top of water heater (completed by maintenance).
  - Test water pressure at spigot by slowly opening valve. Keep all body parts clear of area around spigot because the water may be scalding.
- Water heater sampling.
  - This procedure should be repeated for each water heater sample. Water heater draining and flushing to be conducted by maintenance. Sampling teams should coordinate with maintenance to ensure that

samples are collected at the appropriate stage of draining and flushing.

- Pre-drain sample - conducted prior to draining the water heater.
- Post-drain sample - conducted prior to the completion of draining the water heater.
- Post-flush sample - conducted following the completion of water heater flushing.

- Use a calibrated photoionization detector to collect a photoionization detector reading in the vicinity of the drinking water sampling point (within 2 feet) and record results in the logbook.
- Use a clear 40 milliliter (mL) volatile organic analyte vial to collect a visual sample. Record initial visual observations including presence of sheen, particulates, and biological growth. Allow visual sample to sit undisturbed for at least five minutes before making a final visual observation.
- Using Hach colorimeter, collect a free chlorine measurement.
- Refer to "Drinking Water Sample Collection SOP, Part A - Headspace, Sheen Observation and Free Chlorine" for additional details.
- Use an empty 250 mL glass jar to collect temperature reading with a temperature probe. Record reading in logbook.
- Begin collecting analytical sample for total petroleum hydrocarbons only. Refer to "Drinking Water Sample Collection SOP, Part B – Sample Collection" for additional details.

    - Collect bottleware for United States Environmental Protection Agency Method 8015 total petroleum hydrocarbons-gasoline.Collect bottleware for United States Environmental Protection Agency Method 8015 total petroleum hydrocarbons-diesel/oil. If 1 L amber bottleware cannot fit beneath sample point, an unused clean 250 mL bottle can be used to transfer the sample to a 1 L bottle. The transfer bottle must be discarded after use.

Appendix K

Summary of Fire Hydrant and Split Drinking Water Sample Results

Summary of Fire Hydrant and Split Drinking Water Samples

Address	Sampling Date	Initial RRT Results	TPH-d (ppb)	TPH-g (ppb)	TPH-o (ppb)	Total TPH (ppb)
Address A - Hydrant [redacted]	12/18/2023	ND	86.4	ND	ND	86.4
Address A - Hydrant [redacted]	12/18/2023	ND	99.8	ND	ND	99.8
Address B - Hydrant [redacted]	12/20/2023	ND	53.8	ND	ND	53.8
Address B - Hydrant [redacted]	12/20/2023	ND	52.8	ND	ND	52.8
Address C - Hydrant [redacted]	12/15/2023	ND	55.9	ND	ND	55.9
Address C - Hydrant [redacted]	12/15/2023	ND	59	ND	ND	59
Address D - Hydrant [redacted]	12/15/2023	TPH-DRO	58.1	ND	ND	58.1
	12/16/2023[1]	ND	N/A	N/A	N/A	N/A
Address D - Hydrant [redacted]	12/15/2023	ND	62.8	ND	ND	62.8
Address E - Hydrant [redacted]	12/21/2023	ND	72.9	ND	ND	72.9
Address E – Hydrant [redacted]	12/21/2023	ND	ND	ND	ND	ND
Address F – Hydrant [redacted]	12/21/2023	ND	70.5	ND	ND	ND
Address F – Hydrant [redacted]	12/21/2023	ND	52.3	ND	ND	52.3
Address G - Hydrant [redacted]	12/15/2023	ND	57.6	ND	ND	57.6
Address G - Hydrant [redacted]	12/15/2023	ND	ND	ND	ND	ND
Address H - Hydrant [redacted]	12/20/2023	ND	68.2	ND	ND	68.2
Address H - Hydrant [redacted]	12/20/2023	ND	78	ND	ND	78
Address I - Hydrant [redacted]	12/19/2023	ND	88	ND	55.9	143.9
Address I - Hydrant [redacted]	12/19/2023	ND	64.6	ND	ND	64.6
Address J - Hydrant [redacted]	12/19/2023	ND	89	ND	ND	89
Address J - Hydrant [redacted]	12/19/2023	ND	ND	ND	ND	ND
Address K - Hydrant [redacted]	12/21/2023	ND	64.8	ND	ND	64.8
Address K - Hydrant [redacted]	12/21/2023	ND	69.1	ND	ND	69.1
Address L - Hydrant [redacted]	12/20/2023	ND	58.2	ND	ND	58.2
Address L - Hydrant [redacted]	12/20/2023	ND	50.5	ND	ND	50.5

Split Drinking Water Sampling

			TPH-d (ppb)				TPH-g (ppb)				TPH-o (ppb)				Total TPH (ppb)			
			SGS Sample #1	Eurofins Sample #1	SGS Sample #2	Eurofins Sample #2	SGS Sample #1	Eurofins Sample #1	SGS Sample #2	Eurofins Sample #2	SGS Sample #1	Eurofins Sample #1	SGS Sample #2	Eurofins Sample #2	SGS Sample #1	Eurofins Sample #1	SGS Sample #2	Eurofins Sample #2
Address I	12/27/2023	N/A	88.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	88.3	ND	ND	ND
Address K	12/27/2023	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

[1] RRT DRO detection on 15Dec23. Hydrant flushed on 16Dec23 and repeat RRT sample collected. Lubricant observed on the hydrant threads during initial sampling event.

Appendix L

AECOM Technical Memorandum for LTM TPH Samples

AECOM
1001 Bishop Street
Suite 1600
Honolulu, HI 96813
www.aecom.com

February 23, 2024

NAVFAC Hawaii
400 Marshall Road
JBPHH HI 96860-3139

Subject: **Red Hill Bulk Fuel Storage Facility**
LTM TPH Detection Results
Collection Dates: 10/25/23, 10/20/23, 11/03/23

Attention [redacted]

The table below summarizes the original (TPH-d/DRO)-diesel range organics slightly below the DOH proposed threshold of 91 µg/L for these analytes. No detections were reported for the oil range organics (TPH-o/ORO).

SDG	Laboratory Sample ID	Field Sample ID	Location	Analyte	Result	Units
DA59608	DA59608-1	D3-[redacted]	Address D	DRO (C10-C24)	65.9	µg/L
DA59502	DA59502-2	D3-[redacted]	Address D	DRO (C10-C24)	56.0	µg/L
DA59503	DA59503-1	D2-[redacted]	Address B	DRO (C10-C24)	50.2	µg/L
DA59504	DA59504-1	A1-[redacted]	Address A	DRO (C10-C24)	71.2	µg/L

µg/L micrograms per liter

The chromatographic data were reviewed to determine if the DRO result could be qualitatively attributed to Jet Propellant 5 (JP-5) or any other common fuel products in the field samples. AECOM has concluded none of the DRO detections can be attributed to JP-5 or any fuel based on the chromatographic patterns, and moreover that none of the reported DRO results can be reliably attributed the drinking water field samples because they are not significantly different than the associated laboratory method blanks. The procedures used by AECOM to review the chromatograms is detailed in, *"Chromatographic Interpretation of Diesel Range Organics (DRO) and Oil Range Organics (ORO) Detections, Drinking Water Long-Term Monitoring,"* which is provided as Attachment 1 to this document.

Method blank detections are evaluated during data validation in accordance with DoD Data Validation Guidelines. Only method blank detections above the method detection limit (MDL) of 50 µg/L are reported by the laboratory and evaluated during validation. Detections below this level are considered not detected (ND) and the values are not reported by the laboratory. These data are only available upon inspection of raw data. If reportable concentrations were observed in the method blank, any associated sample result less than the reporting limit (RL) would be qualified as undetected (U) at the sample specific RL of approximately 80 µg/L. For example, if DRO was reported in the method blank at 55 µg/L and in an associated sample at 68 µg/L the validated result would be reported as 80 U (the RL may vary slightly depending on the initial sample volume). Sample results above the RL, but less than five times the blank concentration would be flagged as estimated, biased high (J+). Sample results greater than five times the blank concentration would be accepted without qualification. The following table summarizes the concentrations of DRO in the associated method blanks as reported in the raw data. As noted above, the laboratory reports all results below the MDL of 50 µg/L as ND. If it were allowable (under the validation guidelines) to consider the method blank results associated with these samples all of the results would have been qualified as undetected (U) during validation.

[redacted]

Laboratory Sample ID	Field Sample ID	Method Blank ID	Analyte	Sample Result (µg/L)	Method Blank Result (µg/L)
DA59608-1	D3-TW-[redacted]	OP24553	DRO (C10-C24)	65.9	45.9
DA59502-2	D3-TW-[redacted]	OP24535	DRO (C10-C24)	56.0	49.4
DA59503-1	D2-TW-[redacted]	OP24535	DRO (C10-C24)	50.2	49.4
DA59504-1	A1-TW-[redacted]	OP24535	DRO (C10-C24)	71.2	49.4

µg/L micrograms per liter

The attached file *DA59608-1 from DA59608 jbphh_048990* (Attachment 2) includes the DRO/ORO quantitation report and chromatograms for laboratory sample ID DA59608-1 = field sample D3-TW-[redacted] on pages 1028-1031 of SGS-Wheat Ridge report DA59608 Level 4. Note the quantitation reports provide on-column results whereas the final results in the table above have been corrected for sample volume. The chromatogram exhibits small peaks in the DRO range. A very similar pattern was observed in other TPH samples from this batch and in the associated method blank. The DRO method blank concentration was only slightly less than the sample result, but because the blank concentration was below the MDL, it could not be used to qualify the sample result. The associated method blank quantitation report and chromatogram are provided in the attached file *op24553-mb from DA59608 jbphh_048990-2* (Attachment 3). Given that the sample DRO result was only slightly higher than the blank result, and that the pattern was present in all the other batch samples, the sample results cannot be reliably attributed to the field sample. The pattern in this and other batch samples does not resemble JP-5 fuel or any other common petroleum product, but appears to be due to laboratory contamination. An example JP-5 chromatogram is provided in the attached file *JP-5 from DA59608 jbphh_048990-3* (Attachment 4) for purposes of comparison to the sample pattern. The n-alkanes in JP-5 are labeled red by carbon number.

The attached file *DA59502-2 from DA59502 jbphh_048822* (Attachment 5) includes the DRO/ORO quantitation report and chromatograms for laboratory sample ID DA59502-2 = field sample ID D3-TW-[redacted] on pages 946-949 of SGS-Wheat Ridge report DA59502-2 Level 4. Note the quantitation reports provide on-column results whereas the final results in the table above have been corrected for sample volume. The chromatogram exhibits small peaks in the DRO range. Note the on-column concentrations calculated in this quantitation report are only 19% higher the values in the associated method blank for DRO, therefore the sample results cannot be reliably attributed to the field sample, even though the method blank result was below the MDL. The associated method blank quantitation report and chromatogram are provided in the attached file *op24535-mb from DA59502 jbphh_048822-2* (Attachment 6). No discrete n-alkane peaks are present in the sample chromatogram and the pattern does not resemble JP-5 fuel or any other common petroleum product. An example JP-5 chromatogram is provided in the attached file *JP-5 from DA59502 jbphh_048822-4* (Attachment 7) for comparison. The n-alkanes in JP-5 are labeled red by carbon number.

The attached file *DA59503-1 from DA59503 jbphh_048824* (Attachment 8) includes the DRO/ORO quantitation report and chromatograms for laboratory sample ID DA59503-1 = field sample ID D2-TW-[redacted] on pages 918-921 of SGS-Wheat Ridge report DA59503 Level 4. Note the quantitation reports provide on-column results whereas the final results in the table above have been corrected for sample volume. The chromatogram exhibits small peaks in the DRO range. The on-column concentrations in this sample quantitation report are only 7% higher than those in the associated method blank, therefore the sample results cannot be reliably attributed to the field sample, even though the method blank result was below the MDL. The associated method blank quantitation report and chromatogram are provided in the attached file *op24535-mb from DA59502 jbphh_048822-2* (Attachment 6). The sample pattern resembles the associated method blank. No discrete n-alkane peaks are present in the chromatogram and the pattern does not resemble JP-5 fuel or any other common petroleum product. See Attachment 7 for an example JP-5 chromatogram. The n-alkanes in JP-5 are labeled red by carbon number.

The attached file *DA59504-1 from DA59504 jbphh_048826* (Attachment 9) includes the DRO/ORO quantitation report and chromatograms for laboratory sample ID DA59504-1 = field sample ID A1-TW-[redacted] on pages 918-921 of SGS-Wheat Ridge report DA59504 Level 4. Note the quantitation reports provide on-column results whereas the final results in the table above have been corrected for sample volume. The chromatogram exhibits small peaks in the DRO range. The on-column concentrations in this sample quantitation report are only 51% higher than those in the associated method blank, therefore the sample results cannot be reliably attributed to the field sample, even though the method blank result was below the MDL. The associated method blank

[redacted]

quantitation report and chromatogram are provided in the attached file *op24535-mb from DA59502 jbphh_048822-2* (Attachment 6). The sample pattern resembles the associated method blank. No discrete n-alkane peaks are present in the chromatogram and the pattern does not resemble JP-5 fuel or any other common petroleum product. See Attachment 7 for an example JP-5 chromatogram. The n-alkanes in JP-5 are labeled red by carbon number.

AECOM has evaluated these positive TPH detections based on objectives driven by the DOH proposed threshold of 91µg/L. AECOM has concluded that none of the reported DRO results can be reliably attributed the drinking water field samples because they are not significantly different than the associated laboratory method blanks. Furthermore, the observed chromatographic peaks do not exhibit patterns associated with JP-5 or any other common petroleum product.

In conclusion, the organic compounds reported as TPH-DRO in the samples described above:

- appear to be due to possible laboratory artifacts, as indicated by the method blanks; and
- are not attributable to JP-5 or any other common petroleum products.

Questions regarding this letter should be addressed to [redacted] at [redacted].

Yours sincerely,

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Attachments

Attachment 1: *Procedure for Chromatographic Interpretation*
Attachment 2: *DA59608-1 from DA59608 jbphh_048990*
Attachment *3: op24553-mb from DA59608 jbphh_048990-2*
Attachment 4: *JP-5 from DA59608 jbphh_048990-3*
Attachment 5: *DA59502-2 from DA59502 jbphh_048822*
Attachment 6: *op24535-mb from DA59502 jbphh_048822-2*
Attachment 7: *JP-5 from DA59502 jbphh_048822-4*
Attachment 8: *DA59503-1 from DA59503 jbphh_048824*
Attachment 9: *DA59504-1 from DA59504 jbphh_048826*

cc: [redacted], NAVFAC

[redacted]

Attachment 1:

Procedure for Chromatographic Interpretation

Chromatographic Interpretation of
Diesel Range Organics (DRO) and Oil Range Organics (ORO) Detections
Drinking Water Long-Term Monitoring

Procedure followed when a sample result is greater than 100 ug/L for individual TPH component or greater than 200 ug/L for Total TPH

Gather the following chromatograms from the sample data package:

1) Sample of interest (with quantitation report)
2) Method blank (with quantitation report)
3) Retention time (RT) marker standard
4) JP-5 standard
5) DRO (Diesel Fuel #2) and ORO (Motor Oil) calibration standards

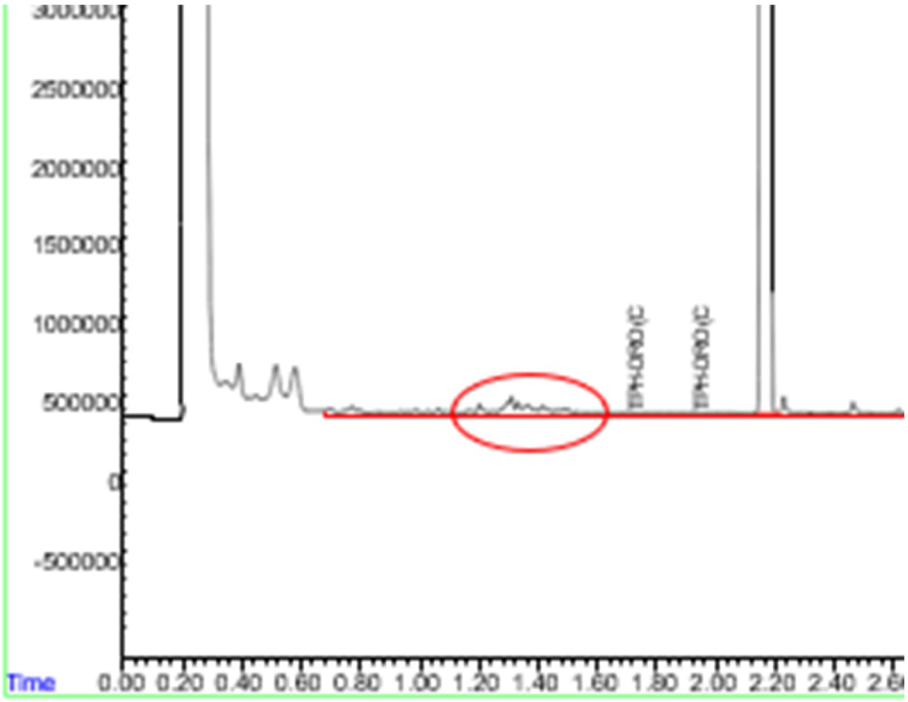
The RT marker, JP-5, DRO, and ORO standards must be analyzed in the same analytical batch as the samples in order to ensure comparability. An analytical batch refers to a group of samples that are analyzed on the same day on the same instrument, under the same operating conditions, and quantitated using the same calibration curve. An analytical batch may include samples from multiple preparation batches. A preparation batch is a group of samples that are prepared together and include a method blank, and blank spike containing known concentrations of the DRO and ORO standards.

Comparison with JP-5, DRO, and ORO Standards

1) Label the carbon numbers of the prominent n-alkanes in the JP-5 and Diesel Fuel #2 standards, using the RT standard provided in the data package as a guide. The laboratory uses fresh JP-5 and Diesel Fuel #2 standards.
2) Examine the sample chromatogram in the RT window corresponding to the first and last n-alkanes identified in the JP-5 and Diesel Fuel standards (C-10 to C-20).
    a. If the RTs of any of the peaks correspond to the n-alkanes identified in either of the standards, label them with the appropriate carbon numbers.
    b. Make note of which alkanes may be present based on RT and those which seem to be missing, e.g., C-12 RT match; no evidence of C-10, C-11, C-13 through C-20.
    c. If none of the n-alkanes are present, it is unlikely that observed peaks are fuel related, particularly if they are not present in a Gaussian shape with an unresolved complex mixture (UCM). If a fuel related hydrocarbon mixture is present, the largest peaks in a given region would be the n-alkanes. Note weathered fuels may have reduced n-alkane abundance, but the UCM hump under the n-alkanes should always be present.
    d. If suspected fuel patterns are identified, the sample data review should be escalated to a forensic specialist. Additional reanalyses at a forensic laboratory may be required.
3) Although JP-5 components do not extend into the ORO range of >C-24 – C-40, compare all peaks in the sample chromatogram with the RTs of the n-alkanes. Discrete peaks are not as evident in the Motor Oil standard, so the RTs from the retention time standard are used as a guide.

Comparison with Method Blank (MB)

1) Review the MB quantitation report to determine if DRO and/or ORO were detected. The quantitation report will include detections that are below the MDL and reported as non-detect by the laboratory as well as concentrations above the MDL that are reported by the laboratory.
2) Compare the concentration of the MB to the samples. Sample results that are within two to three times the concentration in the MB <u>may</u> be entirely attributable to batch contamination. The possibility exists that whatever is present in the MB may also be in the sample so it is important to consider relative concentrations.
3) Review the MB chromatogram, looking for peaks eluting in the same retention time range as the standards.
    a. If the RTs of any of the peaks correspond to the n-alkanes identified in the reference standards, label the carbon numbers.
    b. Look for distinguishable peak patterns. For example, many method blanks have been found to contain the following grouping of peaks falling roughly between 1.04 and 1.56 minutes.

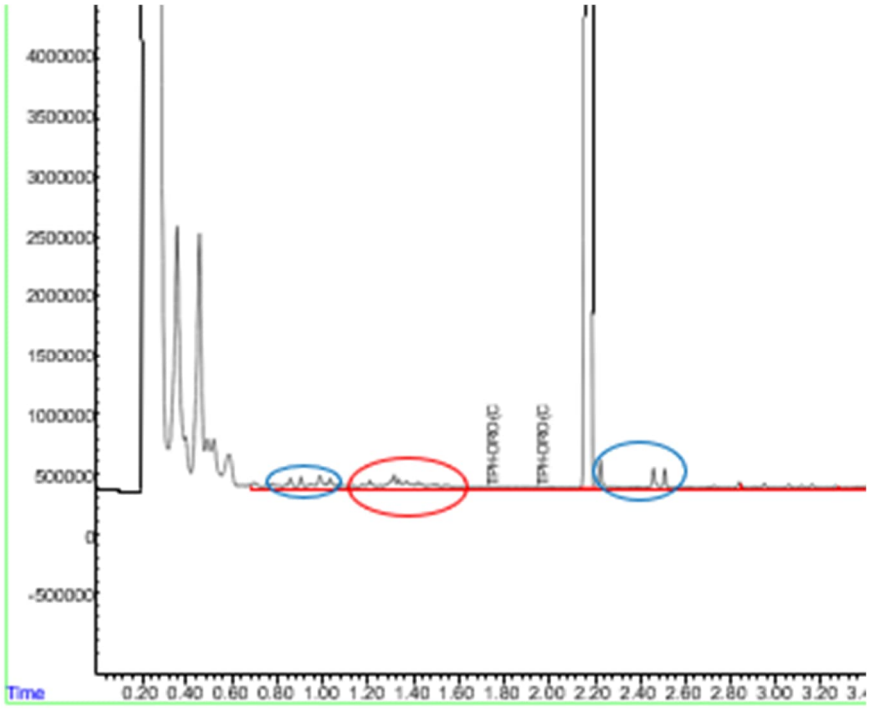


(Note that retention times are specific to a given instrument under a particular set of operating conditions. It is essential that all comparisons of retention times and patterns be done under identical conditions.)

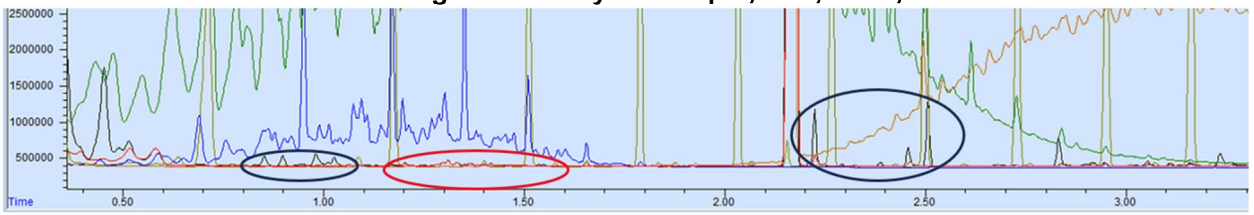
c. Look for the same pattern in the associated samples. While it is not possible to determine the areas of individual portions of the chromatograms from the data package, a rough assessment of the relative magnitude can be made. The pattern noted above has been identified in both MBs and samples and is believed to be a laboratory artifact. If this pattern had been unique to the samples it would be more likely to have originated from the samples.

Additional Qualitative Assessment

1) Review the sample chromatograms looking for distinct peaks or groupings of peaks as discussed in the MB evaluation, above.
2) If found, look to see if the same peaks/patterns are present in the chromatograms of other samples prepared and analyzed in the same batch. Note that a batch may contain samples reported in multiple sample delivery groups (SDGs). All samples from the batch should be reviewed.
3) Identical peak patterns of similar magnitude found in multiple samples from the same batch, particularly if they include samples collected from different areas of the site, suggest that the source is the laboratory rather than the field sample. DRO detections were reported in over 85% of a recent group of samples. All sample chromatograms contained the three peak patterns identified below, with the middle one present in the method blanks as well. Since none of the peak RTs matched the standards, and the pattern was common to all samples, AECOM concluded that the reported DRO concentrations were not fuel related but were due to laboratory artifacts.



Chromatogram Overlay of Sample, JP5, DRO, ORO and Method Blank



Black = Sample
Yellow = RT Marker
Blue = JP5
Green = DRO
Orange = ORO
Red = MB

Attachment 2:

DA59608-1 from DA59608 jbphh_048990

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012623\
Data File : FH069352.D
Signal(s) : FID1A.ch
Acq On : 26 Oct 2023 10:33 pm
Operator : jackb
Sample : da59608-1
Misc : OP24553,GFH23747,1030,,,1,1
ALS Vial : 28 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 27 11:48:15 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	o-Terphenyl	2.232f	626592127	1211.613	ug/ml
	Target Compounds				
2) H	TPH-DRO (C10-C28)	2.020	28292742	76.172	ug/ml
3) H	TPH-DRO (C10-C24)	1.800	25000396	67.863	ug/ml
4) H	TPH-ORO (>C28-C40)	3.830	4581196	26.208	ug/ml
5) H	TPH-ORO (>C24-C40)	3.610	7786702	25.064	ug/ml

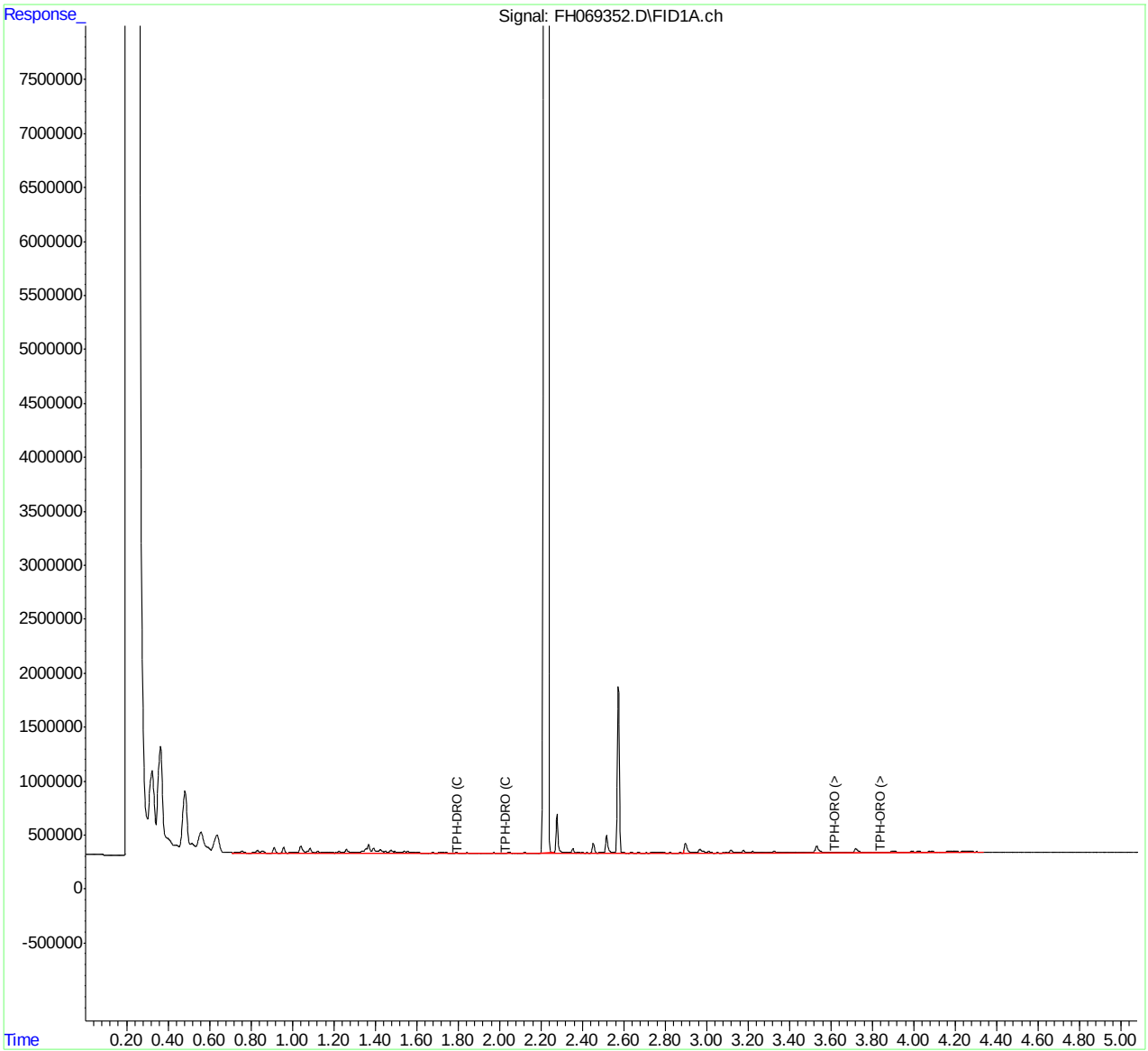
(f)=RT Delta > 1/2 Window (m)=manual int.

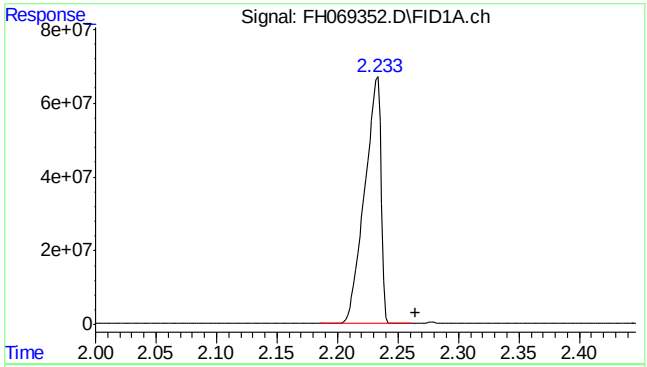
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012623\
Data File : FH069352.D
Signal(s) : FID1A.ch
Acq On : 26 Oct 2023 10:33 pm
Operator : jackb
Sample : da59608-1
Misc : OP24553,GFH23747,1030,,,1,1
ALS Vial : 28 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 27 11:48:15 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

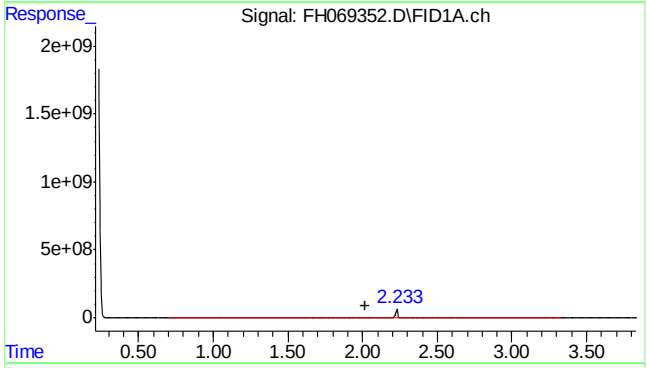
Volume Inj. :
Signal Phase :
Signal Info :





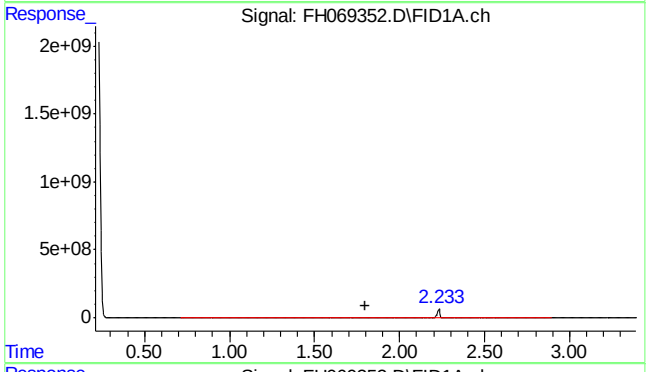
#1 o-Terphenyl

R.T.: 2.232 min
Delta R.T.: -0.033 min
Response: 626592127
Conc: 1211.61 ug/ml



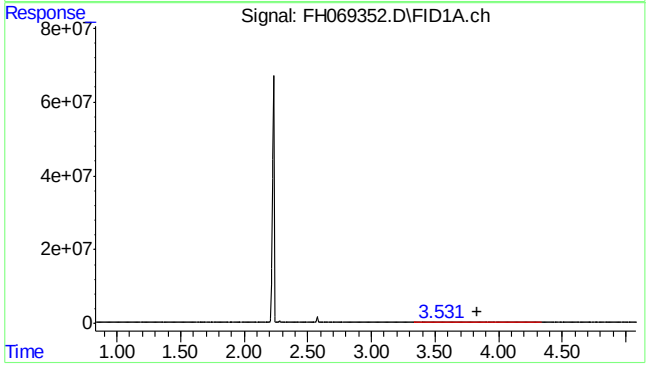
#2 TPH-DRO (C10-C28)

R.T.: 2.020 min
Delta R.T.: 0.000 min
Response: 28292742
Conc: 76.17 ug/ml



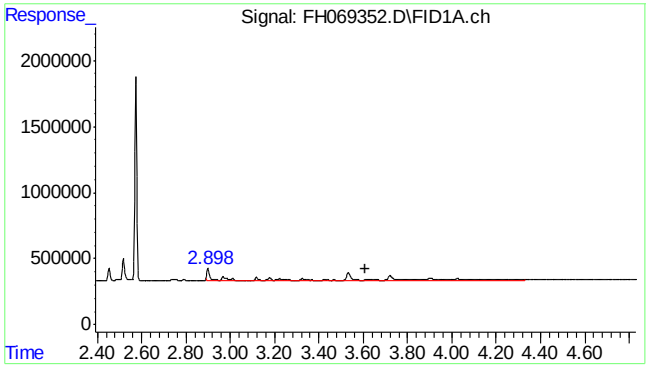
#3 TPH-DRO (C10-C24)

R.T.: 1.800 min
Delta R.T.: 0.000 min
Response: 25000396
Conc: 67.86 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.830 min
Delta R.T.: 0.000 min
Response: 4581196
Conc: 26.21 ug/ml



#5 TPH-ORO (>C24-C40)

R.T.:	3.610 min
Delta R.T.:	0.000 min
Response:	7786702
Conc:	25.06 ug/ml

Attachment 3:

op24553-mb from DA59608 jbphh_048990-2

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012623\
Data File : FH069326.D
Signal(s) : FID1A.ch
Acq On : 26 Oct 2023 7:03 pm
Operator : jackb
Sample : op24553-mb
Misc : OP24553,GFH23747,1000,,,1,1
ALS Vial : 4 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 27 11:47:23 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.235f	763624029	1476.586	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	2.020	22192568	59.748	ug/ml
3) H	TPH-DRO (C10-C24)	1.800	16932404	45.963	ug/ml
4) H	TPH-ORO (>C28-C40)	3.830	2894072	16.556	ug/ml
5) H	TPH-ORO (>C24-C40)	3.610	7512267	24.180	ug/ml

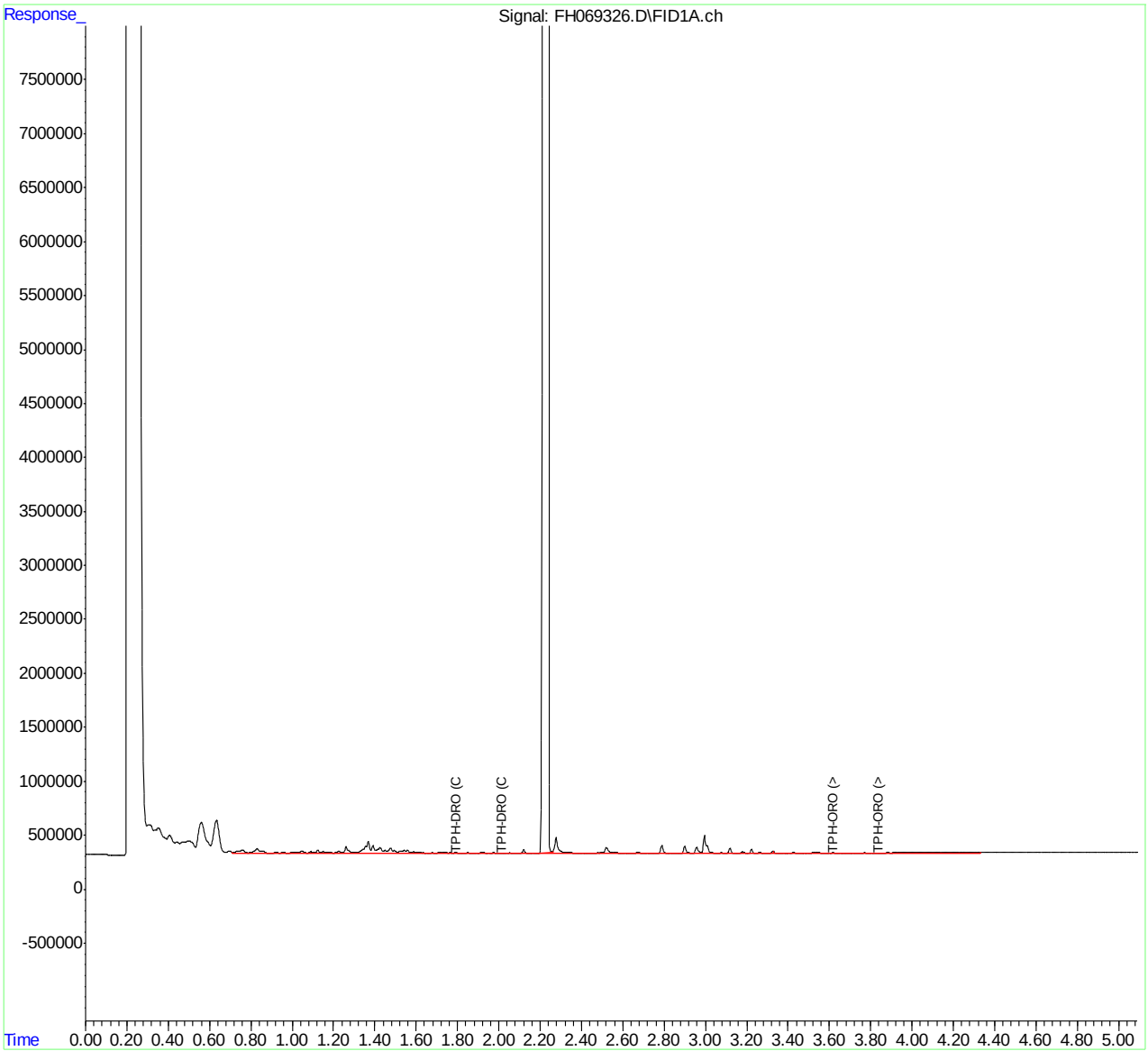
(f)=RT Delta > 1/2 Window (m)=manual int.

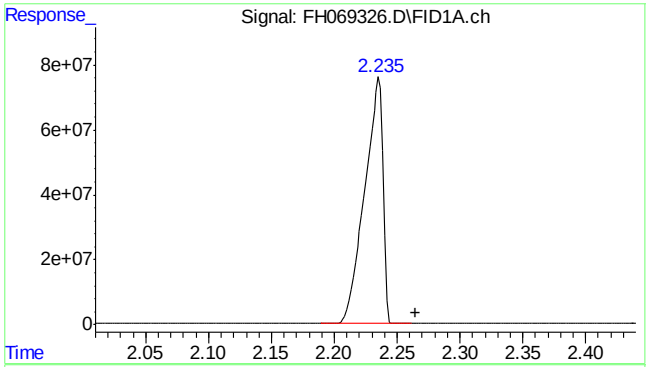
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012623\
Data File : FH069326.D
Signal(s) : FID1A.ch
Acq On : 26 Oct 2023 7:03 pm
Operator : jackb
Sample : op24553-mb
Misc : OP24553,GFH23747,1000,,,1,1
ALS Vial : 4 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 27 11:47:23 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

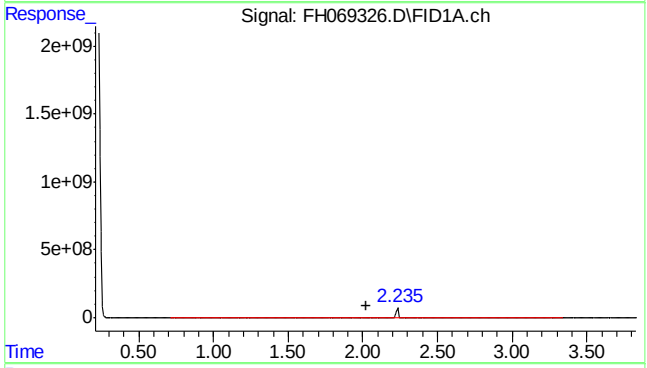
Volume Inj. :
Signal Phase :
Signal Info :





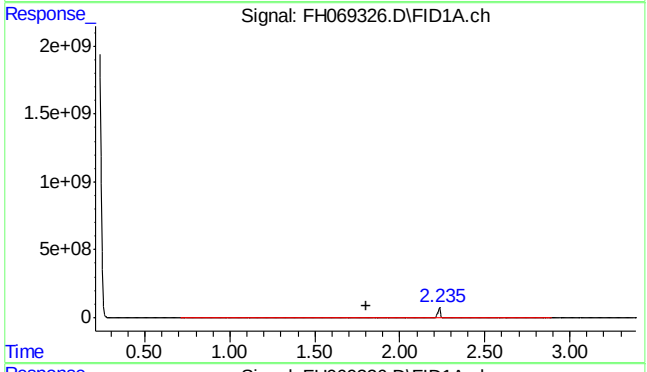
#1 o-Terphenyl

R.T.: 2.235 min
Delta R.T.: -0.030 min
Response: 763624029
Conc: 1476.59 ug/ml



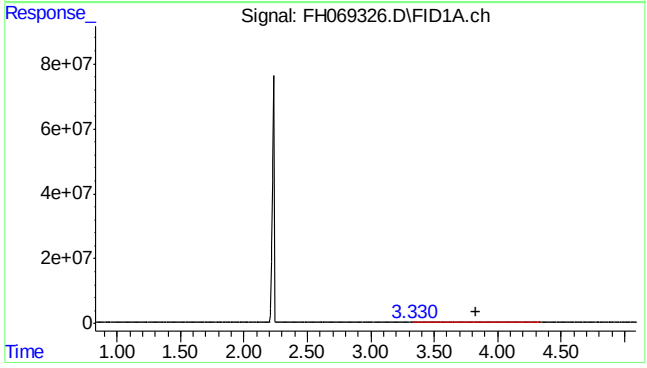
#2 TPH-DRO (C10-C28)

R.T.: 2.020 min
Delta R.T.: 0.000 min
Response: 22192568
Conc: 59.75 ug/ml



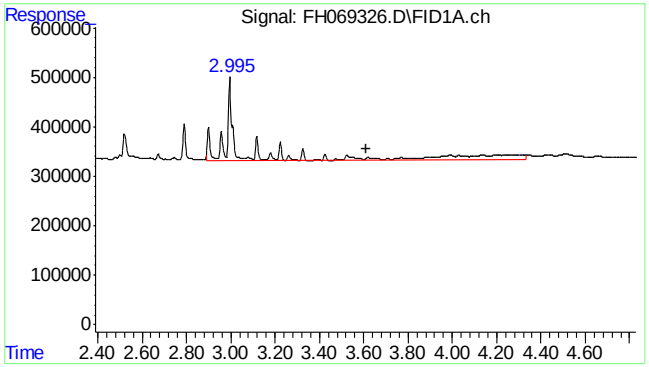
#3 TPH-DRO (C10-C24)

R.T.: 1.800 min
Delta R.T.: 0.000 min
Response: 16932404
Conc: 45.96 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.830 min
Delta R.T.: 0.000 min
Response: 2894072
Conc: 16.56 ug/ml



#5 TPH-ORO (>C24-C40)

R.T.:	3.610 min
Delta R.T.:	0.000 min
Response:	7512267
Conc:	24.18 ug/ml

Attachment 4:

JP-5 from DA59608 jbphh_048990-3

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012623\
Data File : FH069322.D
Signal(s) : FID1A.ch
Acq On : 26 Oct 2023 6:30 pm
Operator : jackb
Sample : RT JP-05
Misc : OP20000,GFH23747,,,,,1
ALS Vial : 3 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 27 11:47:15 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	0.000	0	N.D.	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	2.020	321375214	865.228	ug/ml
3) H	TPH-DRO (C10-C24)	1.800	304409281	826.318	ug/ml
4) H	TPH-ORO (>C28-C40)	3.830	33358061	190.834	ug/ml
5) H	TPH-ORO (>C24-C40)	3.610	49267516	158.582	ug/ml

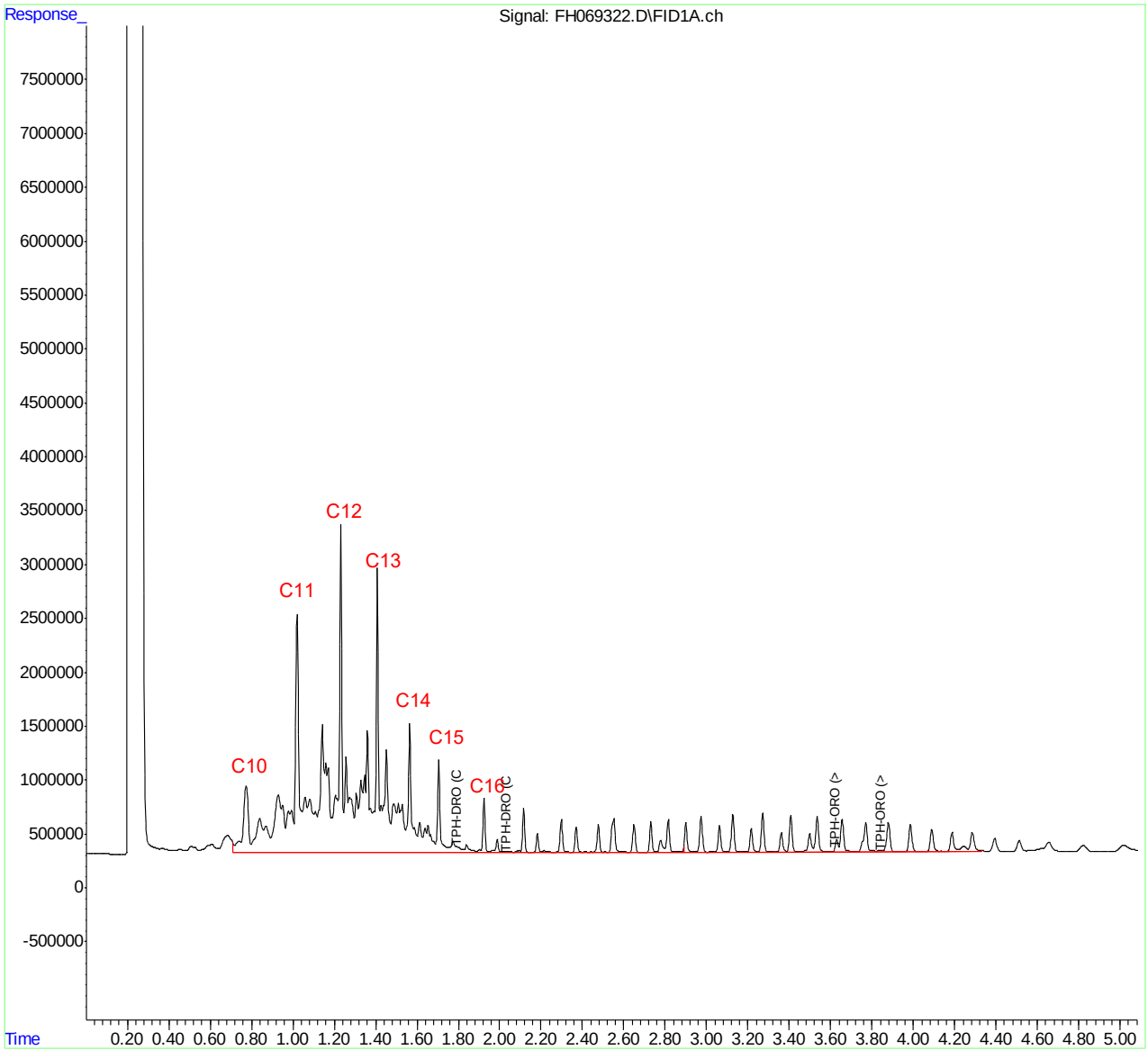
(f)=RT Delta > 1/2 Window (m)=manual int.

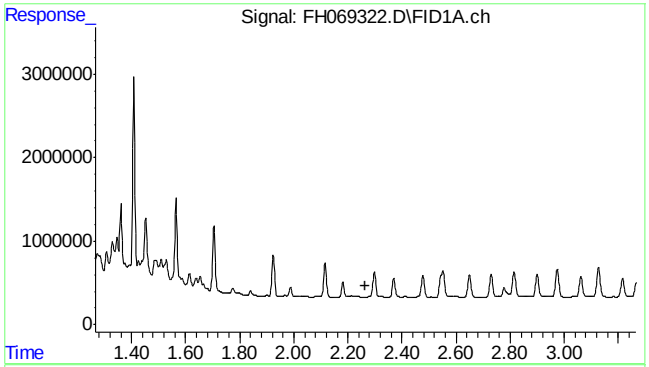
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012623\
Data File : FH069322.D
Signal(s) : FID1A.ch
Acq On : 26 Oct 2023 6:30 pm
Operator : jackb
Sample : RT JP-05
Misc : OP20000,GFH23747,,,,,1
ALS Vial : 3 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 27 11:47:15 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

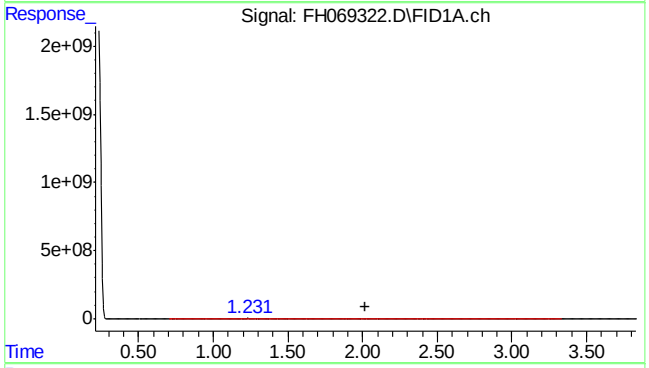
Volume Inj. :
Signal Phase :
Signal Info :





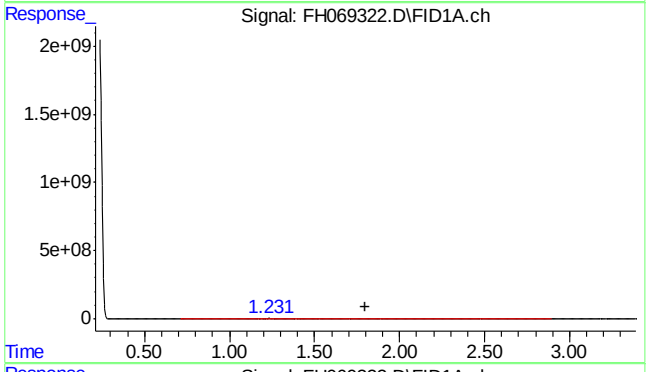
#1 o-Terphenyl

R.T.: 0.000 min
Exp R.T. : 2.265 min
Response: 0
Conc: N.D.



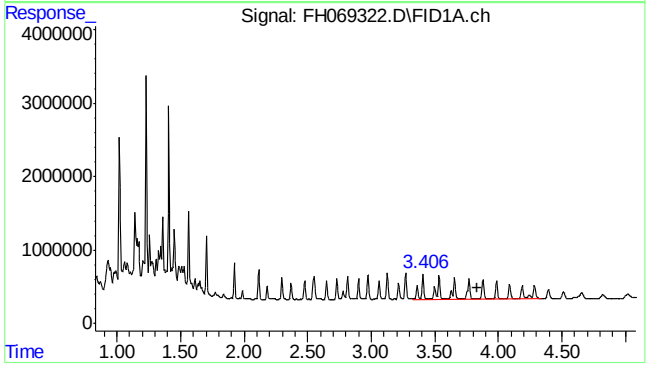
#2 TPH-DRO (C10-C28)

R.T.: 2.020 min
Delta R.T.: 0.000 min
Response: 321375214
Conc: 865.23 ug/ml



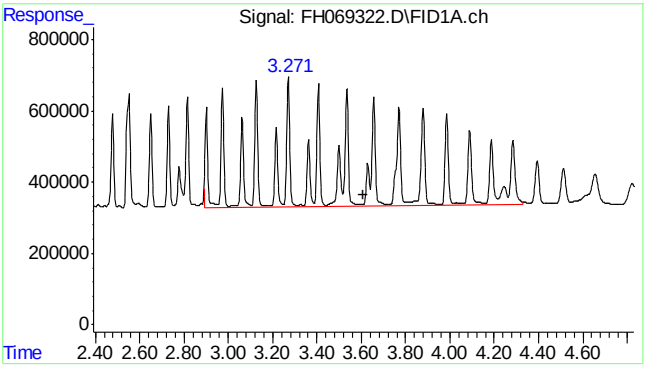
#3 TPH-DRO (C10-C24)

R.T.: 1.800 min
Delta R.T.: 0.000 min
Response: 304409281
Conc: 826.32 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.830 min
Delta R.T.: 0.000 min
Response: 33358061
Conc: 190.83 ug/ml



#5 TPH-ORO (>C24-C40)

R.T.:	3.610 min
Delta R.T.:	0.000 min
Response:	49267516
Conc:	158.58 ug/ml

Attachment 5:

DA59502-2 from DA59502 jbphh_048822

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012323\
Data File : FH069193.D
Signal(s) : FID1A.ch
Acq On : 23 Oct 2023 2:17 pm
Operator : jackb
Sample : da59502-2
Misc : OP24535,GFH23744,1050,,,1,1
ALS Vial : 22 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 24 12:36:59 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	o-Terphenyl	2.234f	596558128	1153.538	ug/ml
	Target Compounds				
2) H	TPH-DRO (C10-C28)	2.060	28846820	77.663	ug/ml
3) H	TPH-DRO (C10-C24)	1.840	21649264	58.767	ug/ml
4) H	TPH-ORO (>C28-C40)	3.880	8438575	48.275	ug/ml
5) H	TPH-ORO (>C24-C40)	3.660	13291141	42.781	ug/mlm

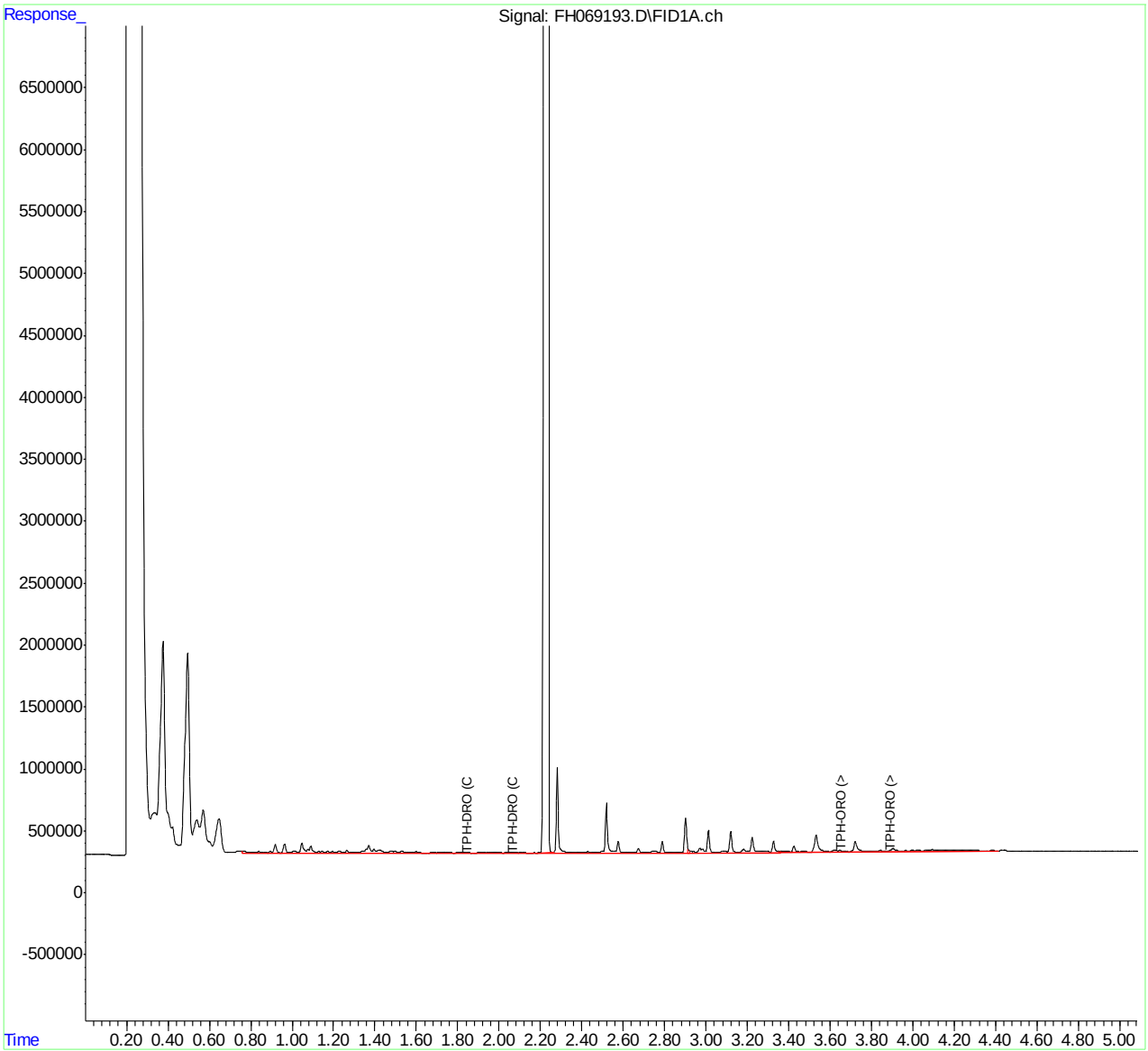
(f)=RT Delta > 1/2 Window (m)=manual int.

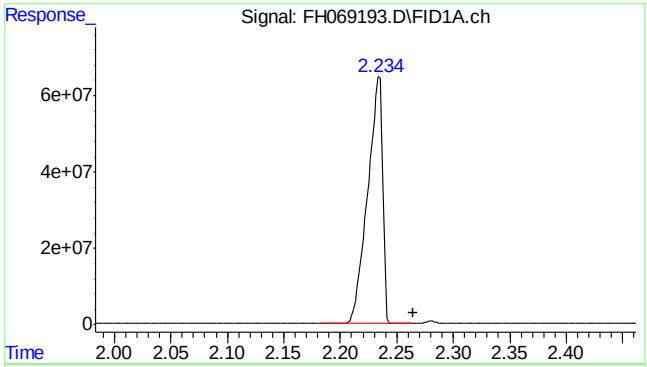
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012323\
Data File : FH069193.D
Signal(s) : FID1A.ch
Acq On : 23 Oct 2023 2:17 pm
Operator : jackb
Sample : da59502-2
Misc : OP24535,GFH23744,1050,,,1,1
ALS Vial : 22 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 24 12:36:59 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

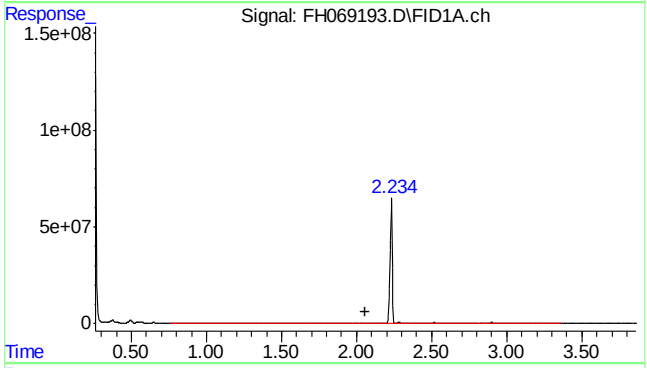
Volume Inj. :
Signal Phase :
Signal Info :





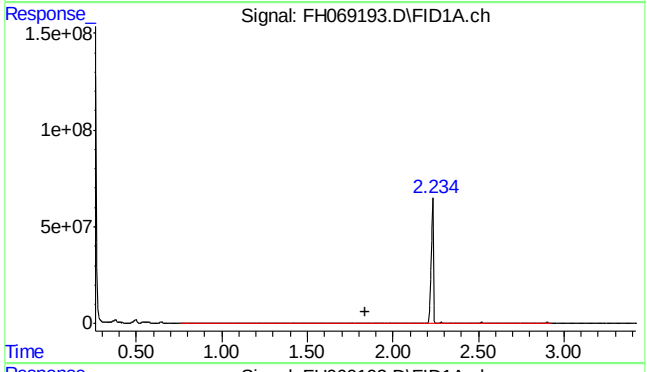
#1 o-Terphenyl

R.T.: 2.234 min
Delta R.T.: -0.031 min
Response: 596558128
Conc: 1153.54 ug/ml



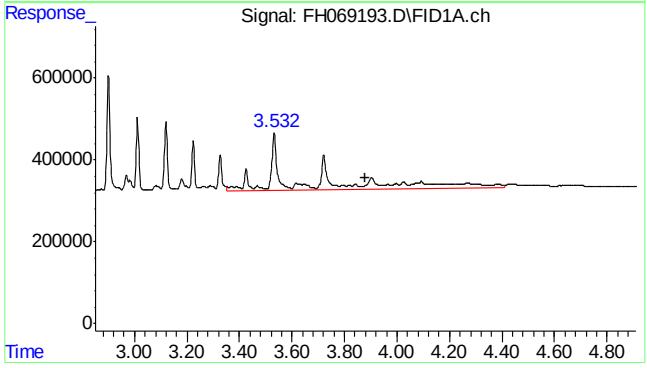
#2 TPH-DRO (C10-C28)

R.T.: 2.060 min
Delta R.T.: 0.000 min
Response: 28846820
Conc: 77.66 ug/ml



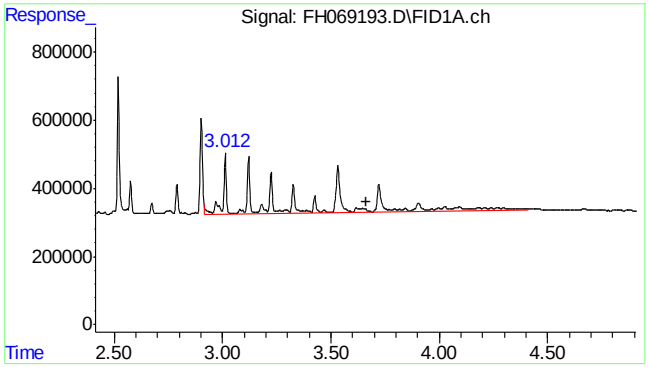
#3 TPH-DRO (C10-C24)

R.T.: 1.840 min
Delta R.T.: 0.000 min
Response: 21649264
Conc: 58.77 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.880 min
Delta R.T.: 0.000 min
Response: 8438575
Conc: 48.28 ug/ml



#5 TPH-ORO (>C24-C40)

R.T.:	3.660 min
Delta R.T.:	0.000 min
Response:	13291141
Conc:	42.78 ug/ml m

Attachment 6:

op24535-mb from DA59502 jbphh_048822-2

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012323\
Data File : FH069173.D
Signal(s) : FID1A.ch
Acq On : 23 Oct 2023 11:34 am
Operator : jackb
Sample : op24535-mb
Misc : OP24535,GFH23744,1000,,,1,1
ALS Vial : 4 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 23 15:10:29 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.239f	840032406	1624.333	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	2.060	24654485	66.376	ug/ml
3) H	TPH-DRO (C10-C24)	1.840	18183910	49.360	ug/ml
4) H	TPH-ORO (>C28-C40)	3.880	6737884	38.546	ug/ml
5) H	TPH-ORO (>C24-C40)	3.660	13641440	43.909	ug/ml

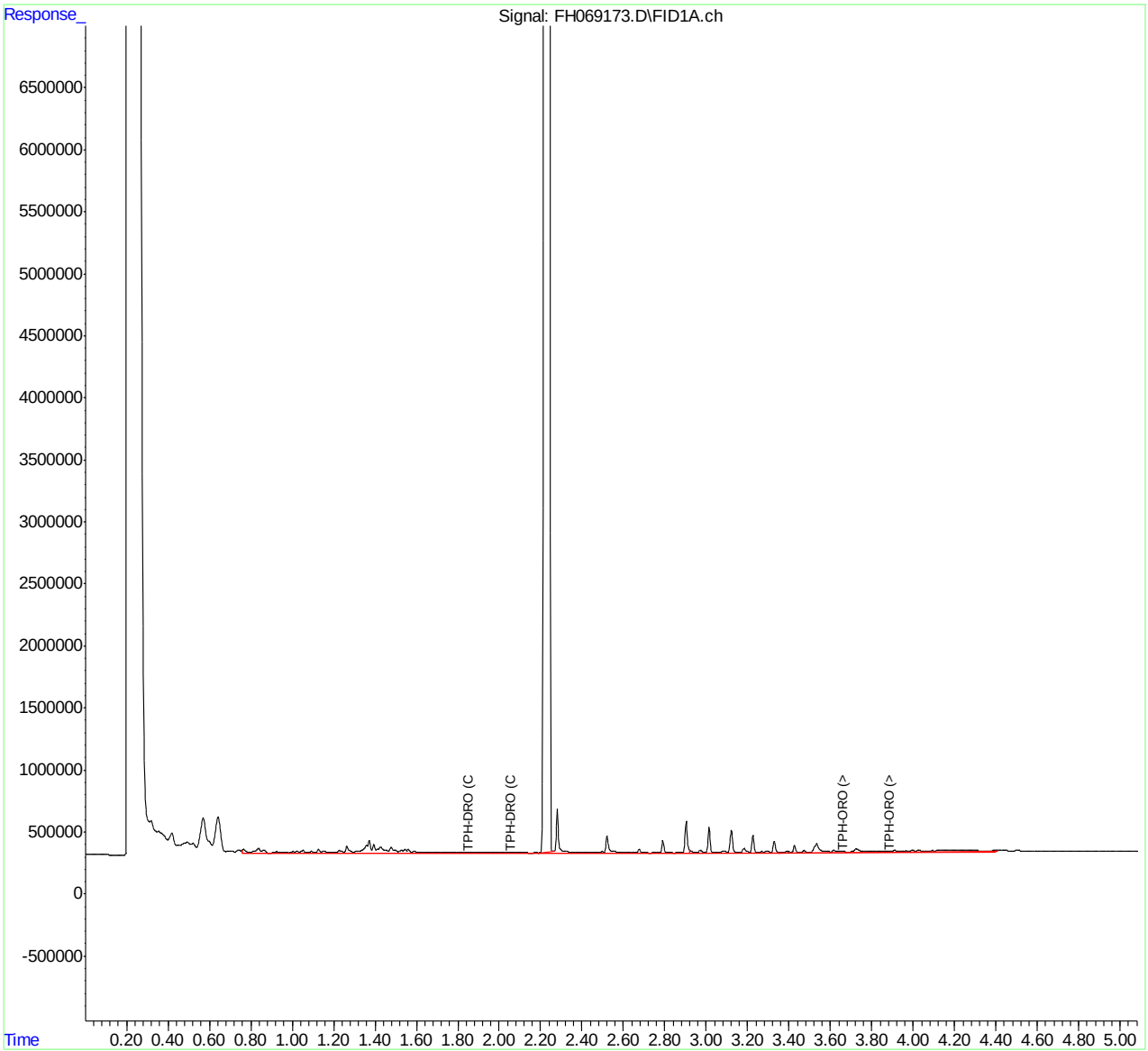
(f)=RT Delta > 1/2 Window (m)=manual int.

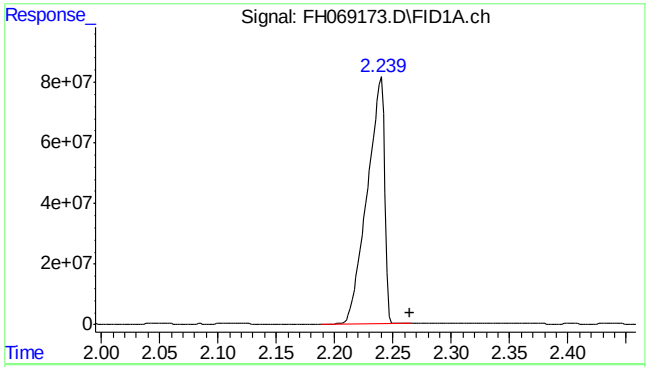
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012323\
Data File : FH069173.D
Signal(s) : FID1A.ch
Acq On : 23 Oct 2023 11:34 am
Operator : jackb
Sample : op24535-mb
Misc : OP24535,GFH23744,1000,,,1,1
ALS Vial : 4 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 23 15:10:29 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

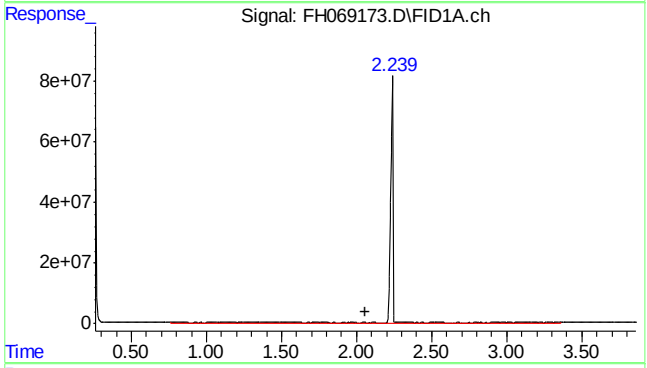
Volume Inj. :
Signal Phase :
Signal Info :





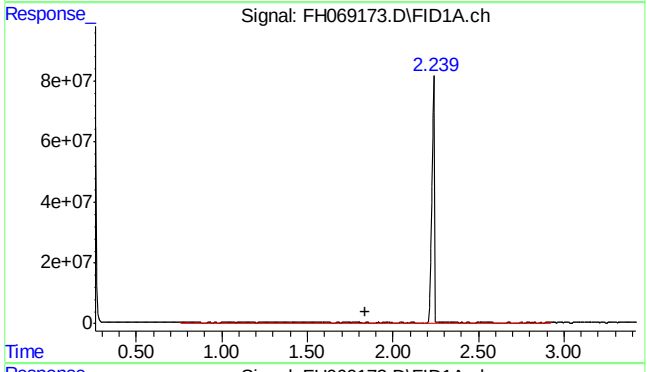
#1 o-Terphenyl

R.T.: 2.239 min
Delta R.T.: -0.026 min
Response: 840032406
Conc: 1624.33 ug/ml



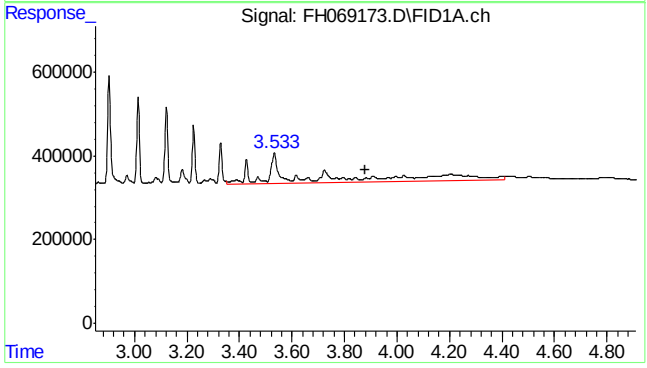
#2 TPH-DRO (C10-C28)

R.T.: 2.060 min
Delta R.T.: 0.000 min
Response: 24654485
Conc: 66.38 ug/ml



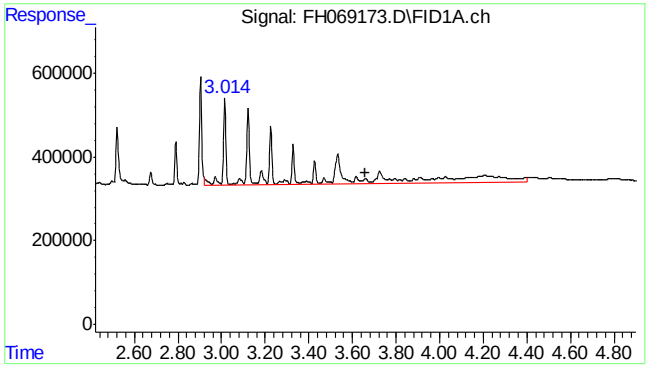
#3 TPH-DRO (C10-C24)

R.T.: 1.840 min
Delta R.T.: 0.000 min
Response: 18183910
Conc: 49.36 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.880 min
Delta R.T.: 0.000 min
Response: 6737884
Conc: 38.55 ug/ml



#5 TPH-ORO (>C24-C40)

R.T.:	3.660 min
Delta R.T.:	0.000 min
Response:	13641440
Conc:	43.91 ug/ml

Attachment 7:

JP-5 from DA59502 jbphh_048822-4

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012323\
Data File : FH069169.D
Signal(s) : FID1A.ch
Acq On : 23 Oct 2023 11:01 am
Operator : jackb
Sample : RT JP-05
Misc : OP20000,GFH23744,,,,,1
ALS Vial : 3 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 23 11:33:08 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	o-Terphenyl	0.000	0	N.D.	ug/ml
	Target Compounds				
2) H	TPH-DRO (C10-C28)	2.060	292956904	788.719	ug/ml
3) H	TPH-DRO (C10-C24)	1.840	280838268	762.335	ug/ml
4) H	TPH-ORO (>C28-C40)	3.880	27516818	157.418	ug/ml
5) H	TPH-ORO (>C24-C40)	3.660	39132241	125.959	ug/ml

(f)=RT Delta > 1/2 Window (m)=manual int.

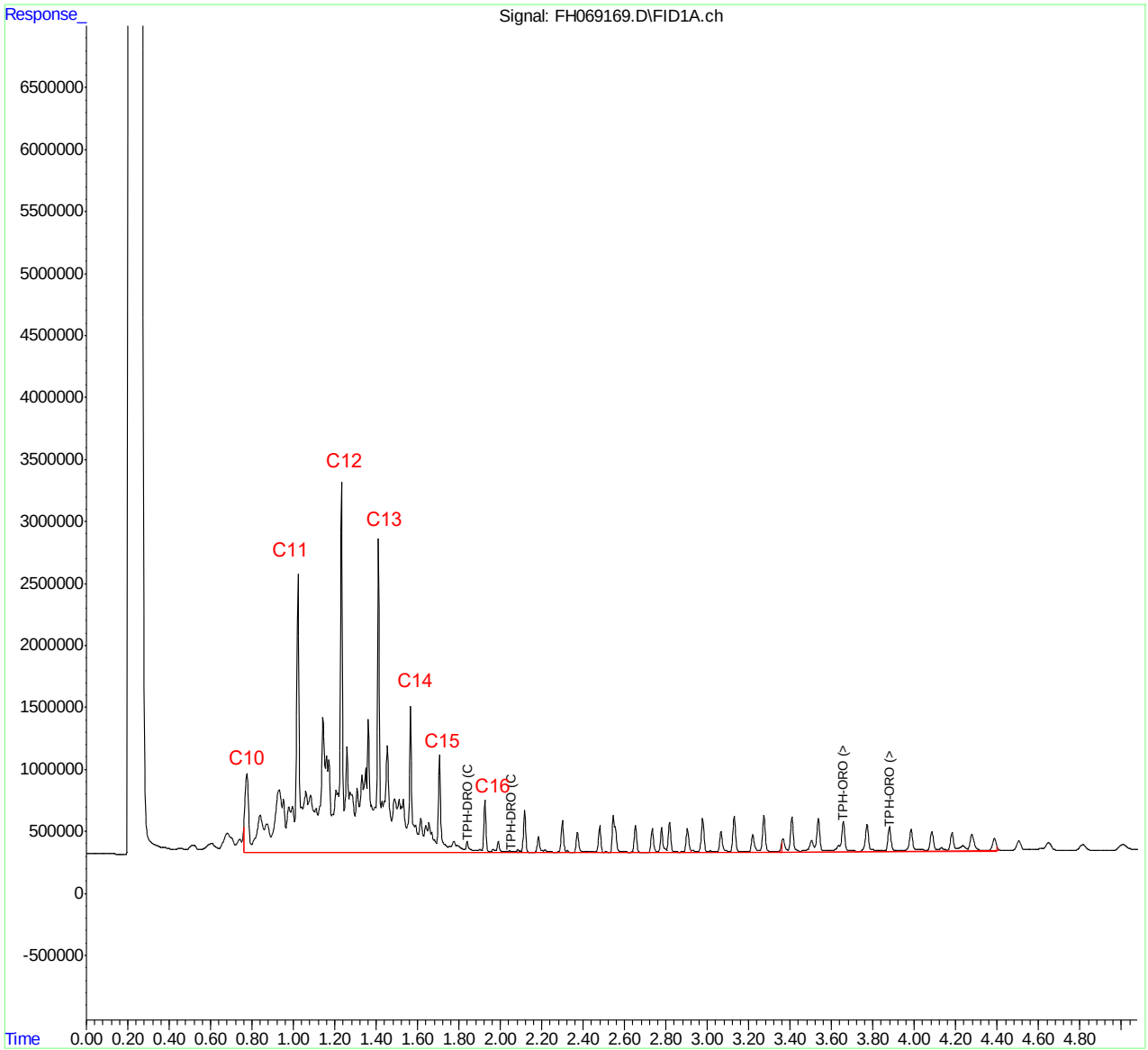
11.5.3 11

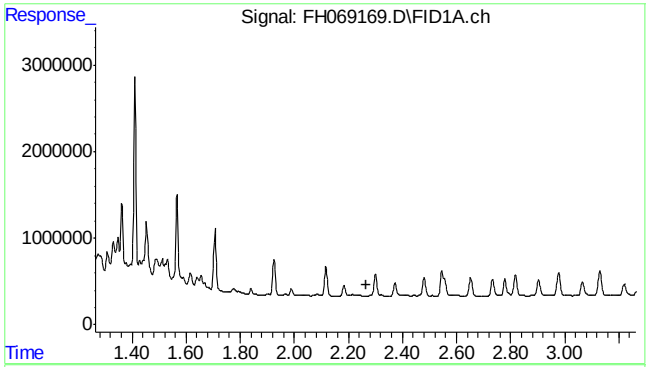
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012323\
Data File : FH069169.D
Signal(s) : FID1A.ch
Acq On : 23 Oct 2023 11:01 am
Operator : jackb
Sample : RT JP-05
Misc : OP20000,GFH23744,,,,,1
ALS Vial : 3 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 23 11:33:08 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

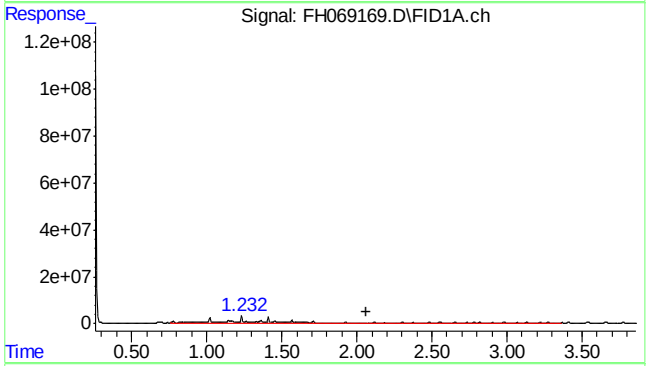
Volume Inj. :
Signal Phase :
Signal Info :





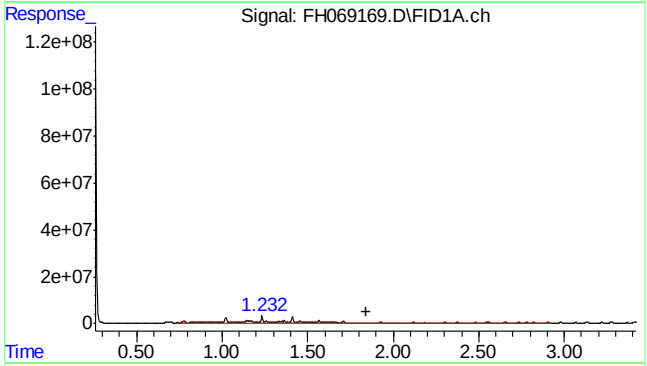
#1 o-Terphenyl

R.T.: 0.000 min
Exp R.T. : 2.265 min
Response: 0
Conc: N.D.



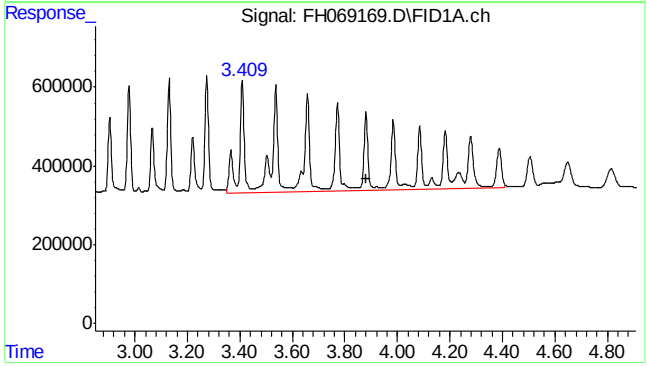
#2 TPH-DRO (C10-C28)

R.T.: 2.060 min
Delta R.T.: 0.000 min
Response: 292956904
Conc: 788.72 ug/ml



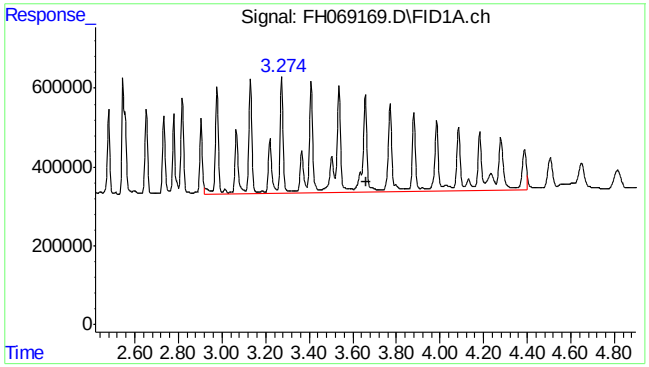
#3 TPH-DRO (C10-C24)

R.T.: 1.840 min
Delta R.T.: 0.000 min
Response: 280838268
Conc: 762.33 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.880 min
Delta R.T.: 0.000 min
Response: 27516818
Conc: 157.42 ug/ml



#5 TPH-ORO (>C24-C40)

R.T.:	3.660 min
Delta R.T.:	0.000 min
Response:	39132241
Conc:	125.96 ug/ml

Attachment 8:

DA59503-1 from DA59503 jbphh_048824

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012323\
Data File : FH069194.D
Signal(s) : FID1A.ch
Acq On : 23 Oct 2023 2:25 pm
Operator : jackb
Sample : da59503-1
Misc : OP24535,GFH23744,1050,,,1,1
ALS Vial : 23 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 23 15:11:11 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	o-Terphenyl	2.238f	846901792	1637.616	ug/ml
	Target Compounds				
2) H	TPH-DRO (C10-C28)	2.060	25380629	68.331	ug/ml
3) H	TPH-DRO (C10-C24)	1.840	19404849	52.674	ug/ml
4) H	TPH-ORO (>C28-C40)	3.880	7271057	41.596	ug/ml
5) H	TPH-ORO (>C24-C40)	3.660	13862458	44.620	ug/ml

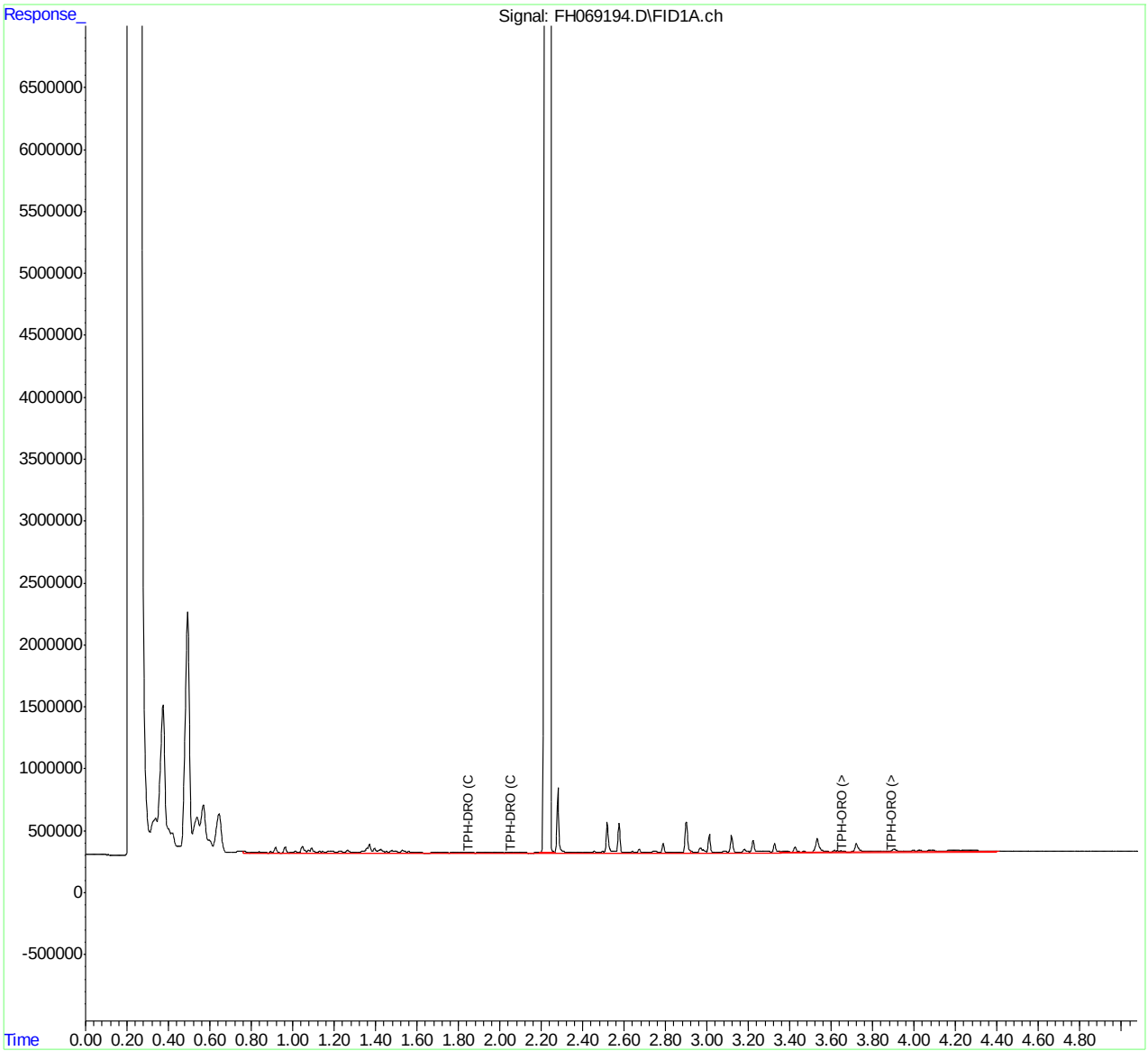
(f)=RT Delta > 1/2 Window (m)=manual int.

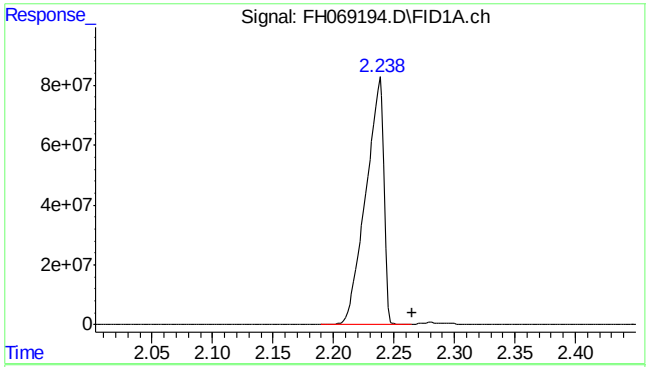
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012323\
Data File : FH069194.D
Signal(s) : FID1A.ch
Acq On : 23 Oct 2023 2:25 pm
Operator : jackb
Sample : da59503-1
Misc : OP24535,GFH23744,1050,,,1,1
ALS Vial : 23 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 23 15:11:11 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

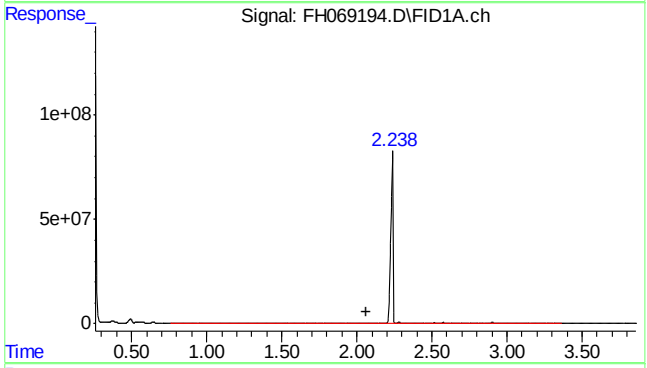
Volume Inj. :
Signal Phase :
Signal Info :





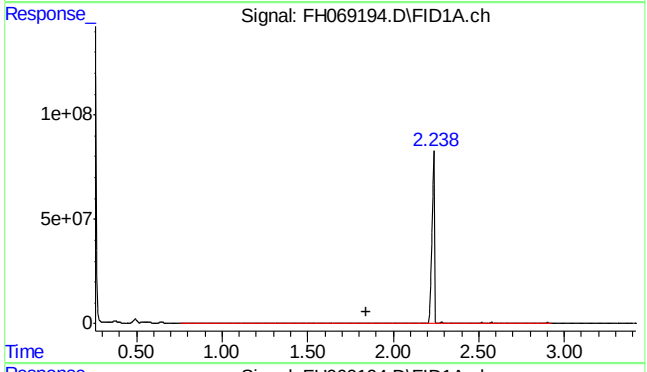
#1 o-Terphenyl

R.T.: 2.238 min
Delta R.T.: -0.027 min
Response: 846901792
Conc: 1637.62 ug/ml



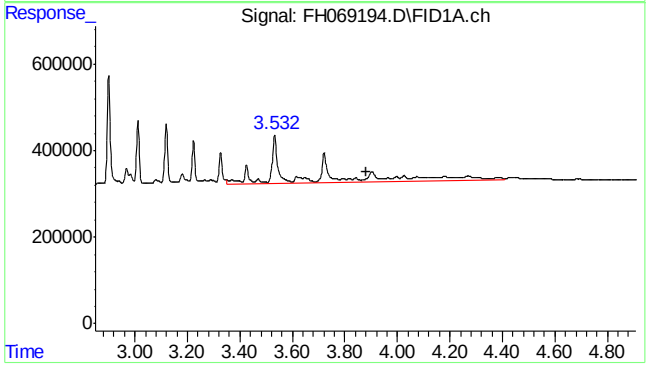
#2 TPH-DRO (C10-C28)

R.T.: 2.060 min
Delta R.T.: 0.000 min
Response: 25380629
Conc: 68.33 ug/ml



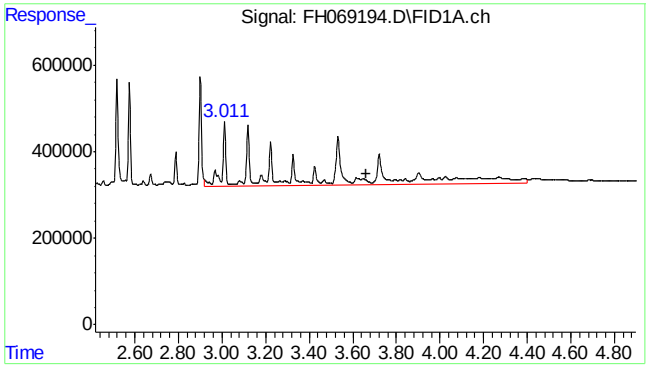
#3 TPH-DRO (C10-C24)

R.T.: 1.840 min
Delta R.T.: 0.000 min
Response: 19404849
Conc: 52.67 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.880 min
Delta R.T.: 0.000 min
Response: 7271057
Conc: 41.60 ug/ml



#5 TPH-ORO (>C24-C40)

R.T.:	3.660 min
Delta R.T.:	0.000 min
Response:	13862458
Conc:	44.62 ug/ml

Attachment 8:

DA59504-1 from DA59504 jbphh_048826

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012323\
Data File : FH069195.D
Signal(s) : FID1A.ch
Acq On : 23 Oct 2023 2:33 pm
Operator : jackb
Sample : da59504-1
Misc : OP24535,GFH23744,1050,,,1,1
ALS Vial : 24 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 23 15:11:13 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	o-Terphenyl	2.237f	783793374	1515.586	ug/ml
	Target Compounds				
2) H	TPH-DRO (C10-C28)	2.060	33504857	90.204	ug/ml
3) H	TPH-DRO (C10-C24)	1.840	27523727	74.713	ug/ml
4) H	TPH-ORO (>C28-C40)	3.880	7455698	42.652	ug/ml
5) H	TPH-ORO (>C24-C40)	3.660	14295264	46.014	ug/ml

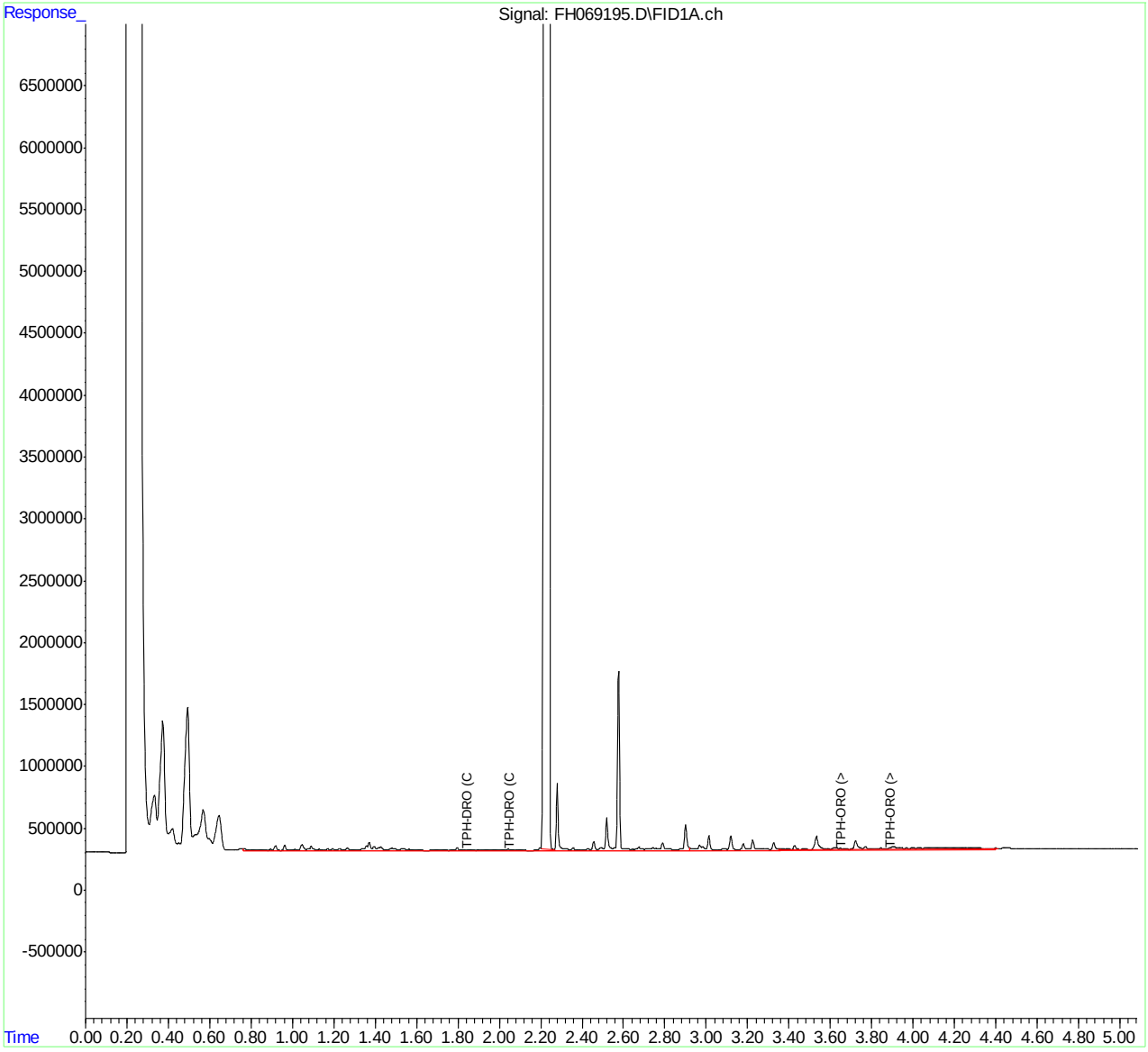
(f)=RT Delta > 1/2 Window (m)=manual int.

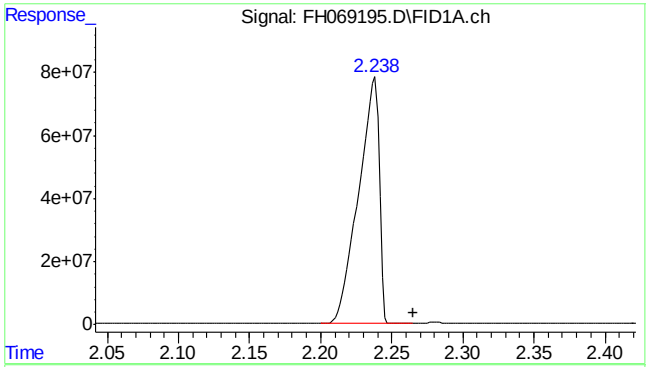
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\10.23\fh1012323\
Data File : FH069195.D
Signal(s) : FID1A.ch
Acq On : 23 Oct 2023 2:33 pm
Operator : jackb
Sample : da59504-1
Misc : OP24535,GFH23744,1050,,,1,1
ALS Vial : 24 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Oct 23 15:11:13 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

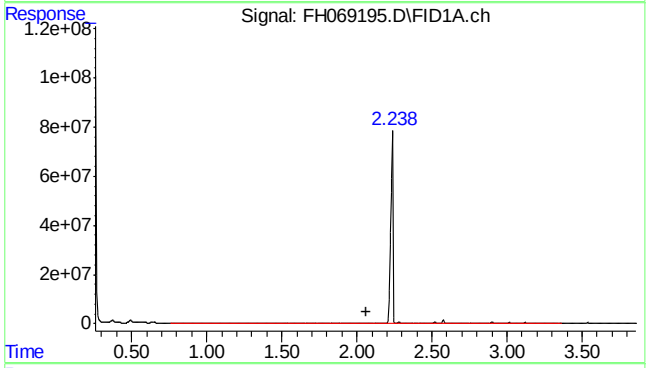
Volume Inj. :
Signal Phase :
Signal Info :





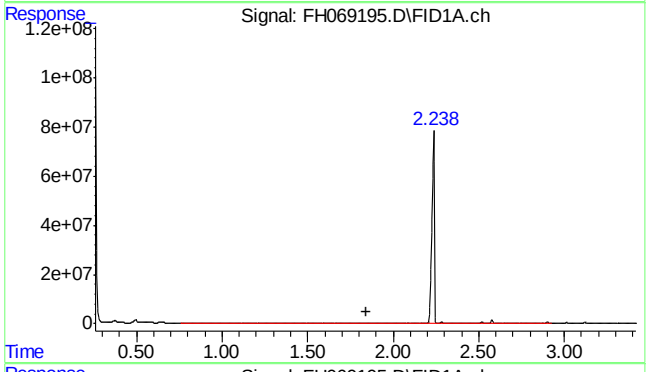
#1 o-Terphenyl

R.T.: 2.237 min
Delta R.T.: -0.028 min
Response: 783793374
Conc: 1515.59 ug/ml



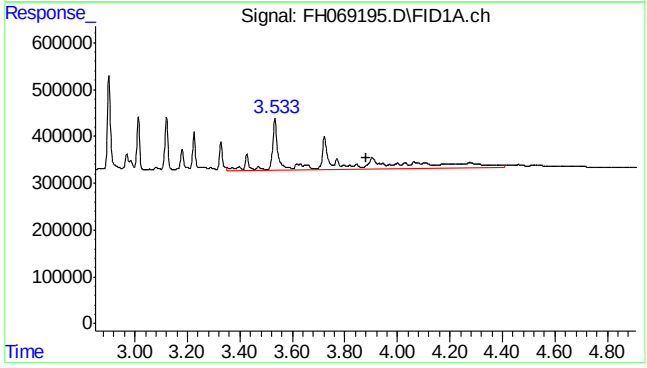
#2 TPH-DRO (C10-C28)

R.T.: 2.060 min
Delta R.T.: 0.000 min
Response: 33504857
Conc: 90.20 ug/ml



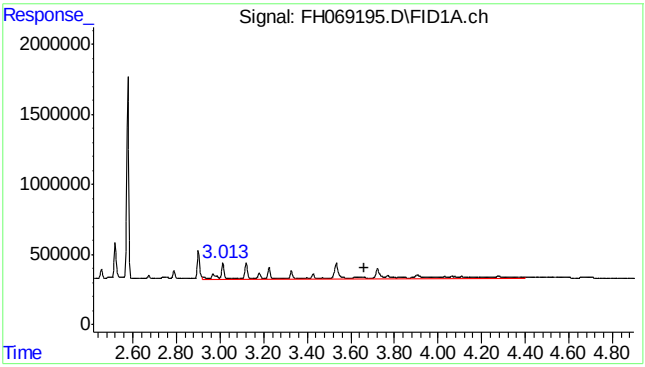
#3 TPH-DRO (C10-C24)

R.T.: 1.840 min
Delta R.T.: 0.000 min
Response: 27523727
Conc: 74.71 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.880 min
Delta R.T.: 0.000 min
Response: 7455698
Conc: 42.65 ug/ml



#5 TPH-ORO (>C24-C40)

R.T.:	3.660 min
Delta R.T.:	0.000 min
Response:	14295264
Conc:	46.01 ug/ml

Appendix M

AECOM Technical Memorandum for Water Heater Samples

AECOM
1001 Bishop Street
Suite 1600
Honolulu, HI 96813
www.aecom.com

February 23, 2024

NAVFAC Hawaii
400 Marshall Road
JBPHH HI 96860-3139

Subject: **Red Hill Bulk Fuel Storage Facility**
LTM TPH Detection Results
Water Heater Sample Study

Attention [redacted]

AECOM evaluated the TPH results from a set of residential water heaters where residents reported sheens on the hot water from household taps. Samples of the hot water were collected between the dates of 11-20-2023 and 11-22-2023 directly at the heaters prior to draining the water heater (pre-drain), prior to the completion of draining the water heater (post-drain), and following the completion of water heater flushing (post-flush) per the Premise Plumbing Inspection and Water Heater Sampling SOP. None of the detected TPH is attributable to JP-5 or other common fuels. The detected TPH patterns are similar to the associated method blanks and cannot be reliably attributed to the hot water samples collected in the field. The DRO and ORO results do not explain the observed sheens in the hot water from the residences, but rule out JP-5 or any other common fuel as the source of the sheens. The procedures used by AECOM to review the chromatograms is detailed in, *"Chromatographic Interpretation of Diesel Range Organics (DRO) and Oil Range Organics (ORO) Detections, Drinking Water Long-Term Monitoring,"* which is provided as Attachment 1 to this document.

The table below summarizes the (TPH-d/DRO)-diesel range organics, and (TPH-o/ORO) oil range organics results for these analytes in samples listed in the table below. The chromatographic data for detections were reviewed to determine if the DRO or ORO result could be qualitatively attributed to Jet Propellant 5 (JP-5) or any other common fuel products in the field samples.

SDG	Laboratory Sample ID	Field Sample ID	Location	Analyte	Result	Units
DA60154	DA60154-1	D3-TW-[redacted] (pre-drain)	Address G	DRO (C10-C24)	66.6	µg/L
DA60154	DA60154-1	D3-TW-[redacted] (pre-drain)	Address G	ORO (>C24-C40)	75.9	µg/L
DA60154	DA60154-2	D3-TW-[redacted] (post-drain)	Address G	DRO (C10-C24)	55.2	µg/L
DA60154	DA60154-2	D3-TW-[redacted] (post-drain)	Address G	ORO (>C24-C40)	56.7	µg/L
DA60154	DA60154-3	D3-TW-[redacted] (post-flush)	Address G	DRO (C10-C24)	55.7	µg/L
DA60154	DA60154-3	D3-TW-[redacted] (post-flush)	Address G	ORO (>C24-C40)	81.1	µg/L
DA60183	DA60183-1	D3-TW-[redacted] (pre-drain)	Address D	DRO (C10-C24)	ND	µg/L
DA60183	DA60183-1	D3-TW-[redacted] (pre-drain)	Address D	ORO (>C24-C40)	ND	µg/L
DA60183	DA60183-2	D3-TW-[redacted] (post-drain)	Address D	DRO (C10-C24)	ND	µg/L
DA60183	DA60183-2	D3-TW-[redacted] (post-drain)	Address D	ORO (>C24-C40)	ND	µg/L

SDG	Laboratory Sample ID	Field Sample ID	Location	Analyte	Result	Units
DA60183	DA60183-3	D3-TW-[redacted](post-flush)	Address D	DRO (C10-C24)	70.6	µg/L
DA60183	DA60183-3	D3-TW-[redacted] (post-flush)	Address D	ORO (>C24-C40)	ND	µg/L
DA60184	DA60184-1	D3-TW-[redacted] (pre-drain)	Address C	DRO (C10-C24)	ND	µg/L
DA60184	DA60184-1	D3-TW-[redacted] (pre-drain)	Address C	ORO (>C24-C40)	ND	µg/L
DA60184	DA60184-2	D3-TW-[redacted](post-drain)	Address C	DRO (C10-C24)	ND	µg/L
DA60184	DA60184-2	D3-TW-[redacted] (post-drain)	Address C	ORO (>C24-C40)	54.5	µg/L
DA60184	DA60184-3	D3-TW-[redacted] (post-flush)	Address C	DRO (C10-C24)	71.7	µg/L
DA60184	DA60184-3	D3-[redacted] (post-flush)	Address C	ORO (>C24-C40)	63.9	µg/L
DA60212	DA60212-1	A1-TW-[redacted] (pre-drain)	Address A	DRO (C10-C24)	ND	µg/L
DA60212	DA60212-1	A1-TW-[redacted] (pre-drain)	Address A	ORO (>C24-C40)	ND	µg/L
DA60212	DA60212-2	A1-TW-[redacted] (post-drain)	Address A	DRO (C10-C24)	ND	µg/L
DA60212	DA60212-2	A1-TW-[redacted] (post-drain)	Address A	ORO (>C24-C40)	54.8	µg/L
DA60212	DA60212-3	A1-TW-[redacted] (post-flush)	Address A	DRO (C10-C24)	ND	µg/L
DA60212	DA60212-3	A1-TW-[redacted] (post-flush)	Address A	ORO (>C24-C40)	ND	µg/L

µg/L micrograms per liter

The attached files *DA60154-1 from DA60154 jbphh_050364* (2), *DA60154-2 from DA60154 jbphh_050364-2* (3), and *DA60154-3 from DA60154 jbphh_050364-3* (Attachment 4) include the DRO/ORO quantitation reports and chromatograms for samples collected from the Address G residence. Note the quantitation reports provide on-column results whereas the final results in the table above have been corrected for sample volume. The chromatograms exhibit small peaks in the DRO and ORO ranges and some integrated area below the true baseline. A very similar pattern was observed in other TPH samples from this preparatory group and in the associated method blank, although the method blank result was below the method detection limit (MDL). The associated method blank quantitation report and chromatogram are provided in the attached file *op24665-mb from DA60154 jbphh_050364-4* (Attachment 5). The on-column DRO and ORO sample results were less than twice the results in the associated method blank and therefore cannot be reliably attributed to the field samples. Sample results were not negated during validation because the method blank was below the MDL. The patterns in this and other batch samples do not resemble JP-5 fuel or any other common petroleum product, but appear to be due to laboratory artifacts. The DRO and ORO results do not explain the observed sheens in the hot water from this residence but rule out JP-5 or any other common fuel as the source of the sheen. An example JP-5 standard chromatogram is provided in the attached file *JP-5 std from DA60154 jbphh_050364-5* (Attachment 6) for purposes of comparison to the sample pattern. The n-alkanes in JP-5 are labeled in red by carbon number.

The attached file *DA60183-3 from DA60183 jbphh_051407* (Attachment 7) provides the DRO/ORO quantitation report and chromatogram for the only sample collected from the Address D residence where TPH was detected. Note the quantitation reports provide on-column results whereas the final results in the table above have been corrected for sample volume. The chromatogram exhibits small peaks in the DRO and ORO ranges and some integrated area below the true baseline. A very similar pattern was observed in other TPH samples from this preparatory group and in the associated method blank, although the method blank result was below the MDL. The on-column DRO sample results were less than three times the results in the associated method blank and therefore cannot be reliably attributed to the field samples. Sample results were not negated during validation because the method blank was below the MDL. The associated method blank quantitation report and chromatogram are provided in the attached file *op24673-mb from DA60183 jbphh_051407-2*

(Attachment 8).The patterns in this sample and other batch samples do not resemble JP-5 fuel or any other common petroleum product, but appear to be due to laboratory artifacts. The DRO and ORO results do not explain the observed sheens in the hot water from this residence, but rule out JP-5 or any other common fuel as the source of the sheen.

The attached files *DA60184-2 from DA60184 jbphh_051409* (Attachment 9) and *DA60184-3 from DA60184 jbphh_051409-2* (Attachment 10) include the DRO/ORO quantitation reports and chromatograms for samples collected from the Address C residence with TPH detections. Note the quantitation reports provide on-column results whereas the final results in the table above have been corrected for sample volume. The chromatograms exhibit small peaks in the DRO and ORO ranges and some integrated area below the true baseline. A very similar pattern was observed in other TPH samples from this preparatory group and in the associated method blank. The on-column DRO sample results were less than three times the results in the associated method blank and therefore cannot be reliably attributed to the field samples. Sample results were not negated during validation because the method blank was below the MDL. The associated method blank quantitation report and chromatogram are provided in the attached file *op24673-mb from DA60183 jbphh_051407-2* (Attachment 8).The patterns in this sample and other batch samples do not resemble JP-5 fuel or any other common petroleum product, but appear to be due to laboratory artifacts. The DRO and ORO results do not explain the observed sheens in the hot water from this residence, but rule out JP-5 or any other common fuel as the source of the sheen.

The attached file *DA60212-2 from DA60212 jbphh_051411-2* (Attachment 11) provides the DRO/ORO quantitation report and chromatogram for the only sample collected from the Address A residence where TPH was detected. Note the quantitation reports provide on-column results whereas the final results in the table above have been corrected for sample volume. The chromatogram exhibits small peaks in the DRO and ORO ranges and some integrated area below the true baseline. A very similar pattern was observed in other TPH samples from this preparatory group and in the associated method blank. The on-column DRO sample results were less than twice the values in the associated method blank and therefore cannot be reliably attributed to the field samples. Sample results were not negated during validation because the method blank was below the MDL. The associated method blank quantitation report and chromatogram are provided in the attached file *op24673-mb from DA60183 jbphh_051407-2* (Attachment 8).The patterns in this and other batch samples do not resemble JP-5 fuel or any other common petroleum product, but appear to be due to laboratory artifacts. The DRO and ORO results do not explain the observed sheens in the hot water from this residence, but rule out JP-5 or any other common fuel as the source of the sheen.

AECOM has evaluated these positive TPH detections based on objectives driven by the DOH proposed threshold of 91µg/L. AECOM has concluded that the positive results are due to a combination of lower laboratory reporting limits, intermittent laboratory contamination or sample carryover, and variations in analyst integration techniques. None of the reported DRO results can be reliably attributed to the drinking water field samples because they are not significantly different than the associated laboratory method blanks. The patterns in this and other batch samples do not resemble JP-5 fuel or any other common petroleum product, but appear to be due to laboratory artifacts. The DRO and ORO results do not explain the observed sheens in the hot water from these residences, but rule out JP-5 or any other common fuel as the source of the sheen.

In conclusion, the organic compounds reported as TPH-DRO and TPH-ORO in the samples described above:

- appear to be due to possible laboratory artifacts;
- are not attributable to JP-5 or any other common petroleum products, and;
- do not explain the observed hot water sheens.

Questions regarding this letter should be addressed to [redacted] at [redacted]

Yours sincerely,

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Attachments

Attachment 1: *Procedure for Chromatographic Interpretation*
Attachment 2: *DA60154-1 from DA60154 jbphh_050364*
Attachment 3: *DA60154-2 from DA60154 jbphh_050364-2*
Attachment 4: *DA60154-3 from DA60154 jbphh_050364-3*
Attachment 5: *op24665-mb from DA60154 jbphh_050364-4*
Attachment 6: *JP-5 std from DA60154 jbphh_050364-5*
Attachment 7: *DA60183-3 from DA60183 jbphh_051407*
Attachment 8: *op24673-mb from DA60183 jbphh_051407-2*
Attachment 9: *DA60184-2 from DA60184 jbphh_051409*
Attachment 10: *DA60184-3 from DA60184 jbphh_051409-2*
Attachment 11: *DA60212-2 from DA60212 jbphh_051411-2*

cc: [redacted], NAVFAC

Attachment 1:

Procedure for Chromatographic Interpretation

Chromatographic Interpretation of
Diesel Range Organics (DRO) and Oil Range Organics (ORO) Detections
Drinking Water Long-Term Monitoring

Procedure followed when a sample result is greater than 100 ug/L for individual TPH component or greater than 200 ug/L for Total TPH

Gather the following chromatograms from the sample data package:

1) Sample of interest (with quantitation report)
2) Method blank (with quantitation report)
3) Retention time (RT) marker standard
4) JP-5 standard
5) DRO (Diesel Fuel #2) and ORO (Motor Oil) calibration standards

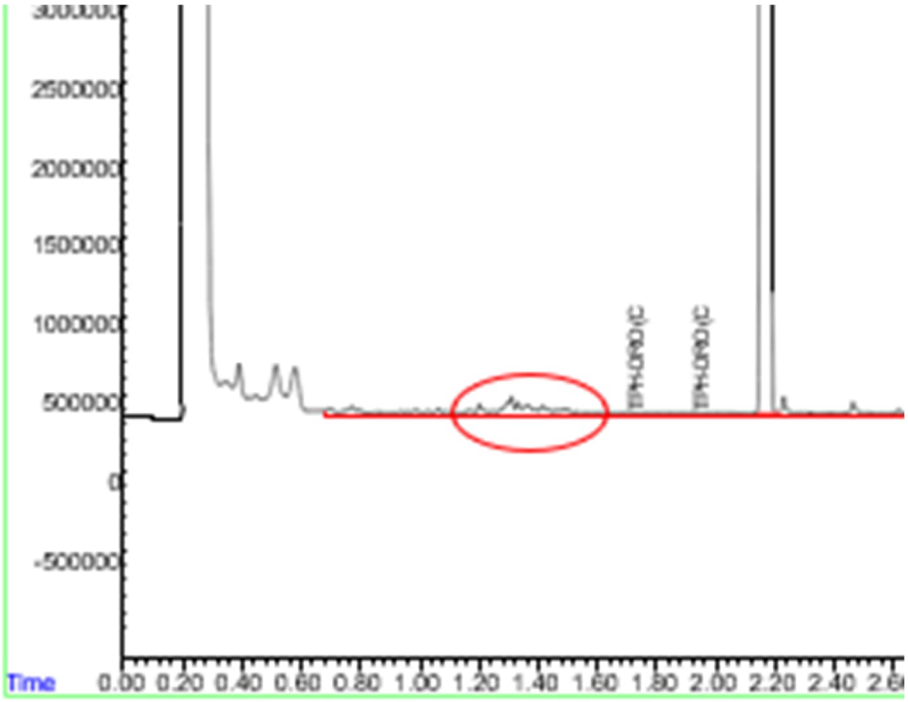
The RT marker, JP-5, DRO, and ORO standards must be analyzed in the same analytical batch as the samples in order to ensure comparability. An analytical batch refers to a group of samples that are analyzed on the same day on the same instrument, under the same operating conditions, and quantitated using the same calibration curve. An analytical batch may include samples from multiple preparation batches. A preparation batch is a group of samples that are prepared together and include a method blank, and blank spike containing known concentrations of the DRO and ORO standards.

Comparison with JP-5, DRO, and ORO Standards

1) Label the carbon numbers of the prominent n-alkanes in the JP-5 and Diesel Fuel #2 standards, using the RT standard provided in the data package as a guide. The laboratory uses fresh JP-5 and Diesel Fuel #2 standards.
2) Examine the sample chromatogram in the RT window corresponding to the first and last n-alkanes identified in the JP-5 and Diesel Fuel standards (C-10 to C-20).
    a. If the RTs of any of the peaks correspond to the n-alkanes identified in either of the standards, label them with the appropriate carbon numbers.
    b. Make note of which alkanes may be present based on RT and those which seem to be missing, e.g., C-12 RT match; no evidence of C-10, C-11, C-13 through C-20.
    c. If none of the n-alkanes are present, it is unlikely that observed peaks are fuel related, particularly if they are not present in a Gaussian shape with an unresolved complex mixture (UCM). If a fuel related hydrocarbon mixture is present, the largest peaks in a given region would be the n-alkanes. Note weathered fuels may have reduced n-alkane abundance, but the UCM hump under the n-alkanes should always be present.
    d. If suspected fuel patterns are identified, the sample data review should be escalated to a forensic specialist. Additional reanalyses at a forensic laboratory may be required.
3) Although JP-5 components do not extend into the ORO range of >C-24 – C-40, compare all peaks in the sample chromatogram with the RTs of the n-alkanes. Discrete peaks are not as evident in the Motor Oil standard, so the RTs from the retention time standard are used as a guide.

Comparison with Method Blank (MB)

1) Review the MB quantitation report to determine if DRO and/or ORO were detected. The quantitation report will include detections that are below the MDL and reported as non-detect by the laboratory as well as concentrations above the MDL that are reported by the laboratory.
2) Compare the concentration of the MB to the samples. Sample results that are within two to three times the concentration in the MB <u>may</u> be entirely attributable to batch contamination. The possibility exists that whatever is present in the MB may also be in the sample so it is important to consider relative concentrations.
3) Review the MB chromatogram, looking for peaks eluting in the same retention time range as the standards.
    a. If the RTs of any of the peaks correspond to the n-alkanes identified in the reference standards, label the carbon numbers.
    b. Look for distinguishable peak patterns. For example, many method blanks have been found to contain the following grouping of peaks falling roughly between 1.04 and 1.56 minutes.

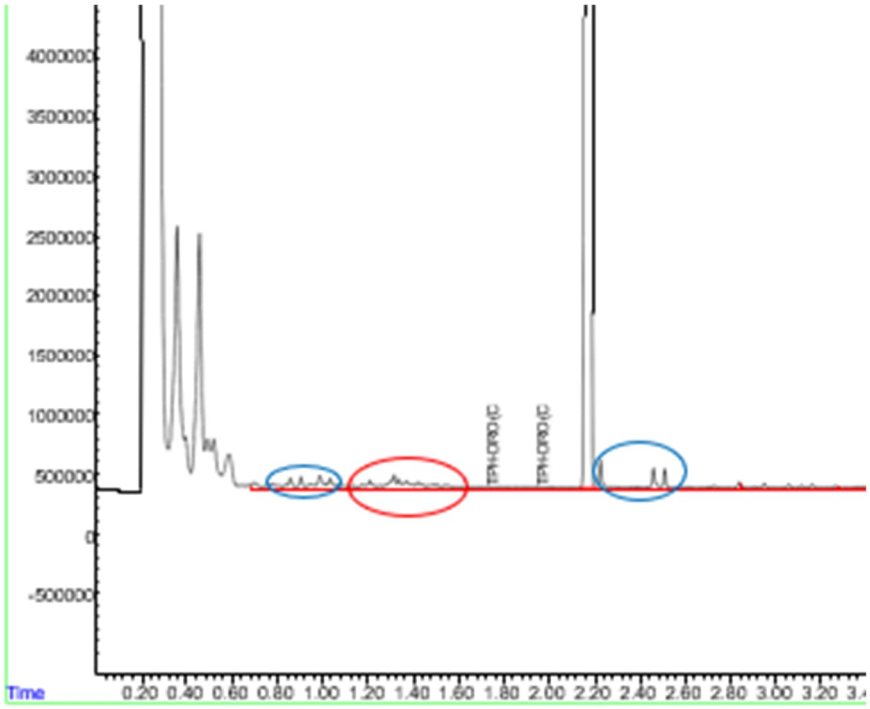


(Note that retention times are specific to a given instrument under a particular set of operating conditions. It is essential that all comparisons of retention times and patterns be done under identical conditions.)

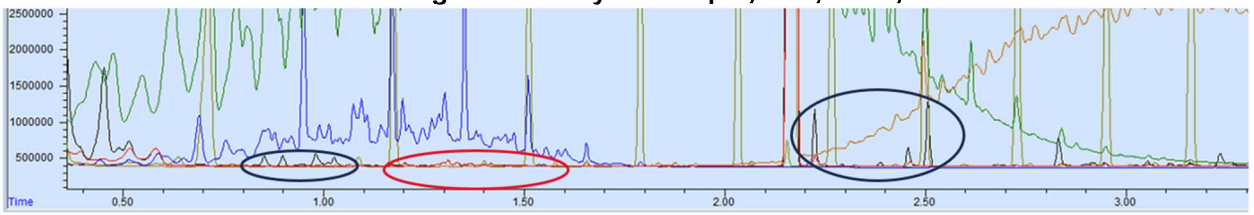
c. Look for the same pattern in the associated samples. While it is not possible to determine the areas of individual portions of the chromatograms from the data package, a rough assessment of the relative magnitude can be made. The pattern noted above has been identified in both MBs and samples and is believed to be a laboratory artifact. If this pattern had been unique to the samples it would be more likely to have originated from the samples.

Additional Qualitative Assessment

1) Review the sample chromatograms looking for distinct peaks or groupings of peaks as discussed in the MB evaluation, above.
2) If found, look to see if the same peaks/patterns are present in the chromatograms of other samples prepared and analyzed in the same batch. Note that a batch may contain samples reported in multiple sample delivery groups (SDGs). All samples from the batch should be reviewed.
3) Identical peak patterns of similar magnitude found in multiple samples from the same batch, particularly if they include samples collected from different areas of the site, suggest that the source is the laboratory rather than the field sample. DRO detections were reported in over 85% of a recent group of samples. All sample chromatograms contained the three peak patterns identified below, with the middle one present in the method blanks as well. Since none of the peak RTs matched the standards, and the pattern was common to all samples, AECOM concluded that the reported DRO concentrations were not fuel related but were due to laboratory artifacts.



Chromatogram Overlay of Sample, JP5, DRO, ORO and Method Blank



Black = Sample
Yellow = RT Marker
Blue = JP5
Green = DRO
Orange = ORO
Red = MB

Attachment 2:

DA60154-1 from DA60154 jbphh_050364

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112223\
Data File : FH069719.D
Signal(s) : FID1A.ch
Acq On : 22 Nov 2023 1:53 pm
Operator : jackb
Sample : da60154-1
Misc : OP24665,GFH23761,1000,,,1,1
ALS Vial : 12 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 22 14:54:50 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	o-Terphenyl	2.228f	836037343	1616.608	ug/ml
	Target Compounds				
2) H	TPH-DRO (C10-C28)	2.020	41226701	110.993	ug/ml
3) H	TPH-DRO (C10-C24)	1.800	24549143	66.639	ug/ml
4) H	TPH-ORO (>C28-C40)	3.830	10013473	57.285	ug/mlm
5) H	TPH-ORO (>C24-C40)	3.610	23593981	75.944	ug/mlm

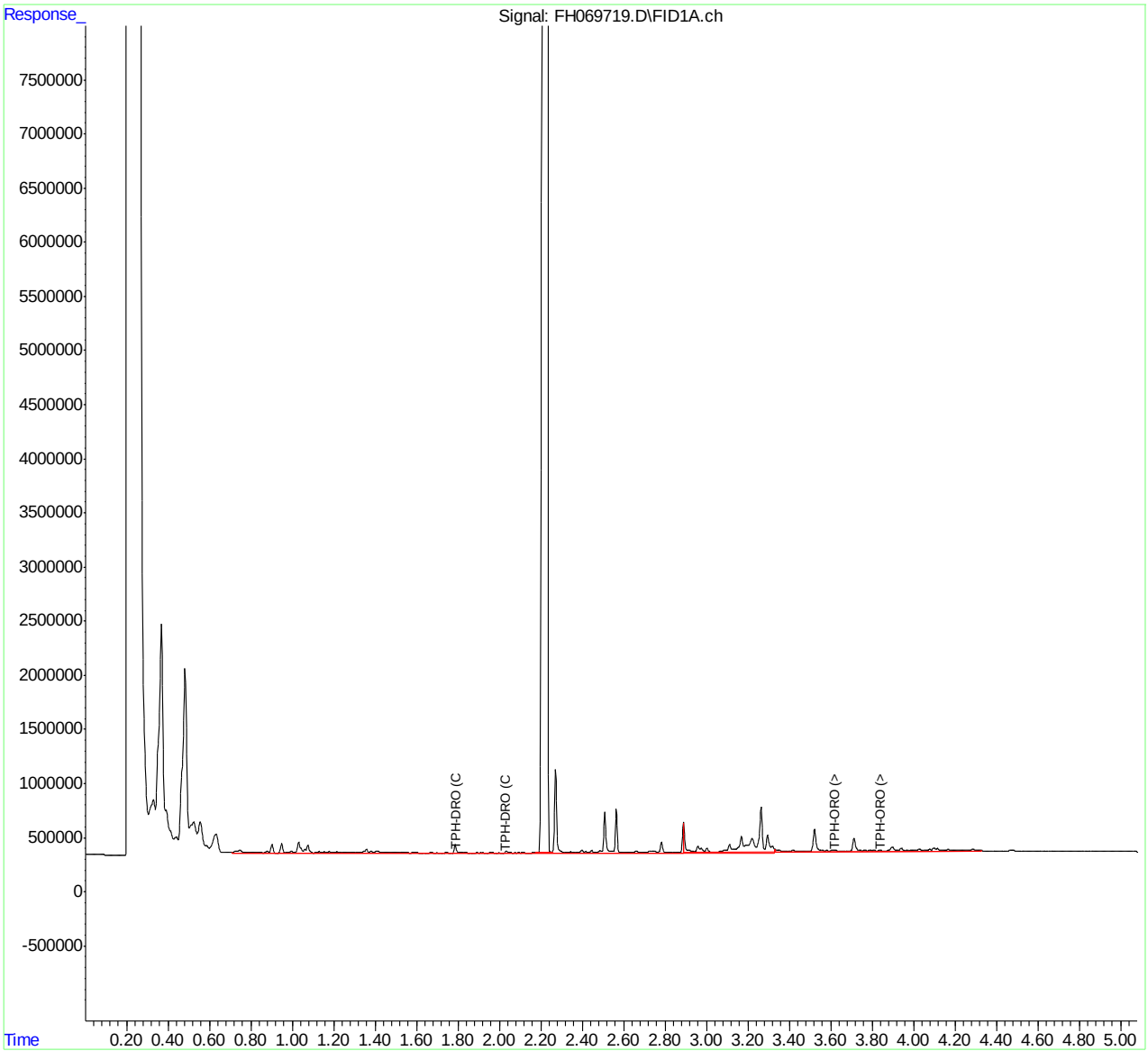
(f)=RT Delta > 1/2 Window (m)=manual int.

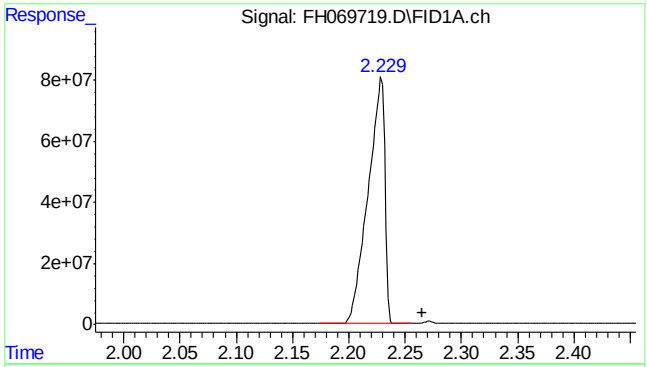
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112223\
Data File : FH069719.D
Signal(s) : FID1A.ch
Acq On : 22 Nov 2023 1:53 pm
Operator : jackb
Sample : da60154-1
Misc : OP24665,GFH23761,1000,,,1,1
ALS Vial : 12 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 22 14:54:50 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

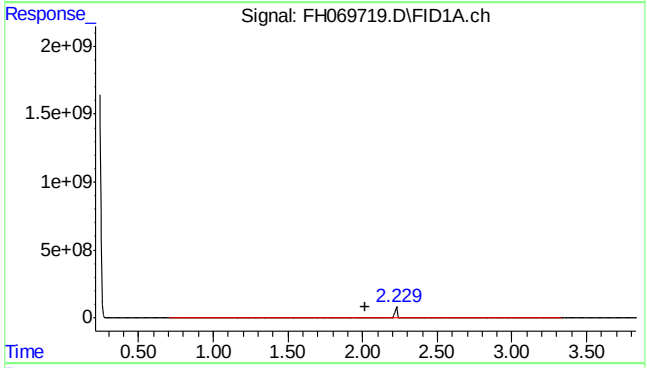
Volume Inj. :
Signal Phase :
Signal Info :





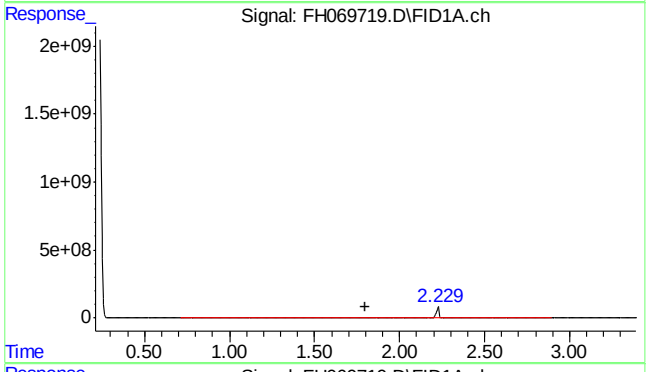
#1 o-Terphenyl

R.T.: 2.228 min
Delta R.T.: -0.037 min
Response: 836037343
Conc: 1616.61 ug/ml



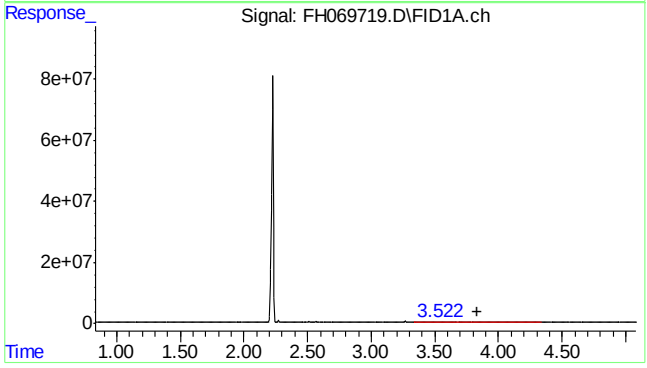
#2 TPH-DRO (C10-C28)

R.T.: 2.020 min
Delta R.T.: 0.000 min
Response: 41226701
Conc: 110.99 ug/ml



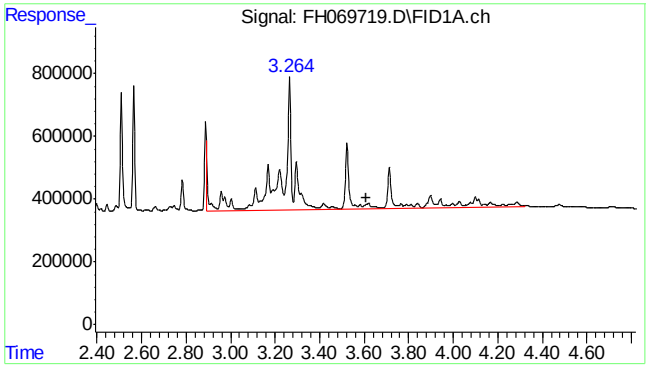
#3 TPH-DRO (C10-C24)

R.T.: 1.800 min
Delta R.T.: 0.000 min
Response: 24549143
Conc: 66.64 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.830 min
Delta R.T.: 0.000 min
Response: 10013473
Conc: 57.28 ug/ml m



#5 TPH-ORO (>C24-C40)

R.T.:	3.610 min
Delta R.T.:	0.000 min
Response:	23593981
Conc:	75.94 ug/ml m

Attachment 3:

DA60154-2 from DA60154 jbphh_050364-2

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112223\
Data File : FH069720.D
Signal(s) : FID1A.ch
Acq On : 22 Nov 2023 2:02 pm
Operator : jackb
Sample : da60154-2
Misc : OP24665,GFH23761,1000,,,1,1
ALS Vial : 13 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 22 14:55:26 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	o-Terphenyl	2.226f	710703449	1374.256	ug/ml
	Target Compounds				
2) H	TPH-DRO (C10-C28)	2.020	32087505	86.388	ug/ml
3) H	TPH-DRO (C10-C24)	1.800	20337487	55.206	ug/ml
4) H	TPH-ORO (>C28-C40)	3.830	7564778	43.276	ug/mlm
5) H	TPH-ORO (>C24-C40)	3.610	17627279	56.739	ug/mlm

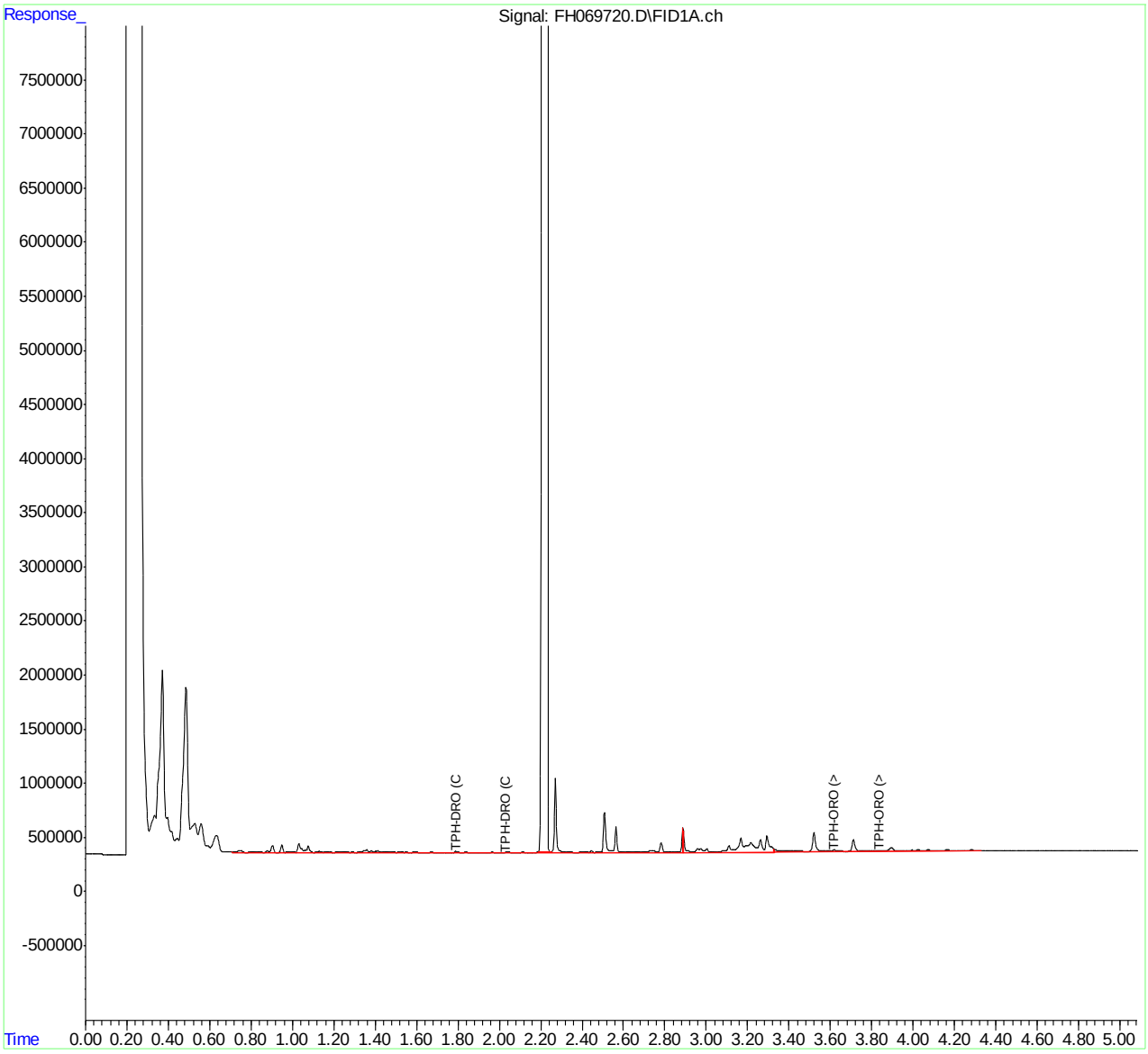
(f)=RT Delta > 1/2 Window (m)=manual int.

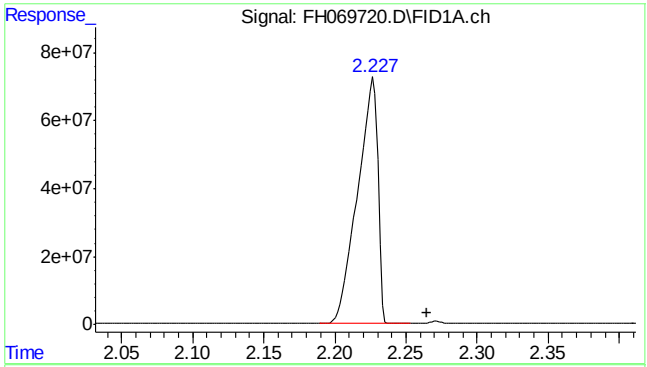
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112223\
Data File : FH069720.D
Signal(s) : FID1A.ch
Acq On : 22 Nov 2023 2:02 pm
Operator : jackb
Sample : da60154-2
Misc : OP24665,GFH23761,1000,,,1,1
ALS Vial : 13 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 22 14:55:26 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

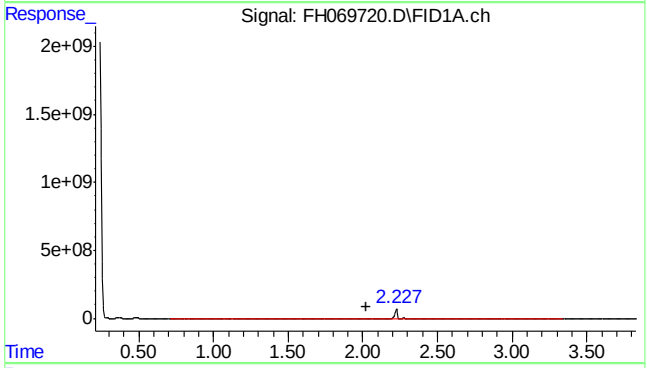
Volume Inj. :
Signal Phase :
Signal Info :





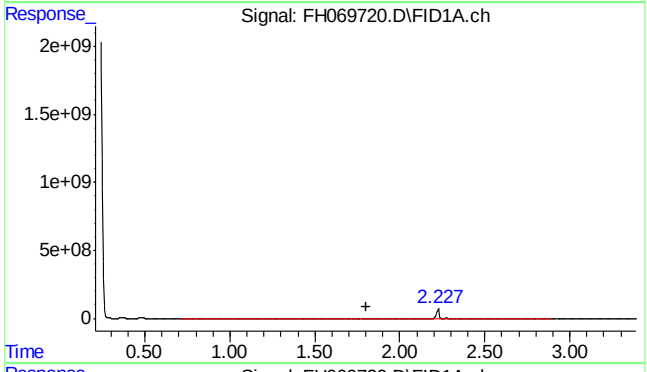
#1 o-Terphenyl

R.T.: 2.226 min
Delta R.T.: -0.039 min
Response: 710703449
Conc: 1374.26 ug/ml



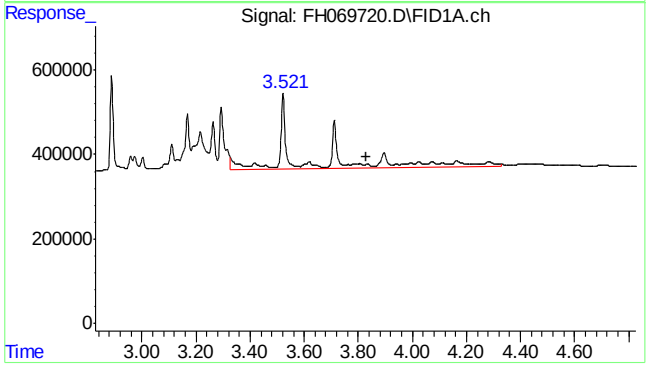
#2 TPH-DRO (C10-C28)

R.T.: 2.020 min
Delta R.T.: 0.000 min
Response: 32087505
Conc: 86.39 ug/ml



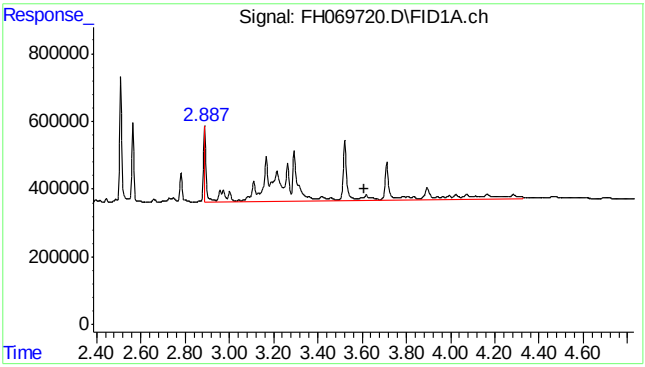
#3 TPH-DRO (C10-C24)

R.T.: 1.800 min
Delta R.T.: 0.000 min
Response: 20337487
Conc: 55.21 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.830 min
Delta R.T.: 0.000 min
Response: 7564778
Conc: 43.28 ug/ml m



#5 TPH-ORO (>C24-C40)

R.T.:	3.610 min
Delta R.T.:	0.000 min
Response:	17627279
Conc:	56.74 ug/ml m

Attachment 4:

DA60154-3 from DA60154 jbphh_050364-3

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112223\
Data File : FH069721.D
Signal(s) : FID1A.ch
Acq On : 22 Nov 2023 2:11 pm
Operator : jackb
Sample : da60154-3
Misc : OP24665,GFH23761,1000,,,1,1
ALS Vial : 14 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 22 14:56:08 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	o-Terphenyl	2.228f	823747109	1592.843	ug/ml
	Target Compounds				
2) H	TPH-DRO (C10-C28)	2.020	34722570	93.482	ug/ml
3) H	TPH-DRO (C10-C24)	1.800	20529269	55.727	ug/ml
4) H	TPH-ORO (>C28-C40)	3.830	11624103	66.499	ug/mlm
5) H	TPH-ORO (>C24-C40)	3.610	25191423	81.086	ug/mlm

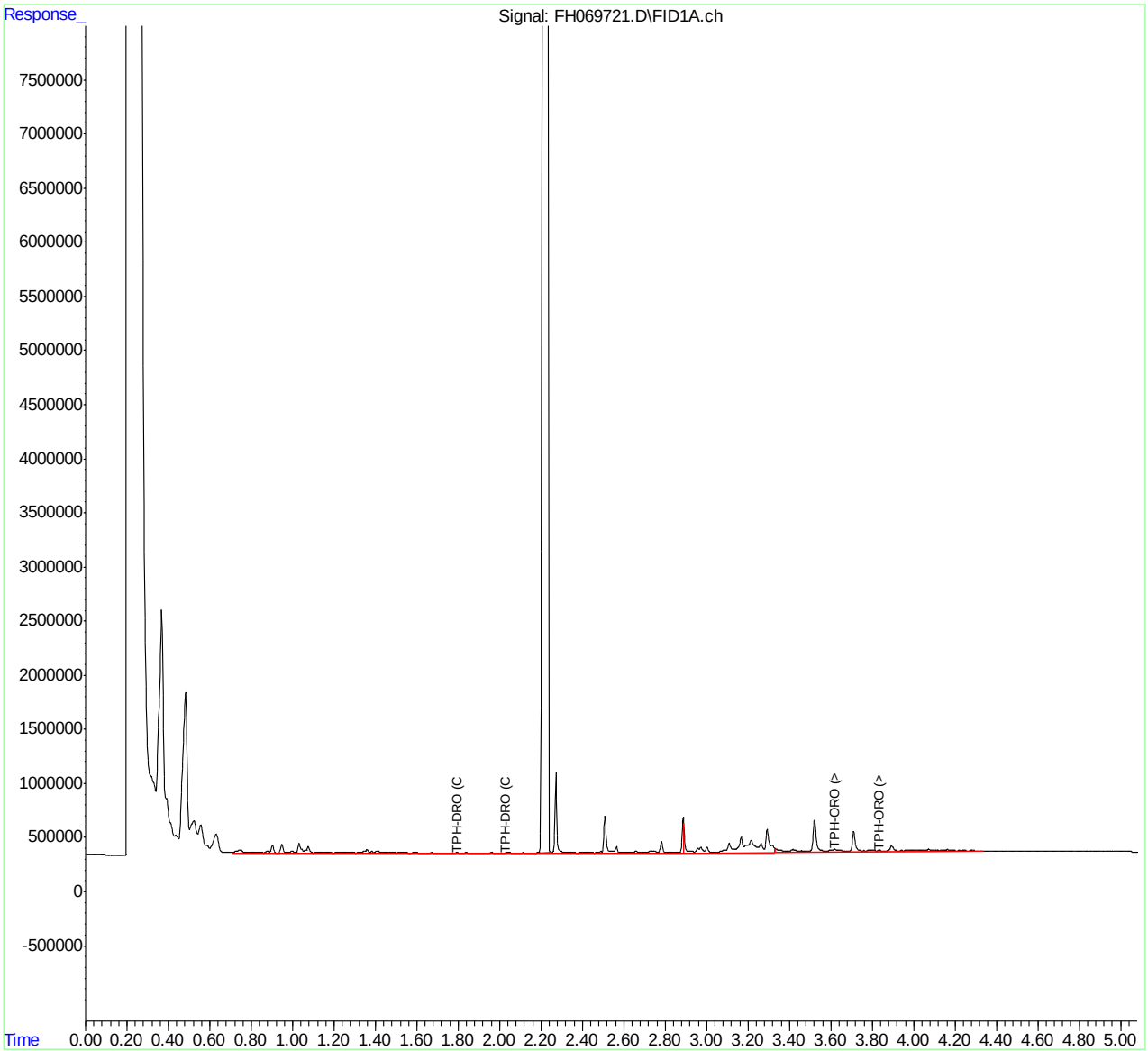
(f)=RT Delta > 1/2 Window (m)=manual int.

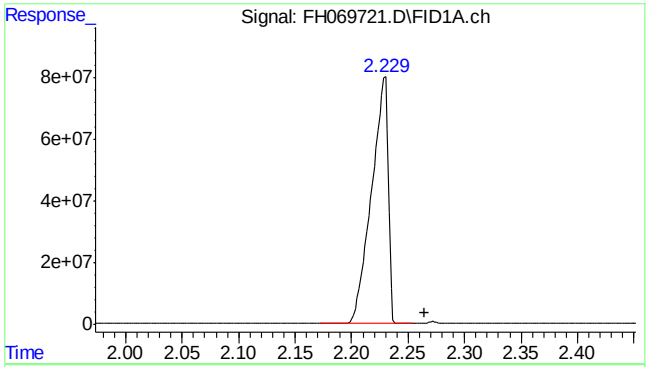
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112223\
Data File : FH069721.D
Signal(s) : FID1A.ch
Acq On : 22 Nov 2023 2:11 pm
Operator : jackb
Sample : da60154-3
Misc : OP24665,GFH23761,1000,,,1,1
ALS Vial : 14 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 22 14:56:08 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

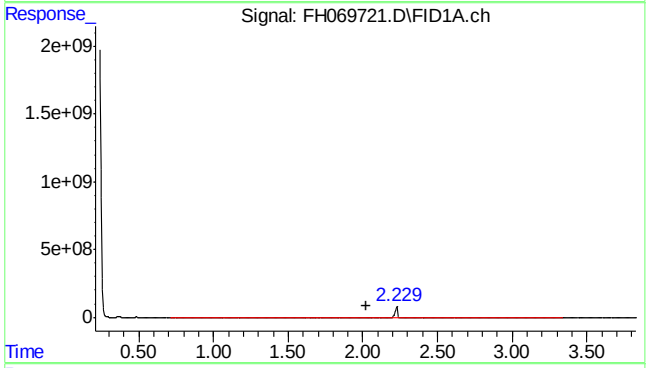
Volume Inj. :
Signal Phase :
Signal Info :





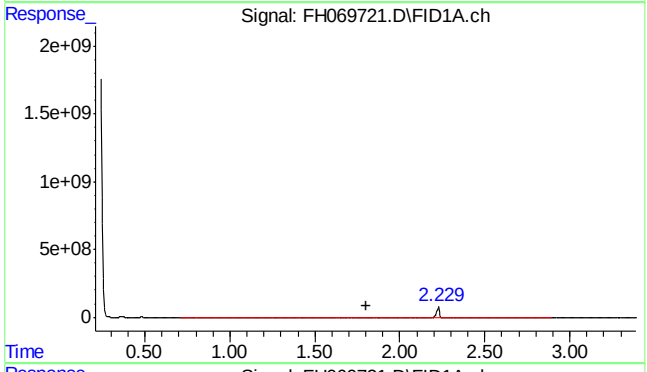
#1 o-Terphenyl

R.T.: 2.228 min
Delta R.T.: -0.037 min
Response: 823747109
Conc: 1592.84 ug/ml



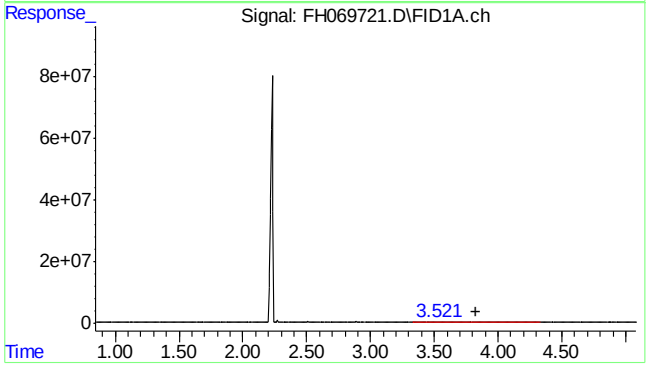
#2 TPH-DRO (C10-C28)

R.T.: 2.020 min
Delta R.T.: 0.000 min
Response: 34722570
Conc: 93.48 ug/ml



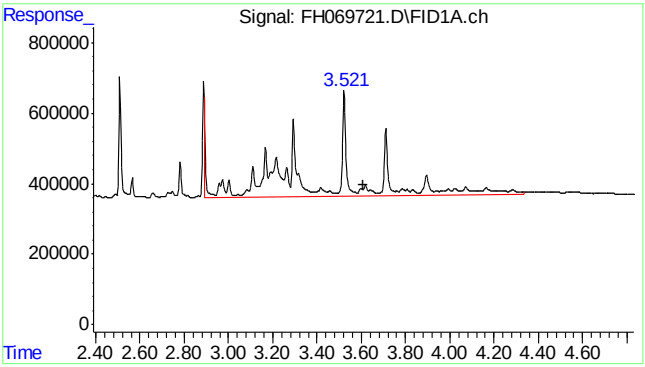
#3 TPH-DRO (C10-C24)

R.T.: 1.800 min
Delta R.T.: 0.000 min
Response: 20529269
Conc: 55.73 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.830 min
Delta R.T.: 0.000 min
Response: 11624103
Conc: 66.50 ug/ml m



#5 TPH-ORO (>C24-C40)

R.T.:	3.610 min
Delta R.T.:	0.000 min
Response:	25191423
Conc:	81.09 ug/ml m

Attachment 5:

op24665-mb from DA60154 jbphh_050364-4

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112223\
Data File : FH069711.D
Signal(s) : FID1A.ch
Acq On : 22 Nov 2023 12:39 pm
Operator : jackb
Sample : op24665-mb
Misc : OP24665,GFH23761,1000,,,1,1
ALS Vial : 4 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 22 12:56:37 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	o-Terphenyl	2.227f	738623598	1428.243	ug/ml
	Target Compounds				
2) H	TPH-DRO (C10-C28)	2.020	20591998	55.439	ug/ml
3) H	TPH-DRO (C10-C24)	1.800	13499112	36.643	ug/ml
4) H	TPH-ORO (>C28-C40)	3.830	5794024	33.146	ug/ml
5) H	TPH-ORO (>C24-C40)	3.610	11063628	35.612	ug/mlm

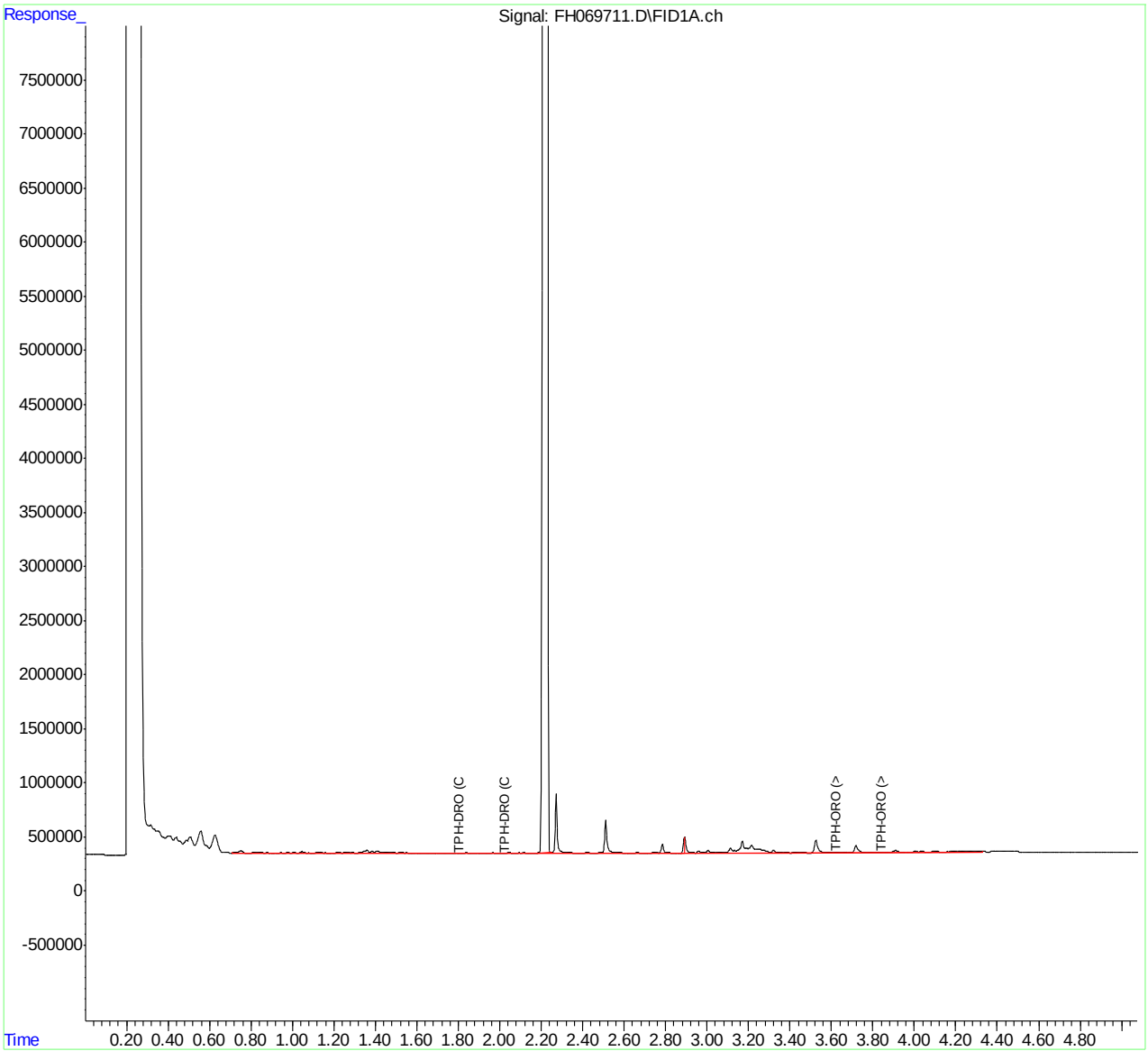
(f)=RT Delta > 1/2 Window (m)=manual int.

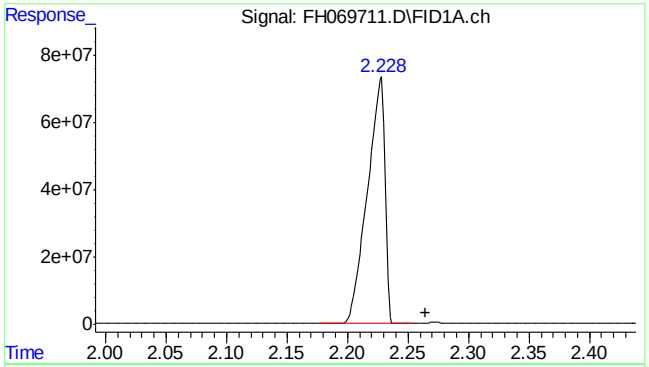
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112223\
Data File : FH069711.D
Signal(s) : FID1A.ch
Acq On : 22 Nov 2023 12:39 pm
Operator : jackb
Sample : op24665-mb
Misc : OP24665,GFH23761,1000,,,1,1
ALS Vial : 4 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 22 12:56:37 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

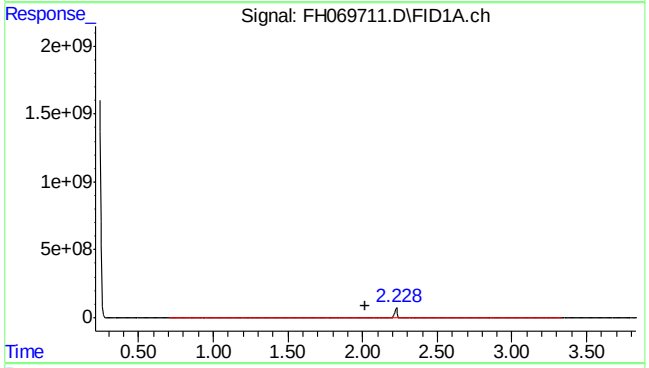
Volume Inj. :
Signal Phase :
Signal Info :





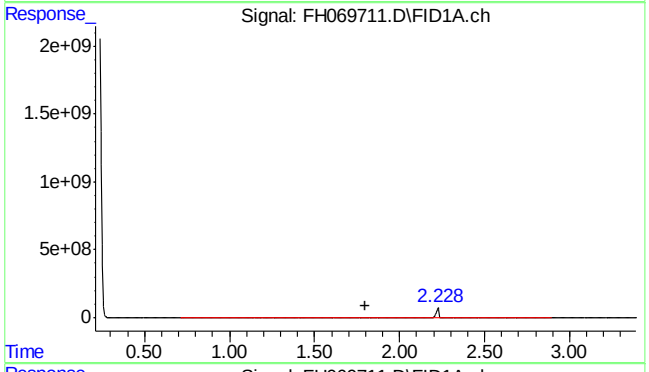
#1 o-Terphenyl

R.T.: 2.227 min
Delta R.T.: -0.038 min
Response: 738623598
Conc: 1428.24 ug/ml



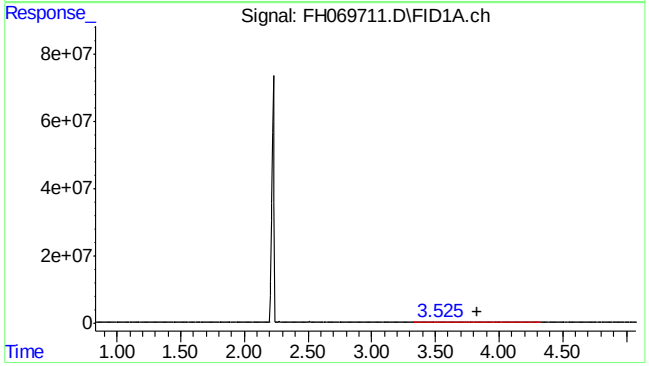
#2 TPH-DRO (C10-C28)

R.T.: 2.020 min
Delta R.T.: 0.000 min
Response: 20591998
Conc: 55.44 ug/ml



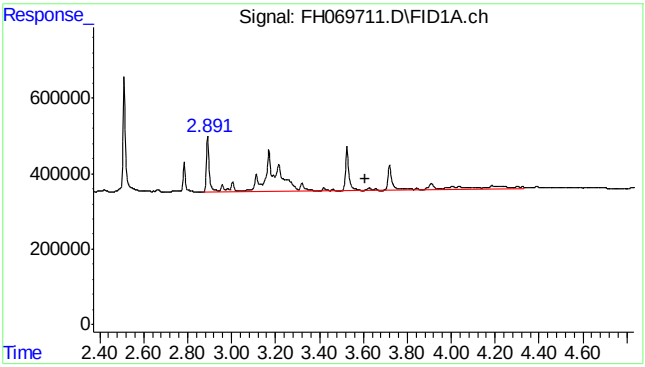
#3 TPH-DRO (C10-C24)

R.T.: 1.800 min
Delta R.T.: 0.000 min
Response: 13499112
Conc: 36.64 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.830 min
Delta R.T.: 0.000 min
Response: 5794024
Conc: 33.15 ug/ml



#5 TPH-ORO (>C24-C40)

R.T.:	3.610 min
Delta R.T.:	0.000 min
Response:	11063628
Conc:	35.61 ug/ml m

Attachment 7:

JP-5 std from DA60154 jbphh_050364-5

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112223\
Data File : FH069706.D
Signal(s) : FID1A.ch
Acq On : 22 Nov 2023 10:06 am
Operator : jackb
Sample : RT JP-05
Misc : OP20000,GFH23761,,,,,1
ALS Vial : 3 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 22 12:30:58 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	0.000	0	N.D.	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	2.020	344799978	928.294	ug/ml
3) H	TPH-DRO (C10-C24)	1.800	333048789	904.060	ug/ml
4) H	TPH-ORO (>C28-C40)	3.830	24185753	138.362	ug/ml
5) H	TPH-ORO (>C24-C40)	3.610	35465575	114.156	ug/ml

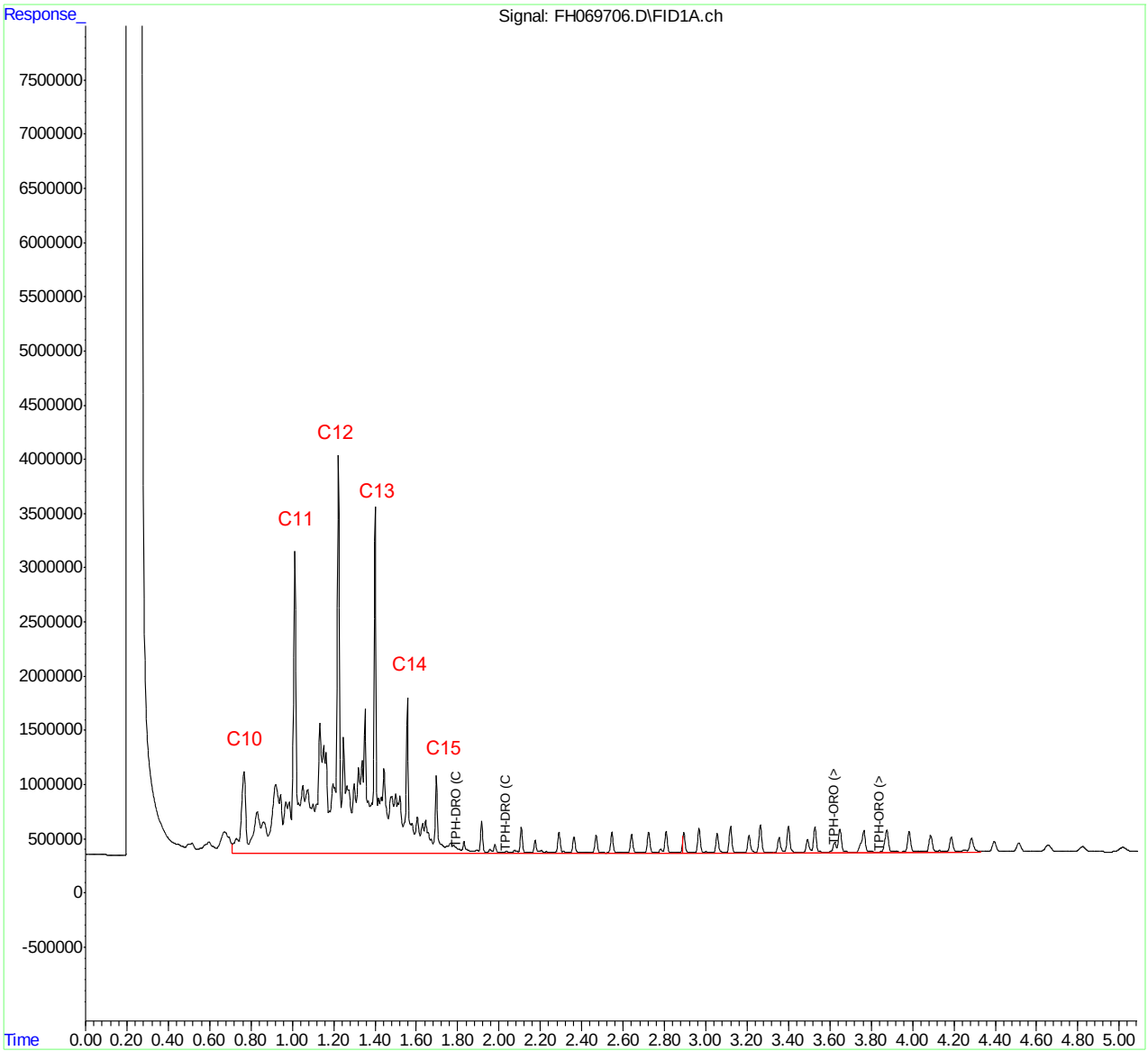
(f)=RT Delta > 1/2 Window (m)=manual int.

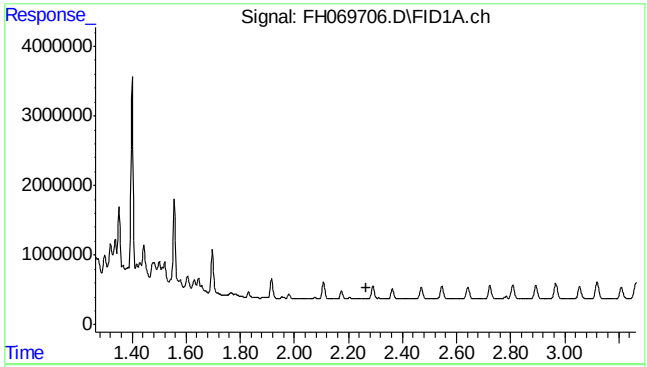
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112223\
Data File : FH069706.D
Signal(s) : FID1A.ch
Acq On : 22 Nov 2023 10:06 am
Operator : jackb
Sample : RT JP-05
Misc : OP20000,GFH23761,,,,,1
ALS Vial : 3 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 22 12:30:58 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

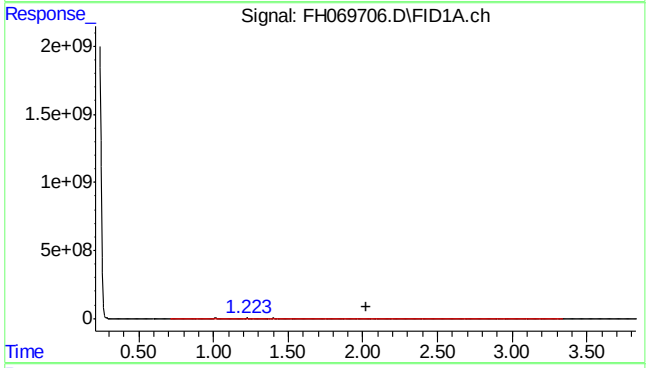
Volume Inj. :
Signal Phase :
Signal Info :





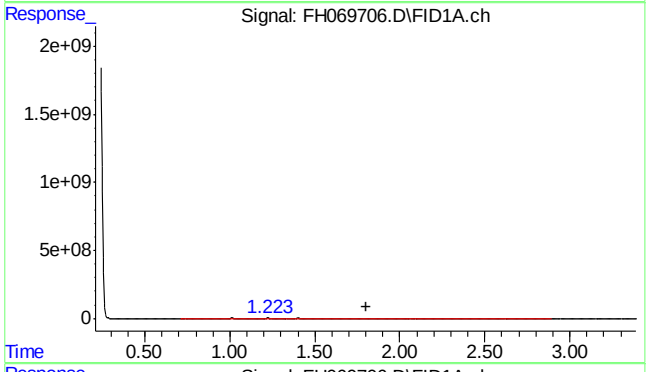
#1 o-Terphenyl

R.T.: 0.000 min
Exp R.T. : 2.265 min
Response: 0
Conc: N.D.



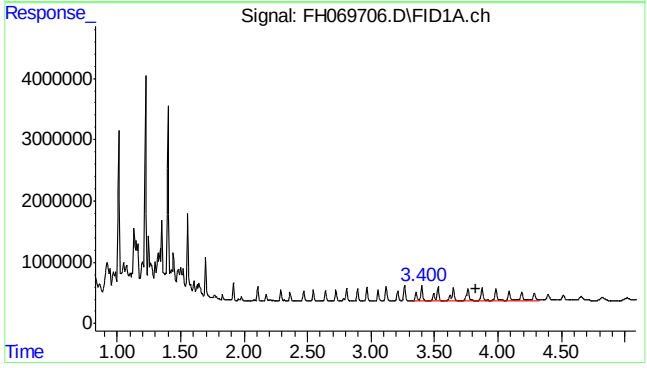
#2 TPH-DRO (C10-C28)

R.T.: 2.020 min
Delta R.T.: 0.000 min
Response: 344799978
Conc: 928.29 ug/ml



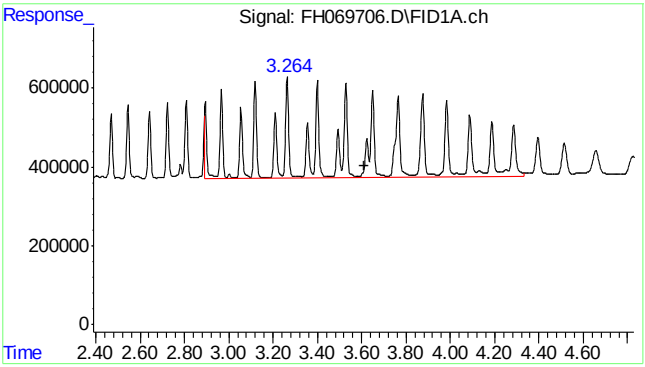
#3 TPH-DRO (C10-C24)

R.T.: 1.800 min
Delta R.T.: 0.000 min
Response: 333048789
Conc: 904.06 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.830 min
Delta R.T.: 0.000 min
Response: 24185753
Conc: 138.36 ug/ml



#5 TPH-ORO (>C24-C40)

R.T.:	3.610 min
Delta R.T.:	0.000 min
Response:	35465575
Conc:	114.16 ug/ml

Attachment 7:

DA60183-3 from DA60183 jbphh_051407

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112623\
Data File : FH069750.D
Signal(s) : FID1A.ch
Acq On : 26 Nov 2023 5:26 pm
Operator : jackb
Sample : da60183-3
Misc : OP24673,GFH23762,1010,,,1,1
ALS Vial : 15 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 27 09:59:26 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	o-Terphenyl	2.224f	653918044	1264.452	ug/ml
	Target Compounds				
2) H	TPH-DRO (C10-C28)	2.020	37618888	101.280	ug/ml
3) H	TPH-DRO (C10-C24)	1.800	26272309	71.316	ug/ml
4) H	TPH-ORO (>C28-C40)	3.830	5613492	32.114	ug/mlm
5) H	TPH-ORO (>C24-C40)	3.610	15855728	51.036	ug/mlm

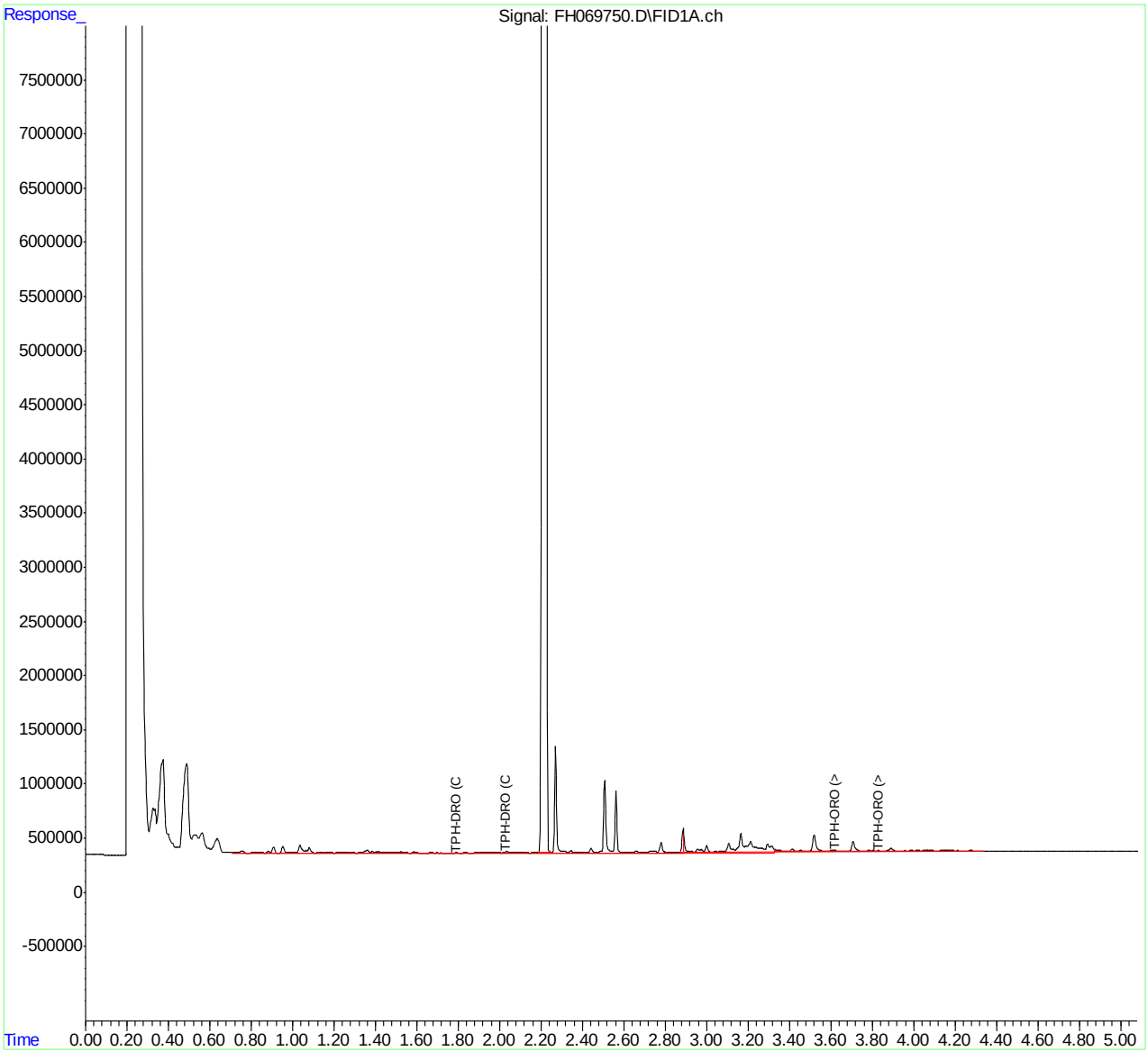
(f)=RT Delta > 1/2 Window (m)=manual int.

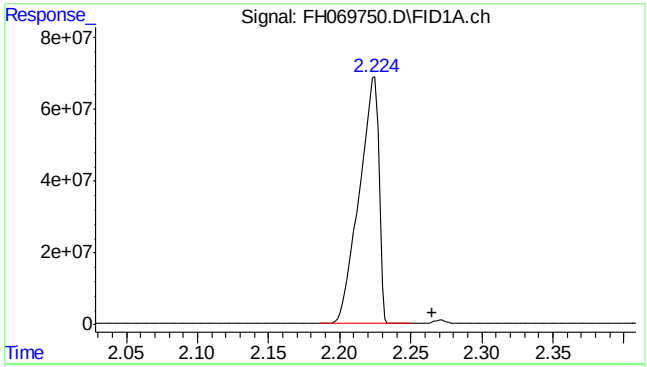
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112623\
Data File : FH069750.D
Signal(s) : FID1A.ch
Acq On : 26 Nov 2023 5:26 pm
Operator : jackb
Sample : da60183-3
Misc : OP24673,GFH23762,1010,,,1,1
ALS Vial : 15 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 27 09:59:26 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

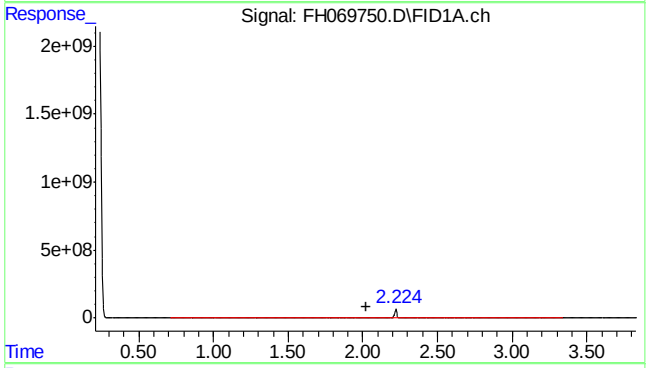
Volume Inj. :
Signal Phase :
Signal Info :





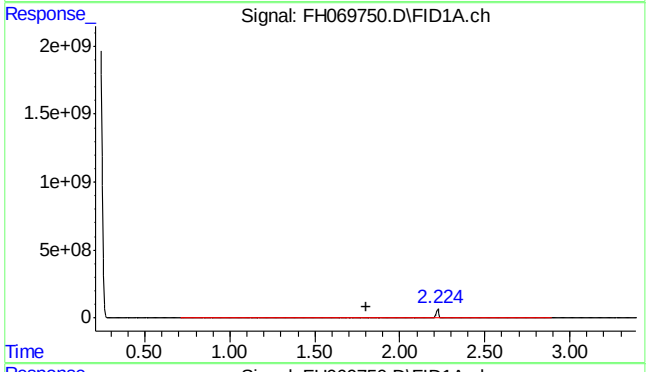
#1 o-Terphenyl

R.T.: 2.224 min
Delta R.T.: -0.041 min
Response: 653918044
Conc: 1264.45 ug/ml



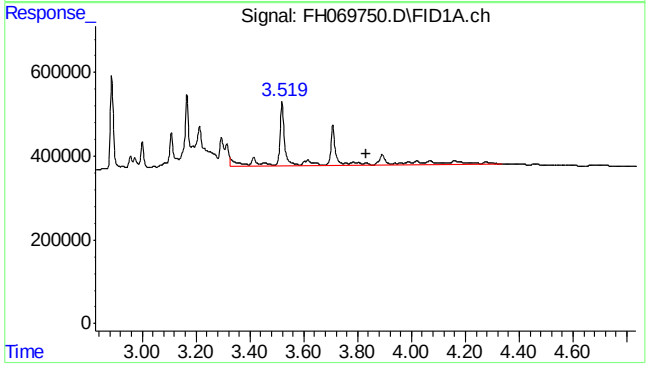
#2 TPH-DRO (C10-C28)

R.T.: 2.020 min
Delta R.T.: 0.000 min
Response: 37618888
Conc: 101.28 ug/ml



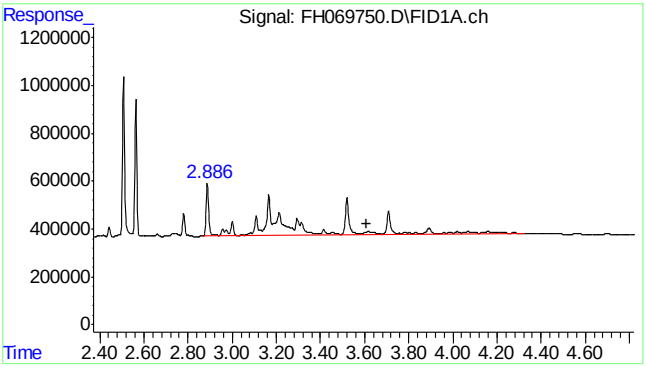
#3 TPH-DRO (C10-C24)

R.T.: 1.800 min
Delta R.T.: 0.000 min
Response: 26272309
Conc: 71.32 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.830 min
Delta R.T.: 0.000 min
Response: 5613492
Conc: 32.11 ug/ml m



#5 TPH-ORO (>C24-C40)

R.T.:	3.610 min
Delta R.T.:	0.000 min
Response:	15855728
Conc:	51.04 ug/ml m

Attachment 8:

op24673-mb from DA60183 jbphh_051407-2

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112623\
Data File : FH069737.D
Signal(s) : FID1A.ch
Acq On : 26 Nov 2023 3:40 pm
Operator : jackb
Sample : op24673-mb
Misc : OP24673,GFH23762,1000,,,1,1
ALS Vial : 4 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 27 09:46:40 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.226f	770710999	1490.289	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	2.020	15933346	42.897	ug/ml
3) H	TPH-DRO (C10-C24)	1.800	10011901	27.177	ug/ml
4) H	TPH-ORO (>C28-C40)	3.830	4164505	23.824	ug/ml
5) H	TPH-ORO (>C24-C40)	3.610	10356322	33.335	ug/ml

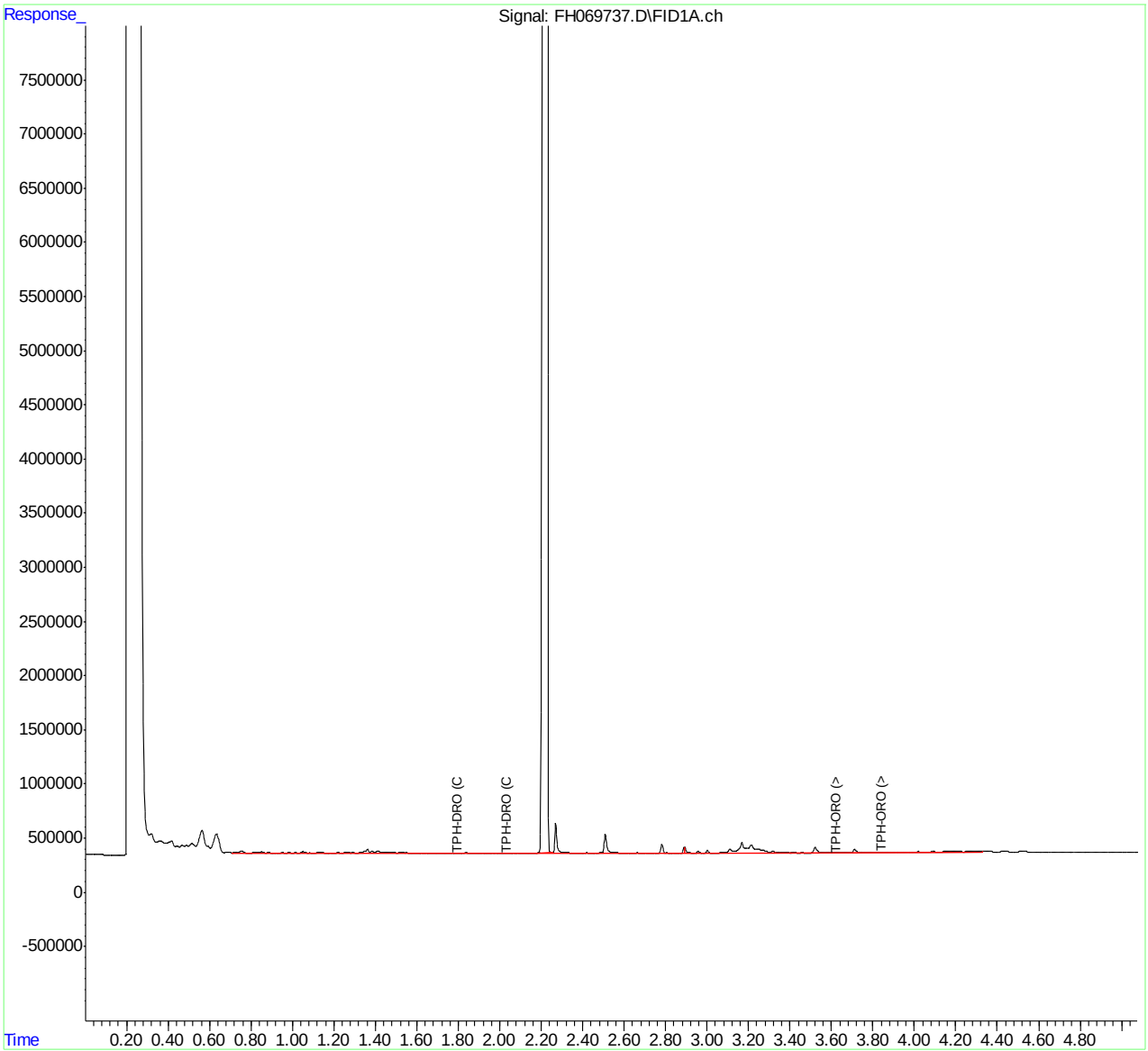
(f)=RT Delta > 1/2 Window (m)=manual int.

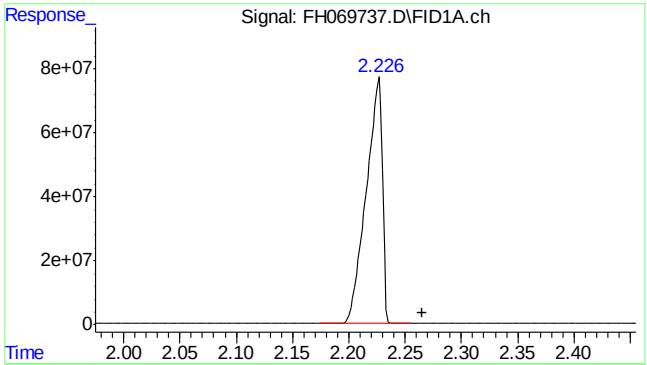
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112623\
Data File : FH069737.D
Signal(s) : FID1A.ch
Acq On : 26 Nov 2023 3:40 pm
Operator : jackb
Sample : op24673-mb
Misc : OP24673,GFH23762,1000,,,1,1
ALS Vial : 4 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 27 09:46:40 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

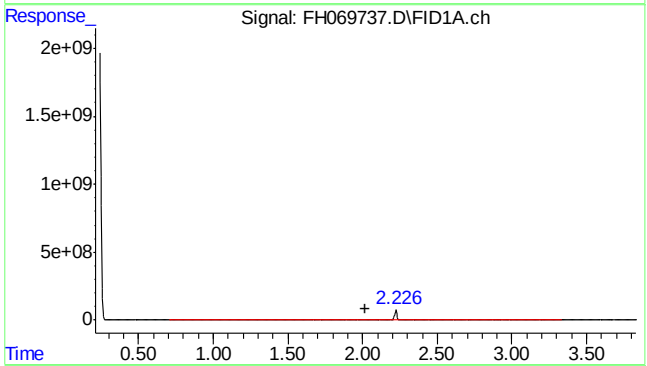
Volume Inj. :
Signal Phase :
Signal Info :





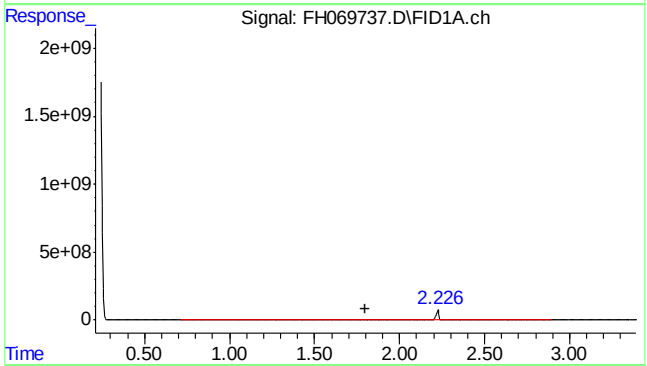
#1 o-Terphenyl

R.T.: 2.226 min
Delta R.T.: -0.039 min
Response: 770710999
Conc: 1490.29 ug/ml



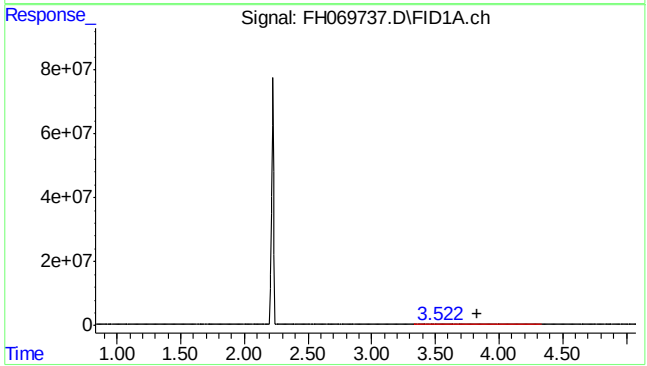
#2 TPH-DRO (C10-C28)

R.T.: 2.020 min
Delta R.T.: 0.000 min
Response: 15933346
Conc: 42.90 ug/ml



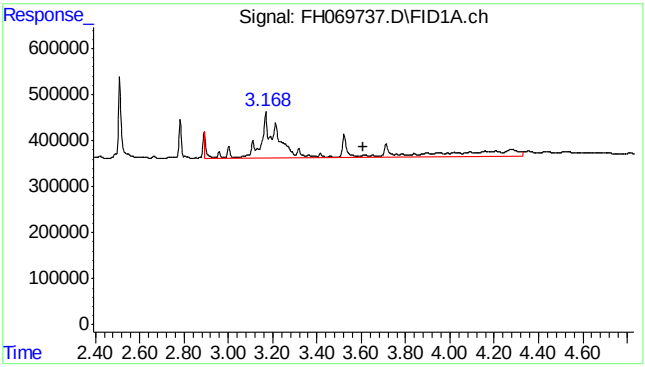
#3 TPH-DRO (C10-C24)

R.T.: 1.800 min
Delta R.T.: 0.000 min
Response: 10011901
Conc: 27.18 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.830 min
Delta R.T.: 0.000 min
Response: 4164505
Conc: 23.82 ug/ml



#5 TPH-ORO (>C24-C40)

R.T.:	3.610 min
Delta R.T.:	0.000 min
Response:	10356322
Conc:	33.33 ug/ml

Attachment 9:

DA60184-2 from DA60184 jbphh_051409

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112623\
Data File : FH069752.D
Signal(s) : FID1A.ch
Acq On : 26 Nov 2023 5:42 pm
Operator : jackb
Sample : da60184-2
Misc : OP24673,GFH23762,1010,,,1,1
ALS Vial : 17 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 27 09:59:48 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	o-Terphenyl	2.223f	568223756	1098.749	ug/ml
	Target Compounds				
2) H	TPH-DRO (C10-C28)	2.020	30242393	81.421	ug/ml
3) H	TPH-DRO (C10-C24)	1.800	17565674	47.682	ug/ml
4) H	TPH-ORO (>C28-C40)	3.830	7892015	45.149	ug/ml
5) H	TPH-ORO (>C24-C40)	3.610	17094854	55.025	ug/mlm

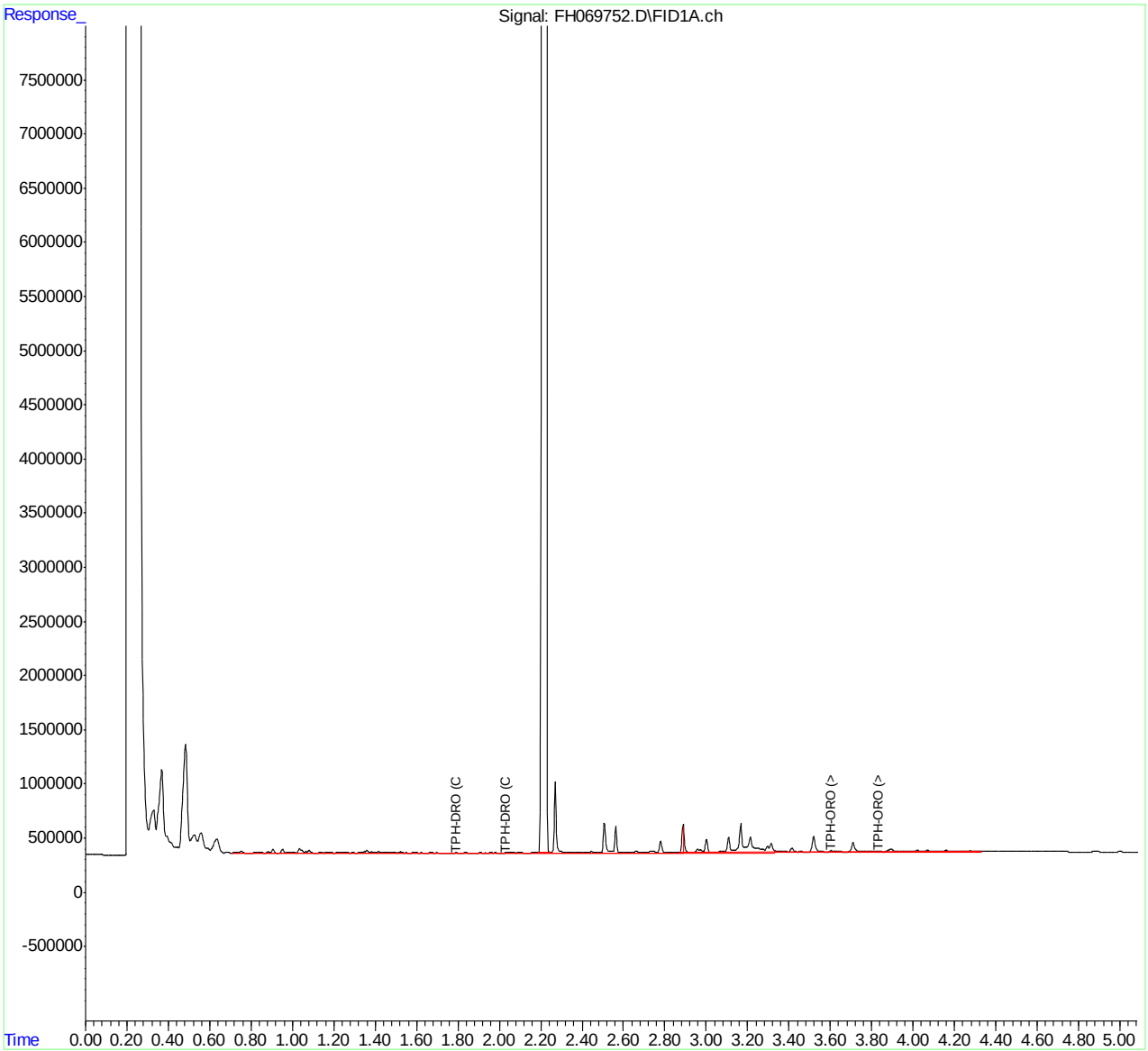
(f)=RT Delta > 1/2 Window (m)=manual int.

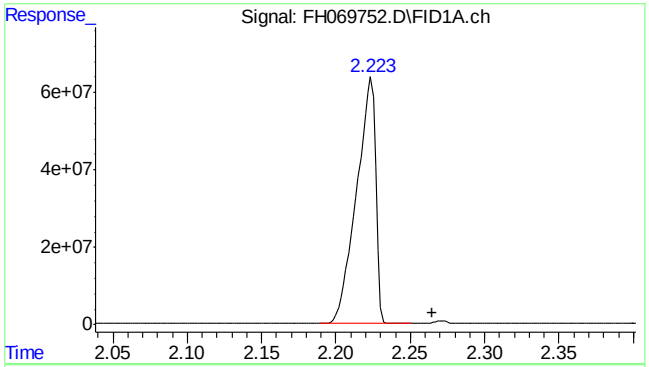
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112623\
Data File : FH069752.D
Signal(s) : FID1A.ch
Acq On : 26 Nov 2023 5:42 pm
Operator : jackb
Sample : da60184-2
Misc : OP24673,GFH23762,1010,,,1,1
ALS Vial : 17 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 27 09:59:48 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

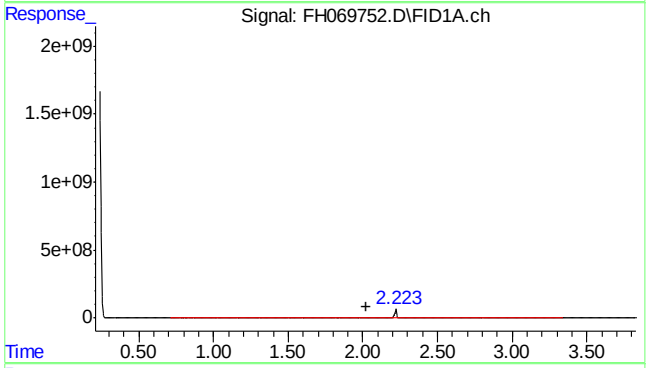
Volume Inj. :
Signal Phase :
Signal Info :





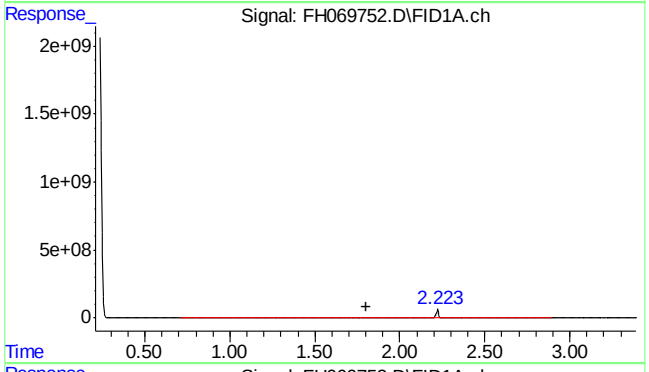
#1 o-Terphenyl

R.T.: 2.223 min
Delta R.T.: -0.042 min
Response: 568223756
Conc: 1098.75 ug/ml



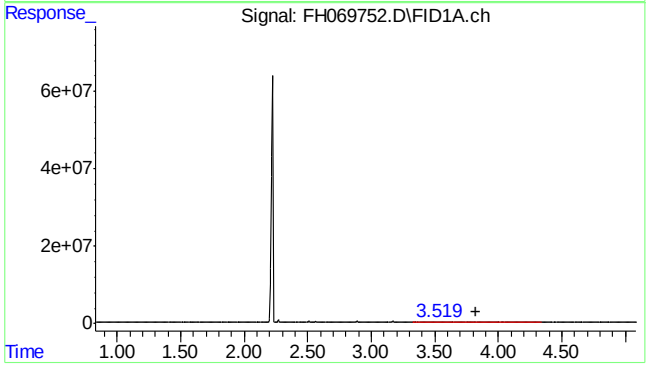
#2 TPH-DRO (C10-C28)

R.T.: 2.020 min
Delta R.T.: 0.000 min
Response: 30242393
Conc: 81.42 ug/ml



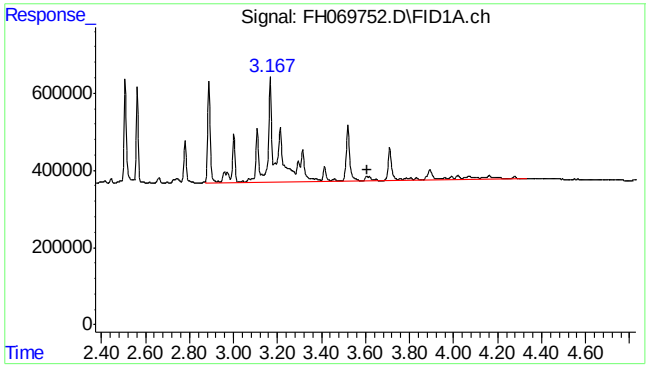
#3 TPH-DRO (C10-C24)

R.T.: 1.800 min
Delta R.T.: 0.000 min
Response: 17565674
Conc: 47.68 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.830 min
Delta R.T.: 0.000 min
Response: 7892015
Conc: 45.15 ug/ml



#5 TPH-ORO (>C24-C40)

R.T.:	3.610 min
Delta R.T.:	0.000 min
Response:	17094854
Conc:	55.02 ug/ml m

Attachment 10:

DA60184-3 from DA60184 jbphh_051409-2

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112623\
Data File : FH069753.D
Signal(s) : FID1A.ch
Acq On : 26 Nov 2023 5:50 pm
Operator : jackb
Sample : da60184-3
Misc : OP24673,GFH23762,1010,,,1,1
ALS Vial : 18 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 27 10:00:12 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	o-Terphenyl	2.225f	774893635	1498.377	ug/ml
	Target Compounds				
2) H	TPH-DRO (C10-C28)	2.020	40577819	109.246	ug/ml
3) H	TPH-DRO (C10-C24)	1.800	26669776	72.395	ug/ml
4) H	TPH-ORO (>C28-C40)	3.830	6984785	39.958	ug/mlm
5) H	TPH-ORO (>C24-C40)	3.610	20043218	64.515	ug/mlm

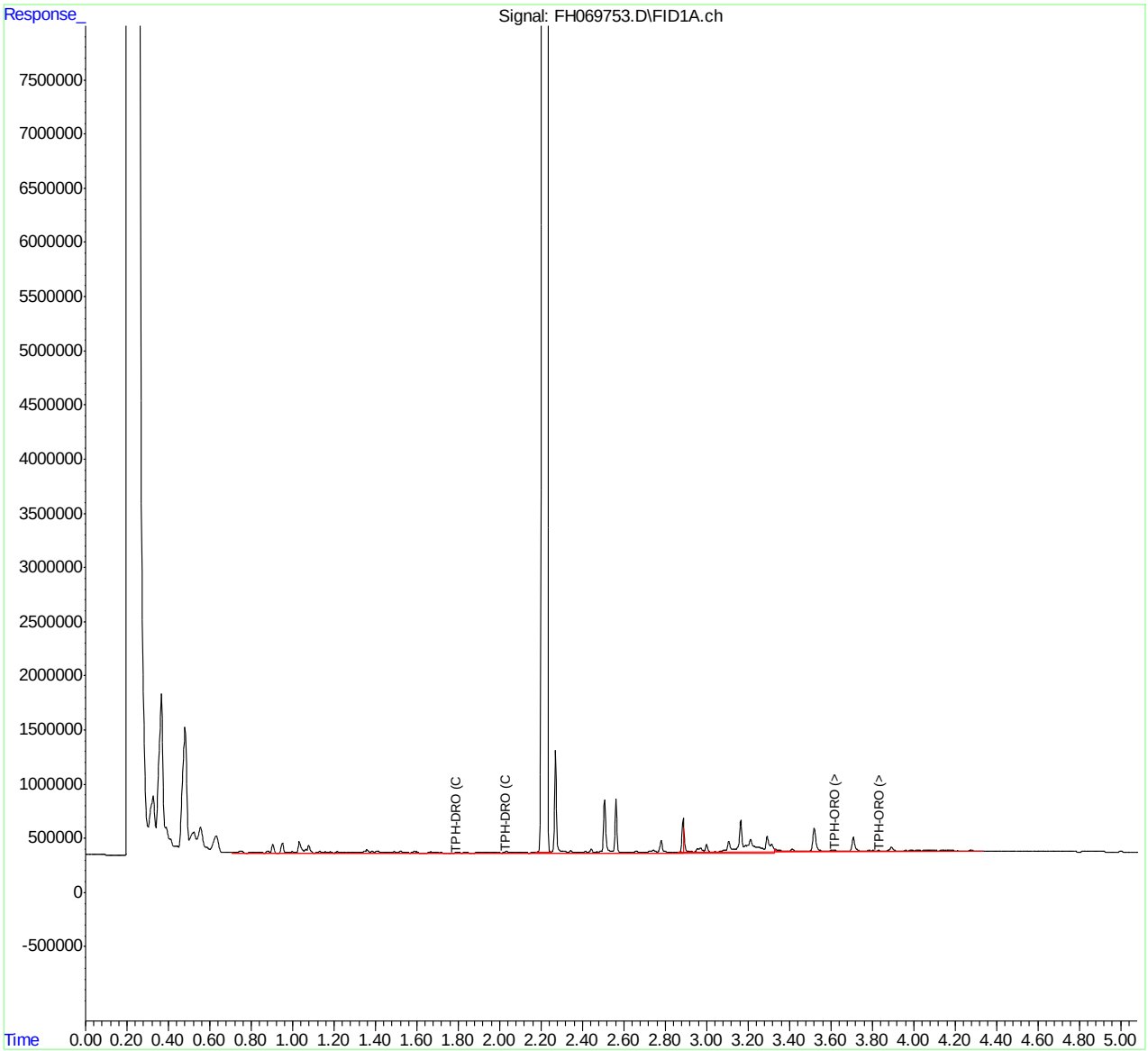
(f)=RT Delta > 1/2 Window (m)=manual int.

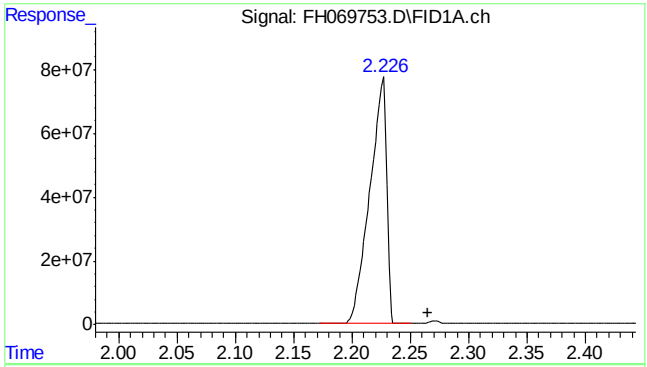
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112623\
Data File : FH069753.D
Signal(s) : FID1A.ch
Acq On : 26 Nov 2023 5:50 pm
Operator : jackb
Sample : da60184-3
Misc : OP24673,GFH23762,1010,,,1,1
ALS Vial : 18 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 27 10:00:12 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

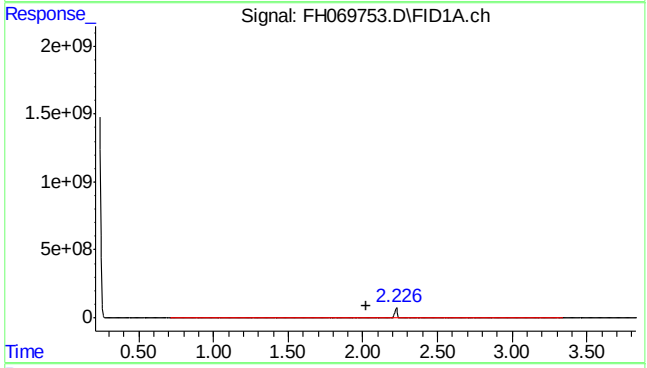
Volume Inj. :
Signal Phase :
Signal Info :





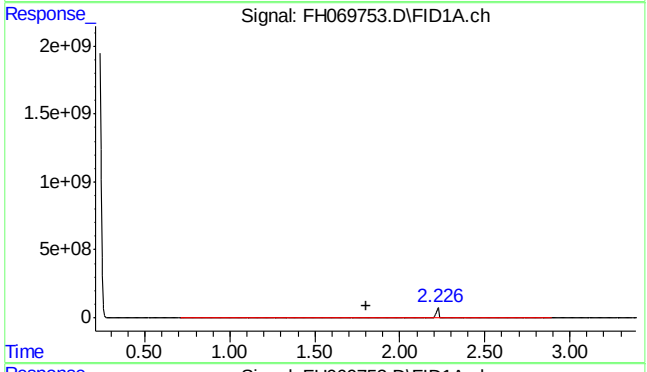
#1 o-Terphenyl

R.T.: 2.225 min
Delta R.T.: -0.040 min
Response: 774893635
Conc: 1498.38 ug/ml



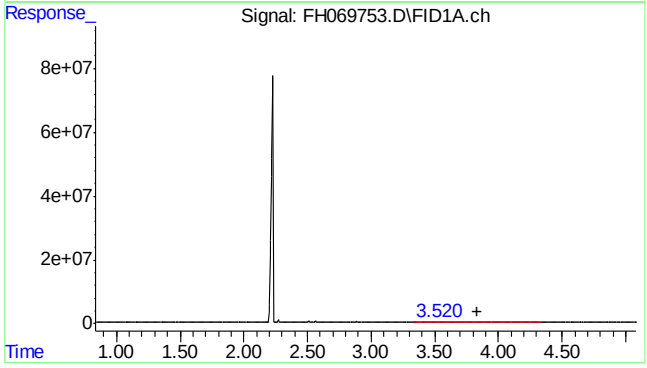
#2 TPH-DRO (C10-C28)

R.T.: 2.020 min
Delta R.T.: 0.000 min
Response: 40577819
Conc: 109.25 ug/ml



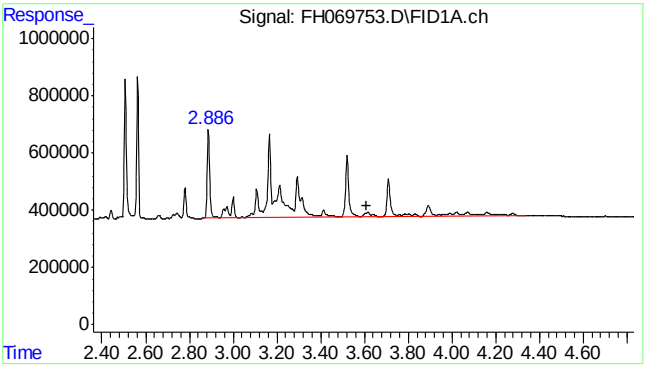
#3 TPH-DRO (C10-C24)

R.T.: 1.800 min
Delta R.T.: 0.000 min
Response: 26669776
Conc: 72.40 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.830 min
Delta R.T.: 0.000 min
Response: 6984785
Conc: 39.96 ug/ml m



#5 TPH-ORO (>C24-C40)

R.T.:	3.610 min
Delta R.T.:	0.000 min
Response:	20043218
Conc:	64.52 ug/ml m

Attachment 11:

DA60212-2 from DA60212 jbphh_051411-2

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112623\
Data File : FH069755.D
Signal(s) : FID1A.ch
Acq On : 26 Nov 2023 6:06 pm
Operator : jackb
Sample : da60212-2
Misc : OP24673,GFH23762,1020,,,1,1
ALS Vial : 20 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 27 10:00:40 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	o-Terphenyl	2.222f	556124756	1075.354	ug/ml
	Target Compounds				
2) H	TPH-DRO (C10-C28)	2.020	29888468	80.468	ug/ml
3) H	TPH-DRO (C10-C24)	1.800	18846950	51.160	ug/ml
4) H	TPH-ORO (>C28-C40)	3.830	6357951	36.372	ug/mlm
5) H	TPH-ORO (>C24-C40)	3.610	17377694	55.935	ug/mlm

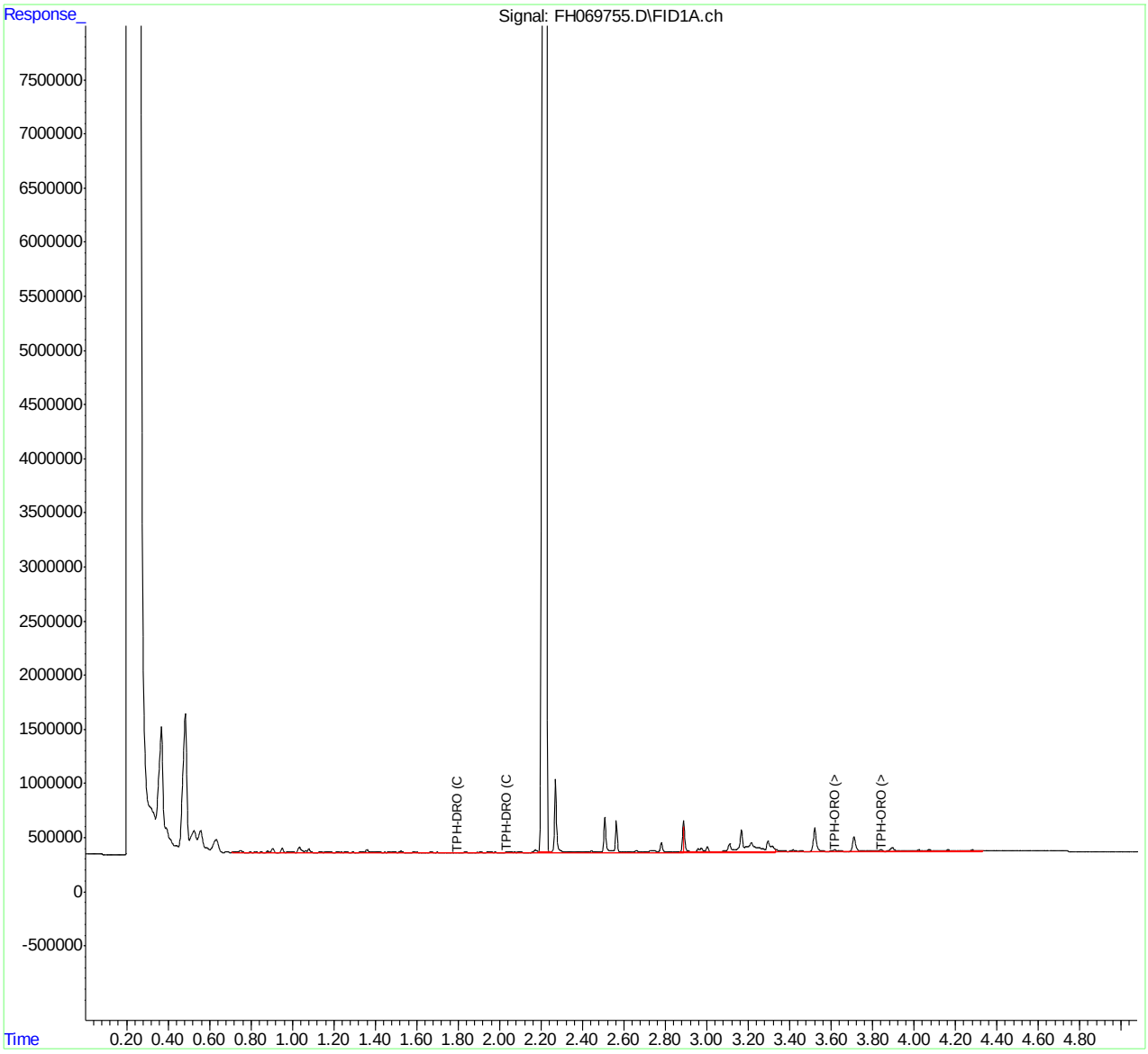
(f)=RT Delta > 1/2 Window (m)=manual int.

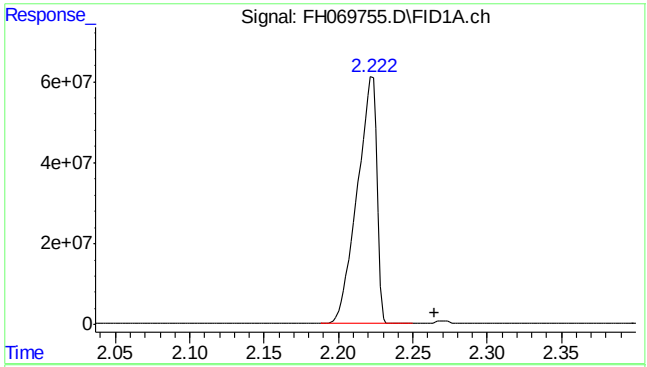
Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\11.23\fh112623\
Data File : FH069755.D
Signal(s) : FID1A.ch
Acq On : 26 Nov 2023 6:06 pm
Operator : jackb
Sample : da60212-2
Misc : OP24673,GFH23762,1020,,,1,1
ALS Vial : 20 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 27 10:00:40 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

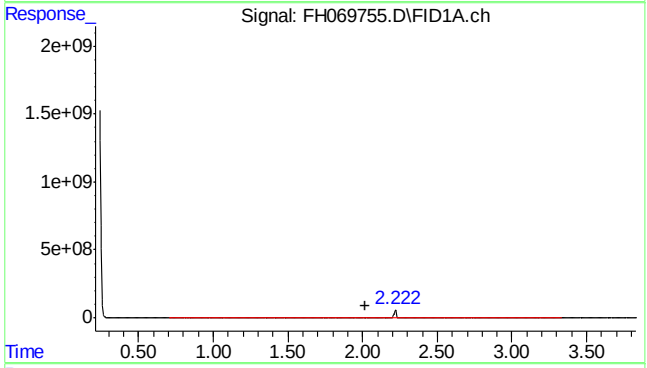
Volume Inj. :
Signal Phase :
Signal Info :





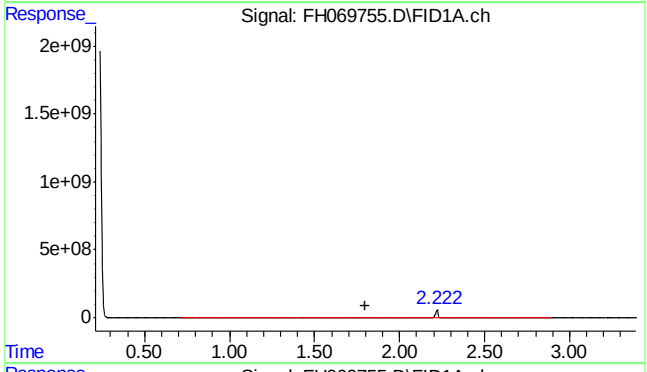
#1 o-Terphenyl

R.T.: 2.222 min
Delta R.T.: -0.043 min
Response: 556124756
Conc: 1075.35 ug/ml



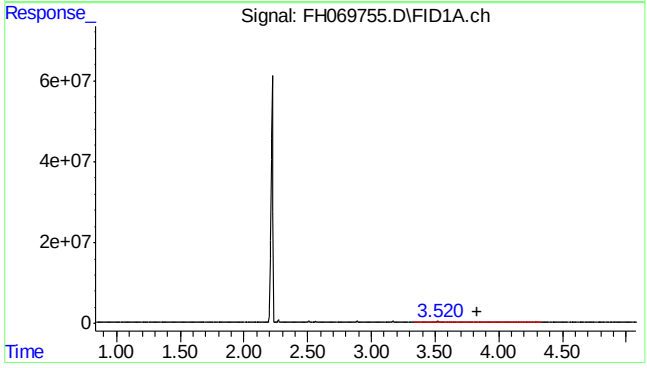
#2 TPH-DRO (C10-C28)

R.T.: 2.020 min
Delta R.T.: 0.000 min
Response: 29888468
Conc: 80.47 ug/ml



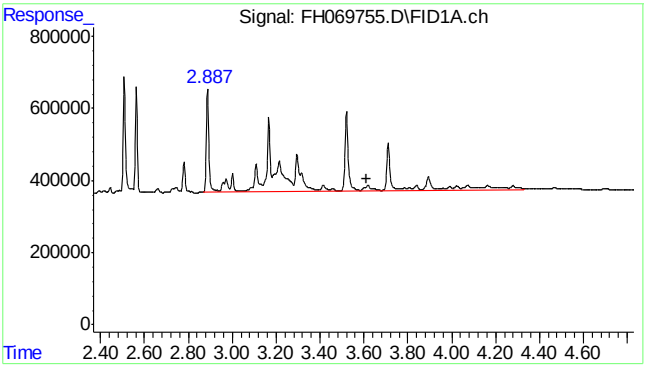
#3 TPH-DRO (C10-C24)

R.T.: 1.800 min
Delta R.T.: 0.000 min
Response: 18846950
Conc: 51.16 ug/ml



#4 TPH-ORO (>C28-C40)

R.T.: 3.830 min
Delta R.T.: 0.000 min
Response: 6357951
Conc: 36.37 ug/ml m



#5 TPH-ORO (>C24-C40)

R.T.:	3.610 min
Delta R.T.:	0.000 min
Response:	17377694
Conc:	55.94 ug/ml m

Appendix N

AECOM Technical Memorandum for Hydrant Samples

AECOM
1001 Bishop Street
Suite 1600
Honolulu, HI 96813
www.aecom.com

February 23, 2024

NAVFAC Hawaii
400 Marshall Road
JBPHH HI 96860-3139

Subject: **Red Hill Bulk Fuel Storage Facility**
LTM TPH Detection Results
Hydrant Samples

Attention [redacted]:

AECOM evaluated the TPH results from a set of 24 hydrants. Samples were collected on December 15, 19, and 20, 2023. None of the detected TPH is attributable to JP-5 or other common fuels. The detected TPH patterns are similar to the associated laboratory method blanks and cannot be reliably attributed to the hydrant samples collected in the field.

The table below summarizes the (TPH-d/DRO) diesel range organics and (TPH-o/ORO) oil range organics results for the samples listed. The chromatographic data for detections were reviewed to determine if the DRO or ORO result could be qualitatively attributed to Jet Propellant 5 (JP-5) or any other common fuel products in the field samples. The procedures used by AECOM to review the chromatograms is detailed in, *"Chromatographic Interpretation of Diesel Range Organics (DRO) and Oil Range Organics (ORO) Detections, Drinking Water Long-Term Monitoring,"* which is provided as Attachment 1 to this document.

SDG	Laboratory Sample ID	Field Sample ID	Location	Analyte	Result	Units
DA60699	DA60699-1	D3-[redacted]	D3-[redacted]	DRO (C10-C24)	ND	µg/L
DA60699	DA60699-1	D3-[redacted]	D3-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60699	DA60699-2	D3-[redacted]	D3-[redacted]	DRO (C10-C24)	57.6	µg/L
DA60699	DA60699-2	D3-[redacted]	D3-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60699	DA60699-3	D3-[redacted]	D3-[redacted]	DRO (C10-C24)	55.9	µg/L
DA60699	DA60699-3	D3-[redacted]	D3-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60699	DA60699-4	D3-[redacted]	D3-[redacted]	DRO (C10-C24)	59.0	µg/L
DA60699	DA60699-4	D3-[redacted]	D3-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60699	DA60699-5	D3-[redacted]	D3-[redacted]	DRO (C10-C24)	58.1	µg/L
DA60699	DA60699-5	D3-[redacted]	D3-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60699	DA60699-6	D3-[redacted]	D3-[redacted]	DRO (C10-C24)	62.8	µg/L
DA60699	DA60699-6	D3-[redacted]	D3-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60775	DA60775-1	D2-[redacted]	D2-[redacted]	DRO (C10-C24)	53.8	µg/L
DA60775	DA60775-1	D2-[redacted]	D2-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60775	DA60775-2	D2-[redacted]	D2-[redacted]	DRO (C10-C24)	52.8	µg/L
DA60775	DA60775-2	D2-[redacted]	D2-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60776	DA60776-1	A2-[redacted]	A2-[redacted]	DRO (C10-C24)	68.2	µg/L
DA60776	DA60776-1	A2-[redacted]	A2-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60776	DA60776-2	A2-[redacted]	A2-[redacted]	DRO (C10-C24)	78.0	µg/L

SDG	Laboratory Sample ID	Field Sample ID	Location	Analyte	Result	Units
DA60776	DA60776-2	A2-[redacted]	A2-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60777	DA60777-1	E1-[redacted]	E1-[redacted]	DRO (C10-C24)	89.0	µg/L
DA60777	DA60777-1	E1-[redacted]	E1-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60777	DA60777-2	E1-[redacted]	E1-[redacted]	DRO (C10-C24)	ND	µg/L
DA60777	DA60777-2	E1-[redacted]	E1-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60778	DA60778-1	A1-[redacted]	A1-[redacted]	DRO (C10-C24)	86.4	µg/L
DA60778	DA60778-1	A1-[redacted]	A1-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60778	DA60778-2	A1-[redacted]	A1-[redacted]	DRO (C10-C24)	99.8	µg/L
DA60778	DA60778-2	A1-[redacted]	A1-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60881	DA60881-1	F2-[redacted]	F2-[redacted]	DRO (C10-C24)	70.5	µg/L
DA60881	DA60881-1	F2-[redacted]	F2-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60881	DA60881-2	F2-[redacted]	F2-[redacted]	DRO (C10-C24)	52.3	µg/L
DA60881	DA60881-2	F2-[redacted]	F2-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60881	DA60881-3	F2-[redacted]	F2-[redacted]	DRO (C10-C24)	58.2	µg/L
DA60881	DA60881-3	F2-[redacted]	F2-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60881	DA60881-4	F2-[redacted]	F2-[redacted]	DRO (C10-C24)	50.5	µg/L
DA60881	DA60881-4	F2-[redacted]	F2-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60881	DA60881-5	F2-[redacted]	F2-[redacted]	DRO (C10-C24)	72.9	µg/L
DA60881	DA60881-5	F2-[redacted]	F2-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60881	DA60881-6	F2-[redacted]	F2-[redacted]	DRO (C10-C24)	ND	µg/L
DA60881	DA60881-6	F2-[redacted]	F2-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60882	DA60882-1	D1-[redacted]	D1-[redacted]	DRO (C10-C24)	64.6	µg/L
DA60882	DA60882-1	D1-[redacted]	D1-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60882	DA60882-2	D1-[redacted]	D1-[redacted]	DRO (C10-C24)	88.0	µg/L
DA60882	DA60882-2	D1-[redacted]	D1-[redacted]	ORO (>C24-C40)	55.9	µg/L
DA60883	DA60883-1	F1-[redacted]	F1-[redacted]	DRO (C10-C24)	64.8	µg/L
DA60883	DA60883-1	F1-[redacted]	F1-[redacted]	ORO (>C24-C40)	ND	µg/L
DA60883	DA60883-2	F1-[redacted]	F1-[redacted]	DRO (C10-C24)	69.1	µg/L
DA60883	DA60883-2	F1-[redacted]	F1-[redacted]	ORO (>C24-C40)	ND	µg/L

µg/L micrograms per liter

ND Not detected above MDL

Attachment 1, *DRO/ORO Detections in Hydrant Samples, Batch OP24766,* and Attachment 2, *DRO/ORO Detections in Hydrant Samples, Batch OP24787* include the DRO/ORO quantitation reports and chromatograms for hydrant samples with detected results and the associated method blanks.

The method blank from batch OP24766 exhibits a pattern of peaks occurring between retention times of approximately 1.16-1.56 minutes and has been circled in red. This peak pattern does not resemble JP-5 fuel or any other common petroleum product and can be assumed to be due to laboratory artifacts because it is present in the method blank. The on-column concentration of DRO in this blank is 39.9 µg/L. Since this concentration is below the MDL of 50 µg/L, it is reported as non-detect by the laboratory and cannot be taken into consideration during validation. However, this identical pattern is observed in each of the hydrant samples analyzed in this batch and appears to be of a similar concentration. If it were allowable to subtract the method blank concentration, the results for all samples in this batch would fall below the MDL and be reported as non-detect.

The method blank and all associated samples from batch OP24787 exhibit the same behavior as those in batch OP24766. In this case, the on-column concentration of DRO in the method blank is 34.9 µg/L, and if it were allowable to subtract the method blank concentration, the results for all samples in this batch except for the samples collected from E1-[redacted], A1-[redacted], A1-[redacted], and D1-[redacted] would fall below the MDL and be reported as non-detect. The results for each of these samples is less than three times the associated blank result and are not significantly different.

There are two distinct sets of peaks in each of the sample chromatograms that do not appear in the blanks and are primarily responsible for driving the reported concentrations above the MDL. These have been circled in blue on the chromatograms. One grouping falls within a window of approximately 0.80-1.04 minutes, and the other within approximately 2.24-2.56 minutes. These peak patterns do not resemble JP-5 fuel or any other common petroleum product but appear to be due to laboratory artifacts that elute within the same retention time range. The precise source of these artifacts is not known, but the consistency of detection in both pattern and magnitude suggests that they may originate in sampling containers, solvent, or other reagents.

An example JP-5 standard chromatogram is provided in the attached file *JP-5 Standard from DA60699 (*Attachment 3), and an example Diesel Fuel #2 standard chromatogram is provided in the attached file *500 ppb Diesel Fuel #2 Standard from DA60699* (Attachment 4) for purposes of comparison to the sample pattern. The n-alkanes in each are labeled in red by carbon number. The portions of the chromatograms corresponding to the three distinct peak pattern areas described in the discussion of method blanks and samples have been circled in the same manner to aid in review.

AECOM has reviewed the TPH detections in the samples to evaluate the likelihood that these results indicate the presence of fuel-related compounds in the hydrant samples. AECOM has concluded that the positive results are due to sub-MDL concentrations of laboratory contamination and additional analytical artifacts. None of the reported DRO results can be reliably attributed to the hydrant field samples because they are not significantly different than the associated laboratory method blanks. None of the peak patterns in these samples resemble JP-5 fuel or any other common petroleum product but appear to be due to laboratory artifacts.

In conclusion, the organic compounds reported as TPH-DRO and TPH-ORO in the samples described above:

- appear to be due to possible laboratory artifacts; and
- are not attributable to JP-5 or any other common petroleum products.

Questions regarding this letter should be addressed to [redacted]

Yours sincerely,

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Attachments

Attachment 1: *Procedure for Chromatographic Interpretation*
Attachment 2: *DRO/ORO Detections in Hydrant Samples, Batch OP24766*
Attachment 3: *DRO/ORO Detections in Hydrant Samples, Batch OP24787*
Attachment 4: *JP-5 Standard from DA60699*
Attachment 5: *500 ppb Diesel Fuel #2 Standard from DA60699*

cc: [redacted], NAVFAC

Attachment 1:

Procedure for Chromatographic Interpretation

Chromatographic Interpretation of
Diesel Range Organics (DRO) and Oil Range Organics (ORO) Detections
Drinking Water Long-Term Monitoring

Procedure followed when a sample result is greater than 100 ug/L for individual TPH component or greater than 200 ug/L for Total TPH

Gather the following chromatograms from the sample data package:

1) Sample of interest (with quantitation report)
2) Method blank (with quantitation report)
3) Retention time (RT) marker standard
4) JP-5 standard
5) DRO (Diesel Fuel #2) and ORO (Motor Oil) calibration standards

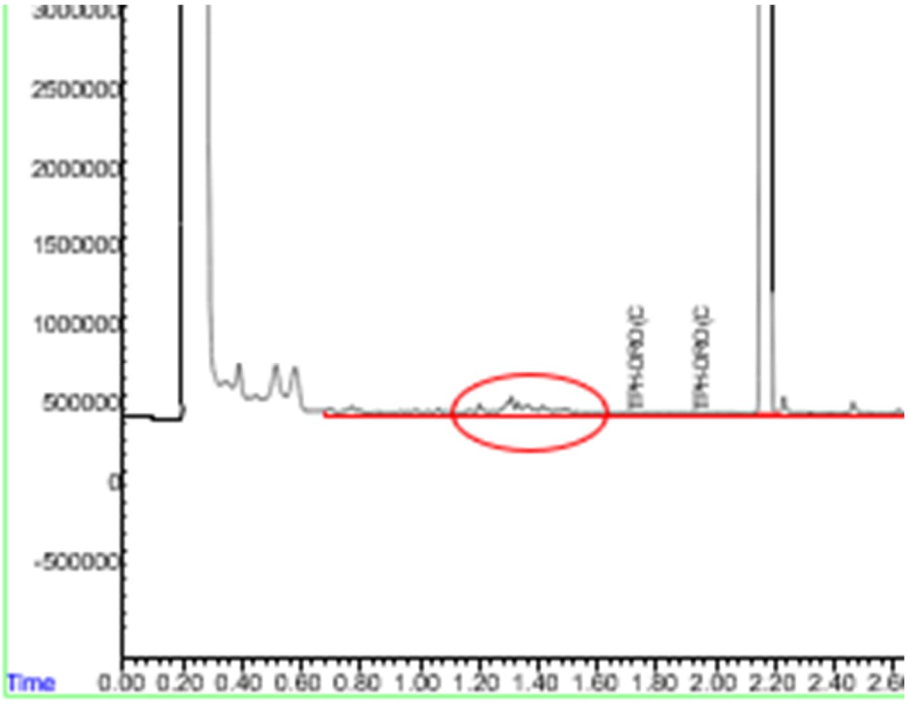
The RT marker, JP-5, DRO, and ORO standards must be analyzed in the same analytical batch as the samples in order to ensure comparability. An analytical batch refers to a group of samples that are analyzed on the same day on the same instrument, under the same operating conditions, and quantitated using the same calibration curve. An analytical batch may include samples from multiple preparation batches. A preparation batch is a group of samples that are prepared together and include a method blank, and blank spike containing known concentrations of the DRO and ORO standards.

Comparison with JP-5, DRO, and ORO Standards

1) Label the carbon numbers of the prominent n-alkanes in the JP-5 and Diesel Fuel #2 standards, using the RT standard provided in the data package as a guide. The laboratory uses fresh JP-5 and Diesel Fuel #2 standards.
2) Examine the sample chromatogram in the RT window corresponding to the first and last n-alkanes identified in the JP-5 and Diesel Fuel standards (C-10 to C-20).
    a. If the RTs of any of the peaks correspond to the n-alkanes identified in either of the standards, label them with the appropriate carbon numbers.
    b. Make note of which alkanes may be present based on RT and those which seem to be missing, e.g., C-12 RT match; no evidence of C-10, C-11, C-13 through C-20.
    c. If none of the n-alkanes are present, it is unlikely that observed peaks are fuel related, particularly if they are not present in a Gaussian shape with an unresolved complex mixture (UCM). If a fuel related hydrocarbon mixture is present, the largest peaks in a given region would be the n-alkanes. Note weathered fuels may have reduced n-alkane abundance, but the UCM hump under the n-alkanes should always be present.
    d. If suspected fuel patterns are identified, the sample data review should be escalated to a forensic specialist. Additional reanalyses at a forensic laboratory may be required.
3) Although JP-5 components do not extend into the ORO range of >C-24 – C-40, compare all peaks in the sample chromatogram with the RTs of the n-alkanes. Discrete peaks are not as evident in the Motor Oil standard, so the RTs from the retention time standard are used as a guide.

Comparison with Method Blank (MB)

1) Review the MB quantitation report to determine if DRO and/or ORO were detected. The quantitation report will include detections that are below the MDL and reported as non-detect by the laboratory as well as concentrations above the MDL that are reported by the laboratory.
2) Compare the concentration of the MB to the samples. Sample results that are within two to three times the concentration in the MB <u>may</u> be entirely attributable to batch contamination. The possibility exists that whatever is present in the MB may also be in the sample so it is important to consider relative concentrations.
3) Review the MB chromatogram, looking for peaks eluting in the same retention time range as the standards.
    a. If the RTs of any of the peaks correspond to the n-alkanes identified in the reference standards, label the carbon numbers.
    b. Look for distinguishable peak patterns. For example, many method blanks have been found to contain the following grouping of peaks falling roughly between 1.04 and 1.56 minutes.

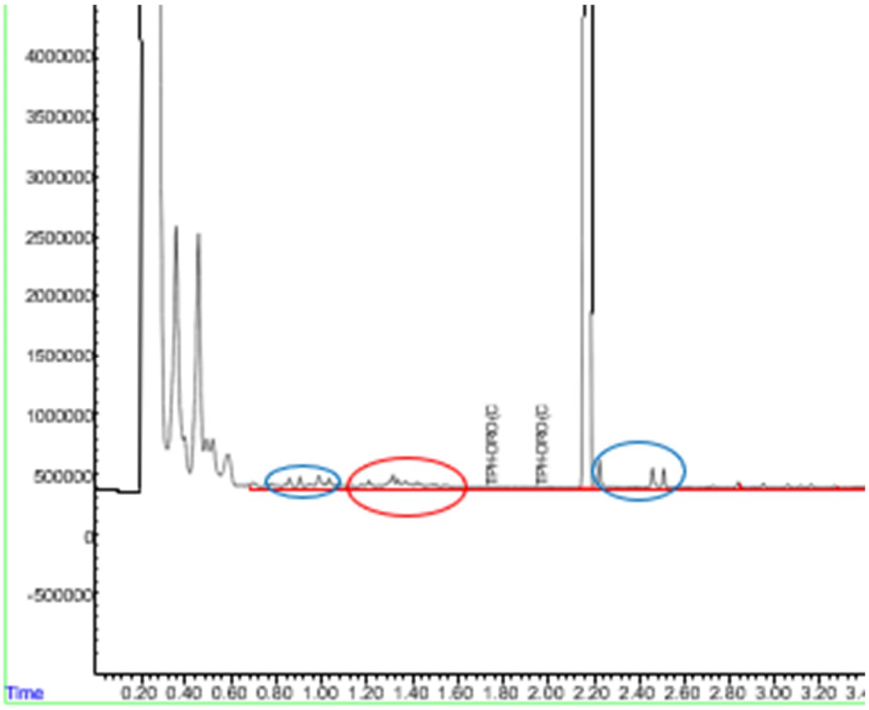


(Note that retention times are specific to a given instrument under a particular set of operating conditions. It is essential that all comparisons of retention times and patterns be done under identical conditions.)

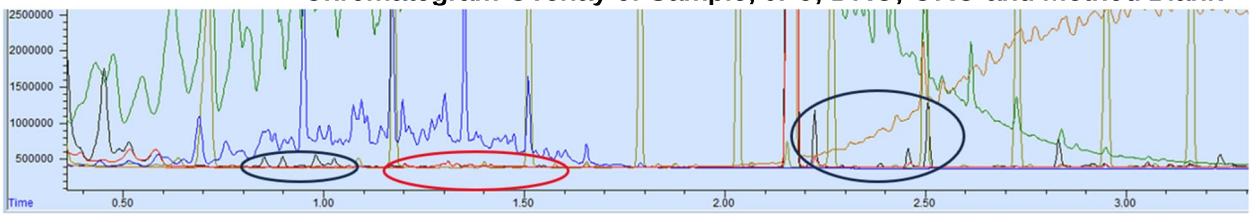
c. Look for the same pattern in the associated samples. While it is not possible to determine the areas of individual portions of the chromatograms from the data package, a rough assessment of the relative magnitude can be made. The pattern noted above has been identified in both MBs and samples and is believed to be a laboratory artifact. If this pattern had been unique to the samples it would be more likely to have originated from the samples.

Additional Qualitative Assessment

1) Review the sample chromatograms looking for distinct peaks or groupings of peaks as discussed in the MB evaluation, above.
2) If found, look to see if the same peaks/patterns are present in the chromatograms of other samples prepared and analyzed in the same batch. Note that a batch may contain samples reported in multiple sample delivery groups (SDGs). All samples from the batch should be reviewed.
3) Identical peak patterns of similar magnitude found in multiple samples from the same batch, particularly if they include samples collected from different areas of the site, suggest that the source is the laboratory rather than the field sample. DRO detections were reported in over 85% of a recent group of samples. All sample chromatograms contained the three peak patterns identified below, with the middle one present in the method blanks as well. Since none of the peak RTs matched the standards, and the pattern was common to all samples, AECOM concluded that the reported DRO concentrations were not fuel related but were due to laboratory artifacts.



Chromatogram Overlay of Sample, JP5, DRO, ORO and Method Blank



Black = Sample
Yellow = RT Marker
Blue = JP5
Green = DRO
Orange = ORO
Red = MB

Attachment 3:

DRO/ORO Detections in Hydrant Samples, Batch OP24766

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh121823a\
Data File : FH070058.D
Signal(s) : FID1A.ch
Acq On : 18 Dec 2023 8:43 pm
Operator : jackb
Sample : op24766-mb
Misc : OP24766,GFH23770,1000,,,1,1
ALS Vial : 4 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 19 14:22:24 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.185	813182212	1572.414	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	18905427	50.898	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	14706550	39.921	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	3447757	19.724	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	7644623	24.606	ug/ml

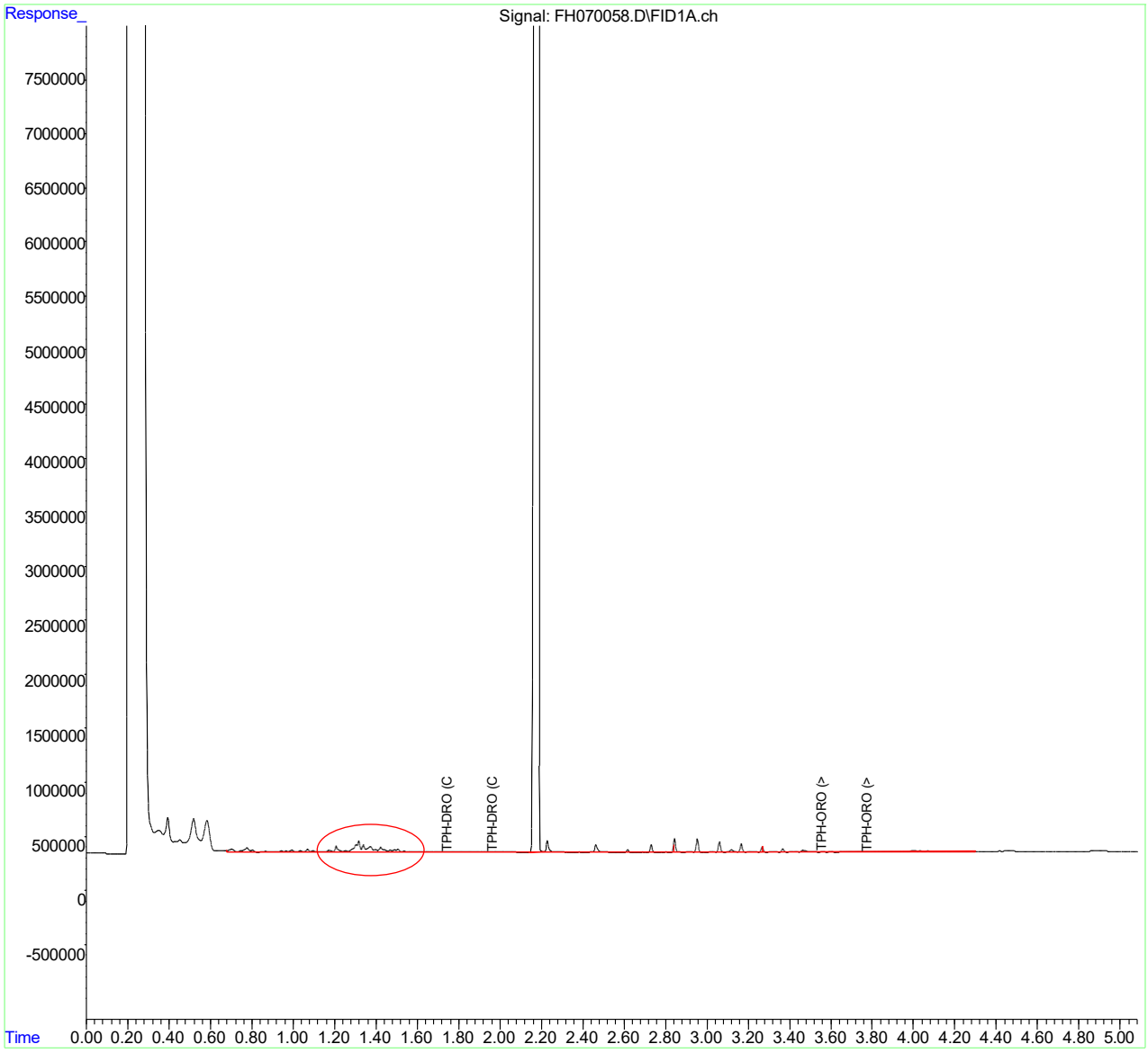
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh121823a\
Data File : FH070058.D
Signal(s) : FID1A.ch
Acq On : 18 Dec 2023 8:43 pm
Operator : jackb
Sample : op24766-mb
Misc : OP24766,GFH23770,1000,,,1,1
ALS Vial : 4 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 19 14:22:24 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh121823a\
Data File : FH070067.D
Signal(s) : FID1A.ch
Acq On : 18 Dec 2023 9:57 pm
Operator : jackb
Sample : da60699-2 D3[redacted]
Misc : OP24766,GFH23770,
ALS Vial : 13 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 19 14:22:42 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.184	763194510	1475.755	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	23470684	63.189	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	21414537	58.130	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	3135687	17.939	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	5085687	16.370	ug/ml

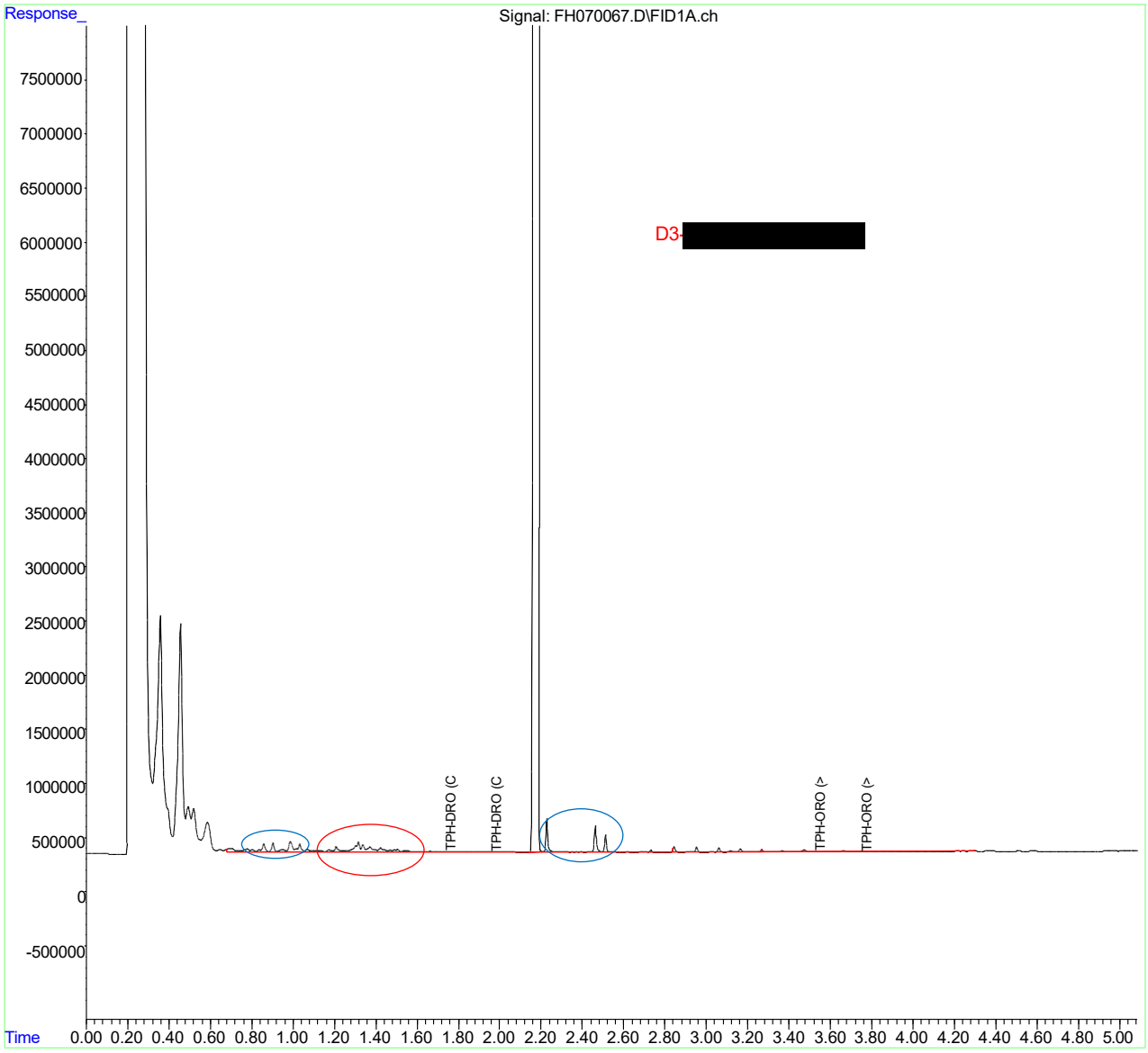
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh121823a\
Data File : FH070067.D
Signal(s) : FID1A.ch
Acq On : 18 Dec 2023 9:57 pm
Operator : jackb
Sample : da60699-2
Misc : OP24766,GFH23770,1010,,,1,1
ALS Vial : 13 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 19 14:22:42 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh121823a\
Data File : FH070070.D
Signal(s) : FID1A.ch
Acq On : 18 Dec 2023 10:21 pm
Operator : jackb
Sample : da60699-3 D3[redacted]
Misc : OP24766,GFH23770,10[redacted]
ALS Vial : 14 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 19 14:22:48 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.184	760303429	1470.165	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	23163156	62.361	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	20577619	55.858	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	2898779	16.583	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	5031101	16.194	ug/ml

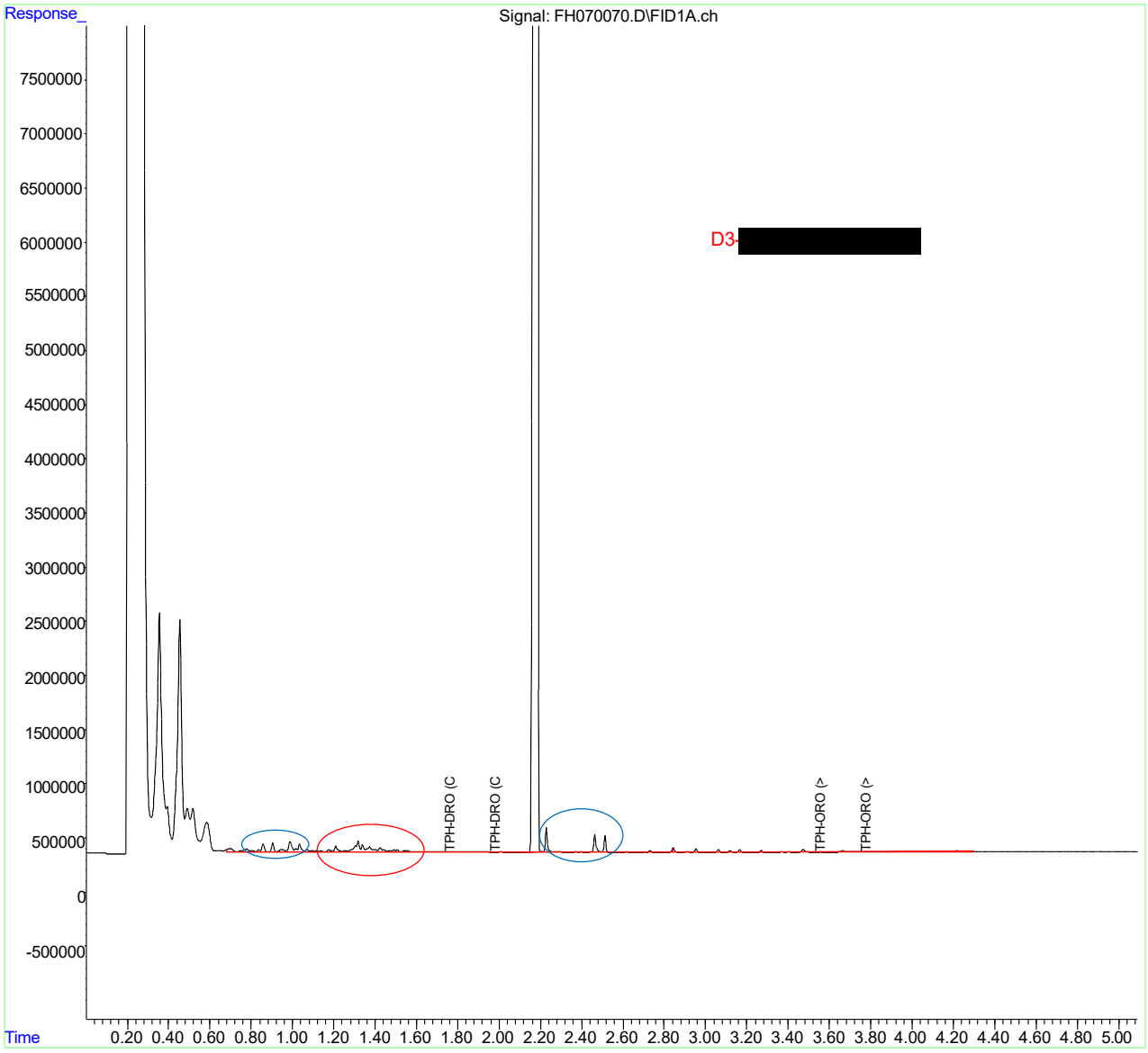
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh121823a\
Data File : FH070070.D
Signal(s) : FID1A.ch
Acq On : 18 Dec 2023 10:21 pm
Operator : jackb
Sample : da60699-3
Misc : OP24766,GFH23770,1000,,,1,1
ALS Vial : 14 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 19 14:22:48 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh121823a\
Data File : FH070071.D
Signal(s) : FID1A.ch
Acq On : 18 Dec 2023 10:30 pm
Operator : jackb
Sample : da60699-4 D3-[redacted]
Misc : OP24766,GFH23770,1[redacted]
ALS Vial : 15 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 19 14:22:50 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.183	791752045	1530.976	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	24498188	65.956	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	22159632	60.152	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	2700518	15.449	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	5017845	16.151	ug/ml

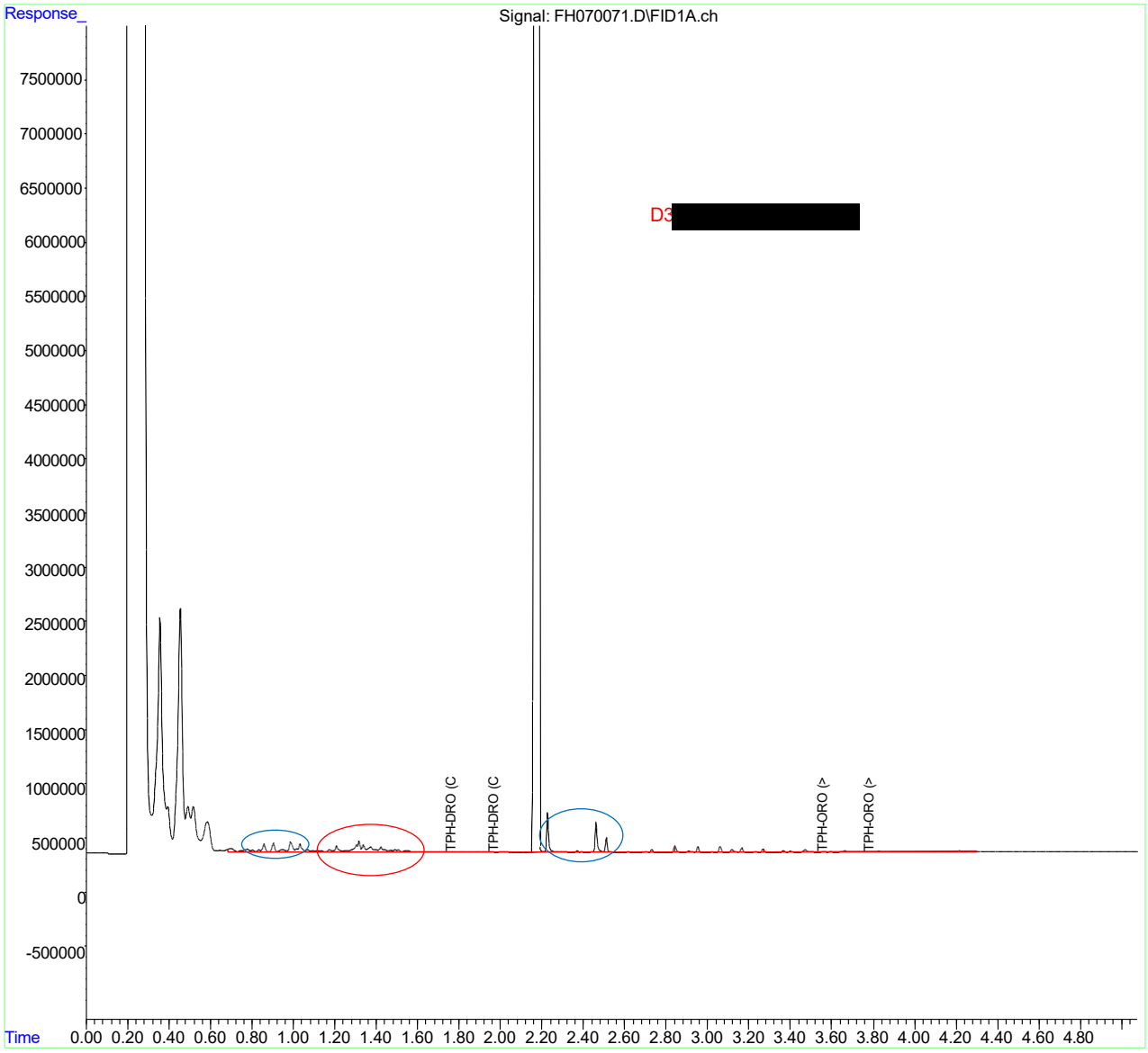
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh121823a\
Data File : FH070071.D
Signal(s) : FID1A.ch
Acq On : 18 Dec 2023 10:30 pm
Operator : jackb
Sample : da60699-4
Misc : OP24766,GFH23770,1020,,,1,1
ALS Vial : 15 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 19 14:22:50 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh121823a\
Data File : FH070072.D
Signal(s) : FID1A.ch
Acq On : 18 Dec 2023 10:38 pm
Operator : jackb
Sample : da60699-5 D3-[redacted]
Misc : OP24766,GFH23770,10[redacted]
ALS Vial : 16 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 19 14:22:52 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.185	795608434	1538.433	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	24502619	65.968	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	22471877	61.000	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	2348547	13.436	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	4348167	13.996	ug/ml

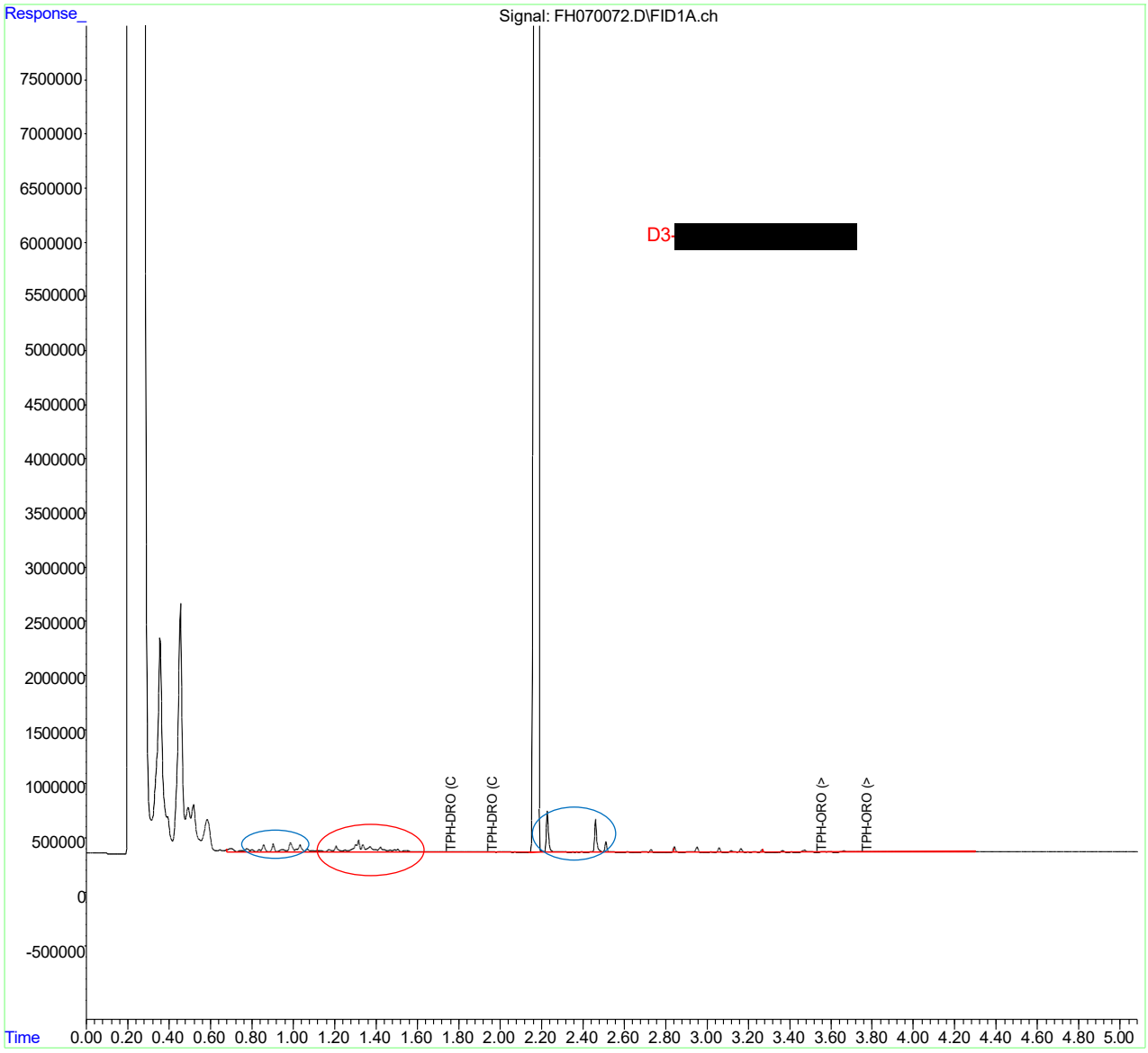
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh121823a\
Data File : FH070072.D
Signal(s) : FID1A.ch
Acq On : 18 Dec 2023 10:38 pm
Operator : jackb
Sample : da60699-5
Misc : OP24766,GFH23770,1050,,,1,1
ALS Vial : 16 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 19 14:22:52 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh121823a\
Data File : FH070073.D
Signal(s) : FID1A.ch
Acq On : 18 Dec 2023 10:46 pm
Operator : jackb
Sample : da60699-6 D3-[redacted]
Misc : OP24766,GFH23770,10[redacted]
ALS Vial : 17 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 19 14:22:54 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.186	899877470	1740.053	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	26552246	71.486	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	23835125	64.700	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	2505219	14.332	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	5134758	16.528	ug/ml

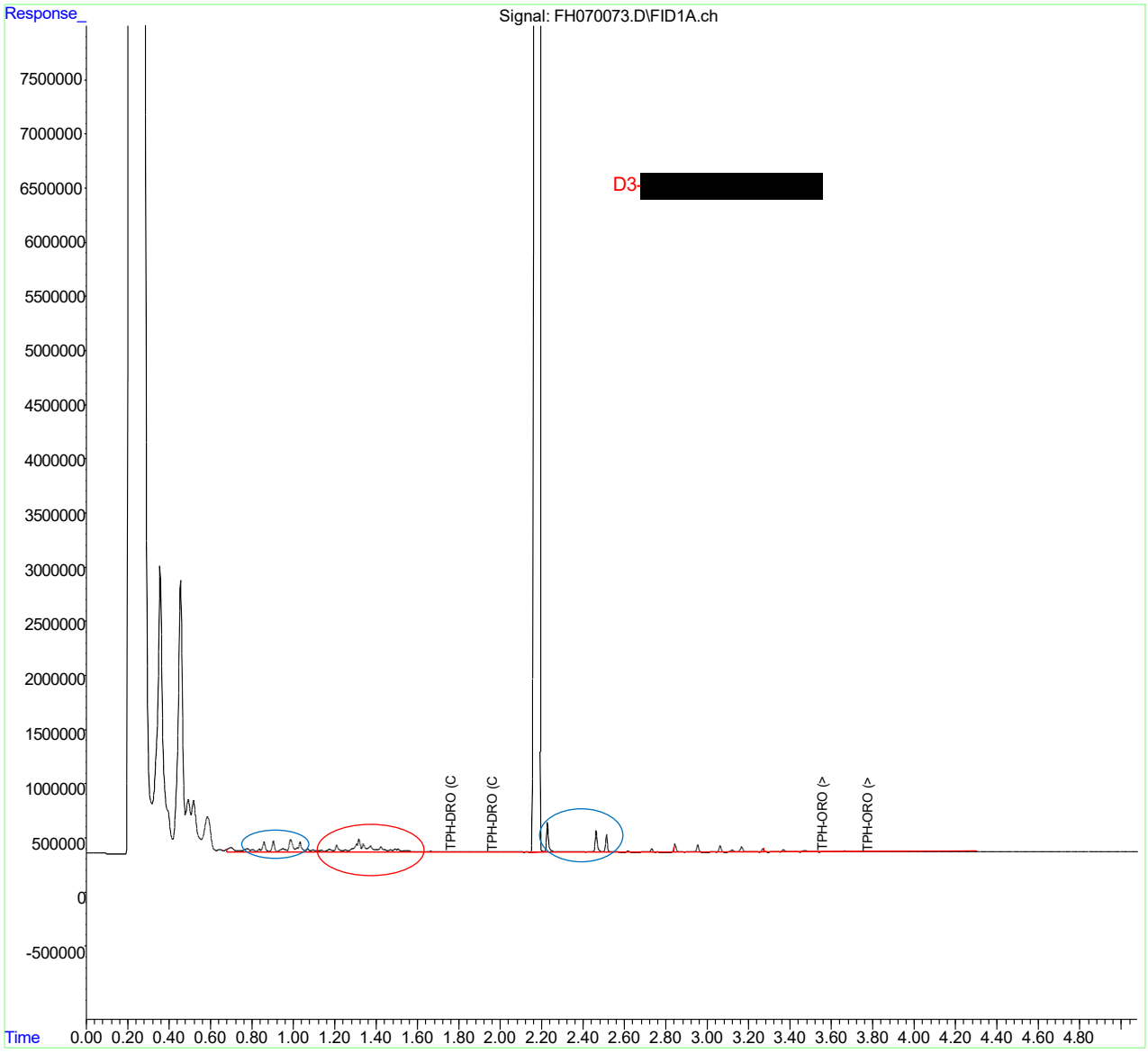
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh121823a\
Data File : FH070073.D
Signal(s) : FID1A.ch
Acq On : 18 Dec 2023 10:46 pm
Operator : jackb
Sample : da60699-6
Misc : OP24766,GFH23770,1030,,,1,1
ALS Vial : 17 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 19 14:22:54 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Attachment 2:

DRO/ORO Detections in Hydrant Samples, Batch OP24787

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070152.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 4:51 pm
Operator : trevorh
Sample : op24787-mb
Misc : OP24787,GFH23679,1000,,,1,1
ALS Vial : 4 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:15 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.177	750458095	1451.127	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	14823621	39.909	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	12868137	34.931	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	2442440	13.973	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	4331490	13.942	ug/ml

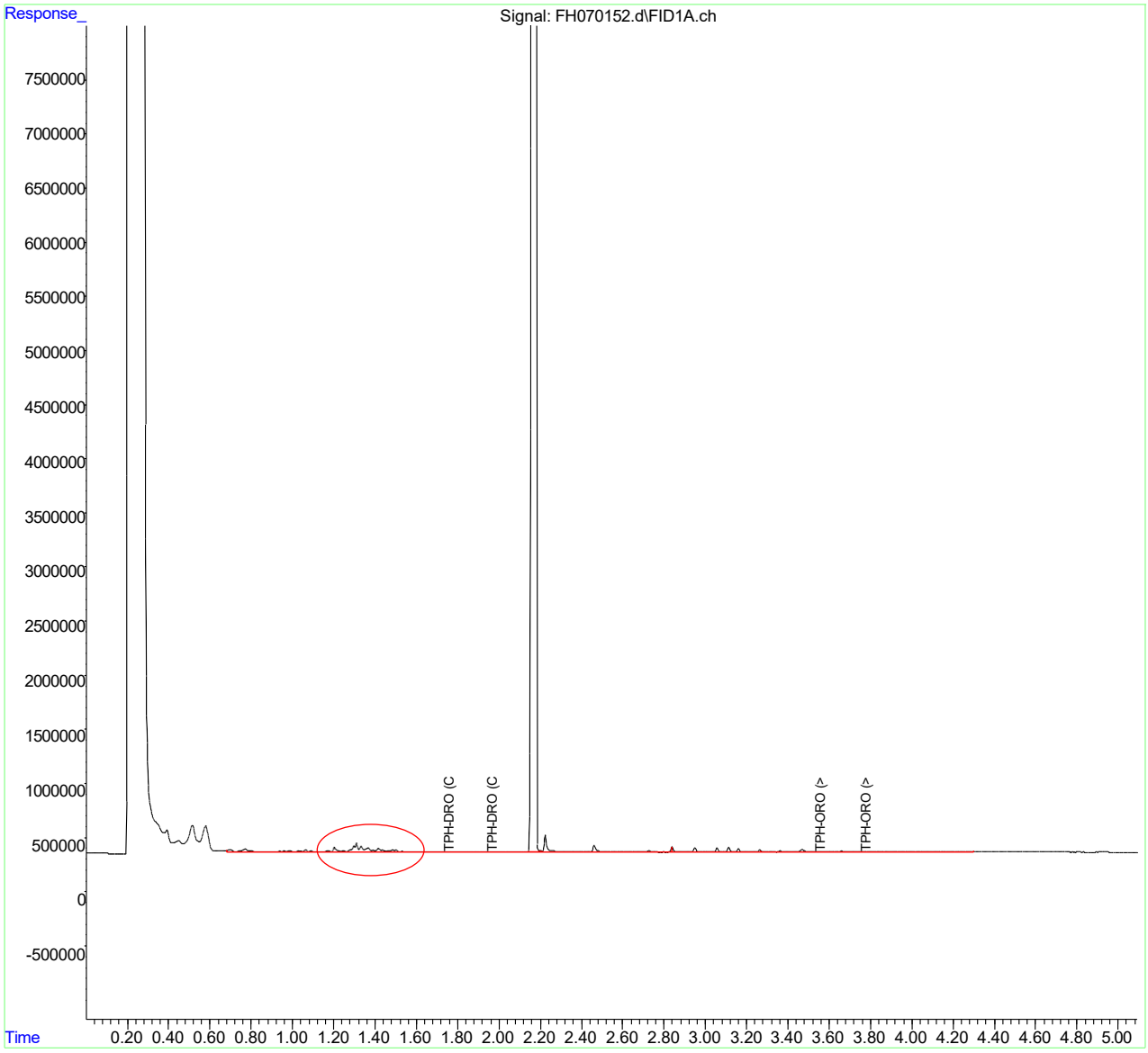
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070152.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 4:51 pm
Operator : trevorh
Sample : op24787-mb
Misc : OP24787,GFH23679,1000,,,1,1
ALS Vial : 4 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:15 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070160.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 5:57 pm
Operator : trevorh
Sample : da60775-1 D2-[redacted]
Misc : OP24787,GFH23679,[redacted]
ALS Vial : 12 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:31 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.176	708068165	1369.160	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	24054472	64.761	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	20631323	56.004	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	5652794	32.338	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	8978789	28.901	ug/ml

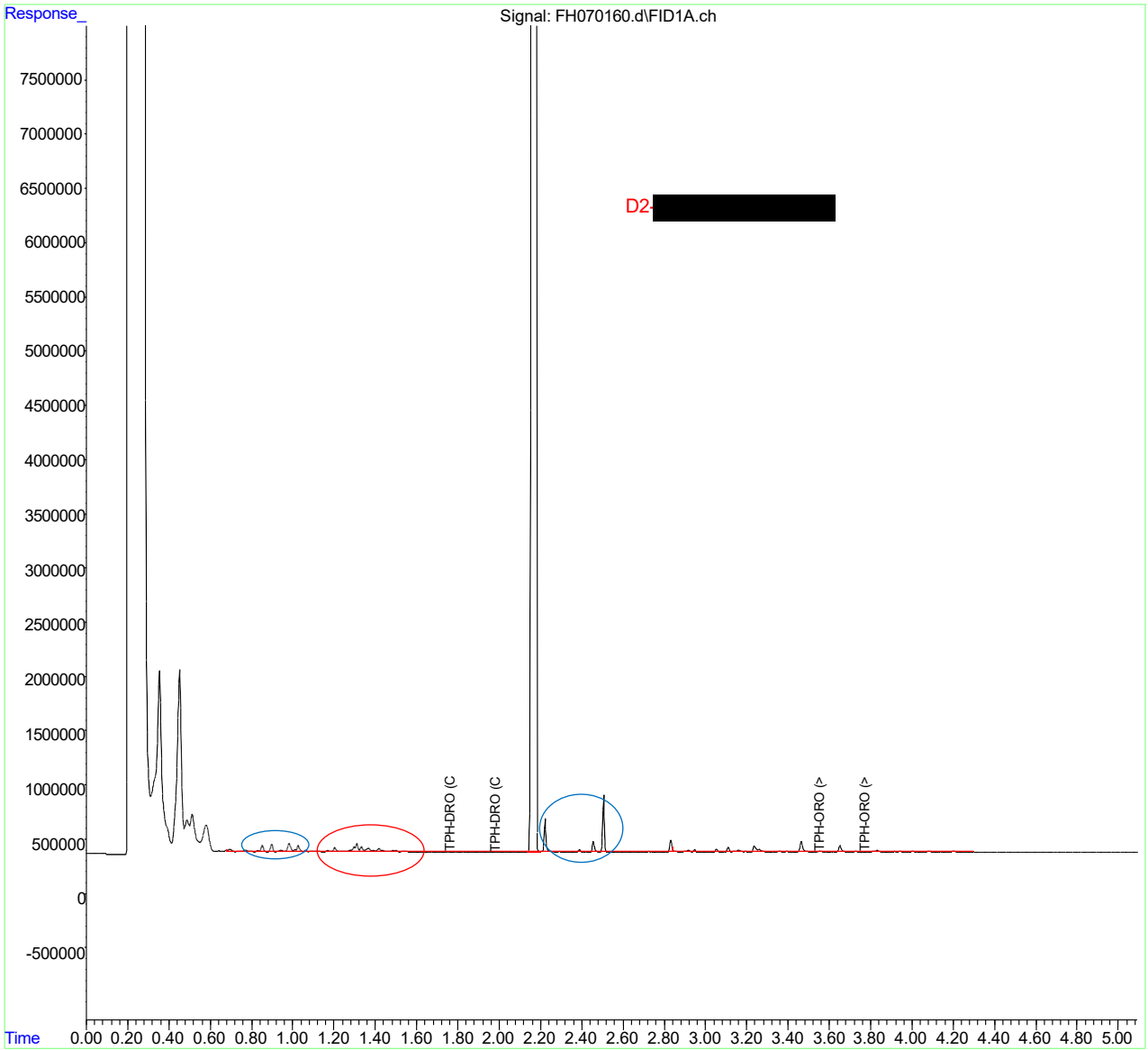
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070160.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 5:57 pm
Operator : trevorh
Sample : da60775-1
Misc : OP24787,GFH23679,1040,,,1,1
ALS Vial : 12 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:31 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070161.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 6:05 pm
Operator : trevorh
Sample : da60775-2 D2-[redacted]
Misc : OP24787,GFH23679
ALS Vial : 13 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:33 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.175	701919758	1357.271	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	23526303	63.339	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	20230732	54.916	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	5043769	28.854	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	8170026	26.298	ug/ml

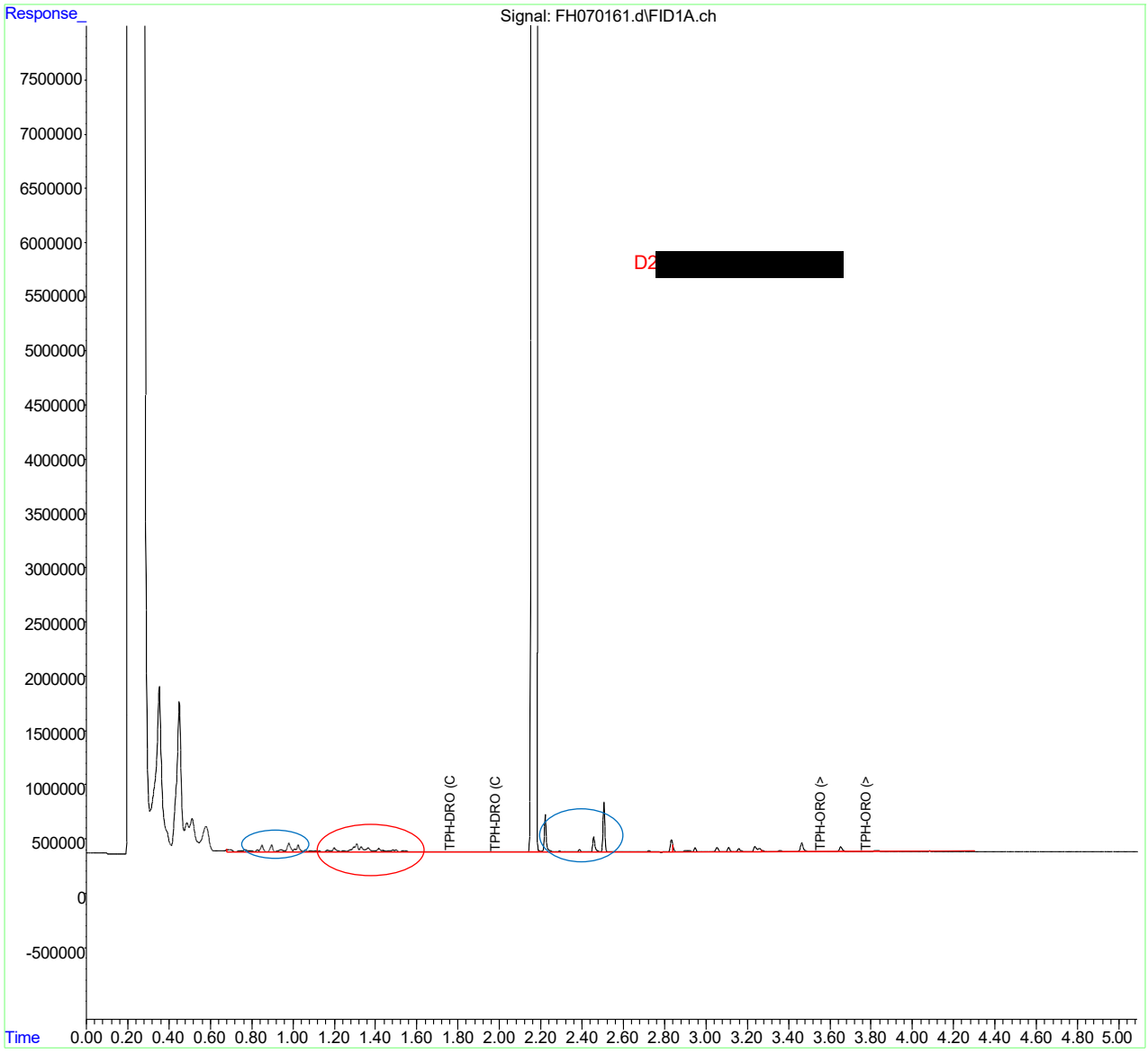
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070161.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 6:05 pm
Operator : trevorh
Sample : da60775-2
Misc : OP24787,GFH23679,1040,,,1,1
ALS Vial : 13 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:33 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070162.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 6:13 pm
Operator : trevorh
Sample : da60776-1 A2-[redacted]
Misc : OP24787,GFH23679,1030
ALS Vial : 14 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:35 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.177	747059228	1444.555	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	29963172	80.669	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	25884606	70.264	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	6152799	35.199	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	10161045	32.706	ug/ml

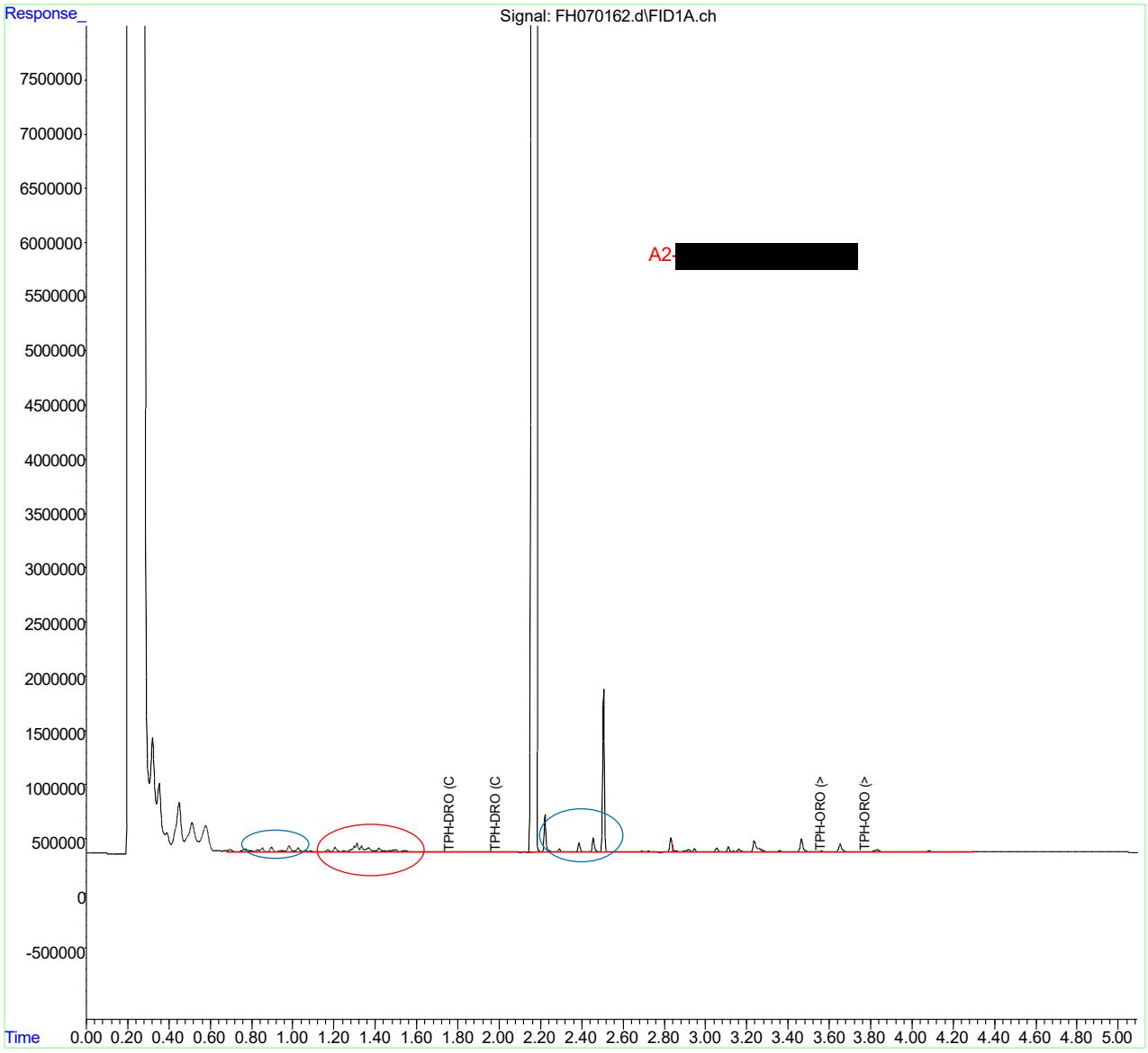
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070162.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 6:13 pm
Operator : trevorh
Sample : da60776-1
Misc : OP24787,GFH23679,1030,,,1,1
ALS Vial : 14 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:35 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070163.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 6:22 pm
Operator : trevorh
Sample : da60776-2 A2-[redacted]
Misc : OP24787,GFH23679,104
ALS Vial : 15 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:37 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.173	571529270	1105.141	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	35251469	94.906	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	29870643	81.084	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	7757285	44.378	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	13155474	42.345	ug/ml

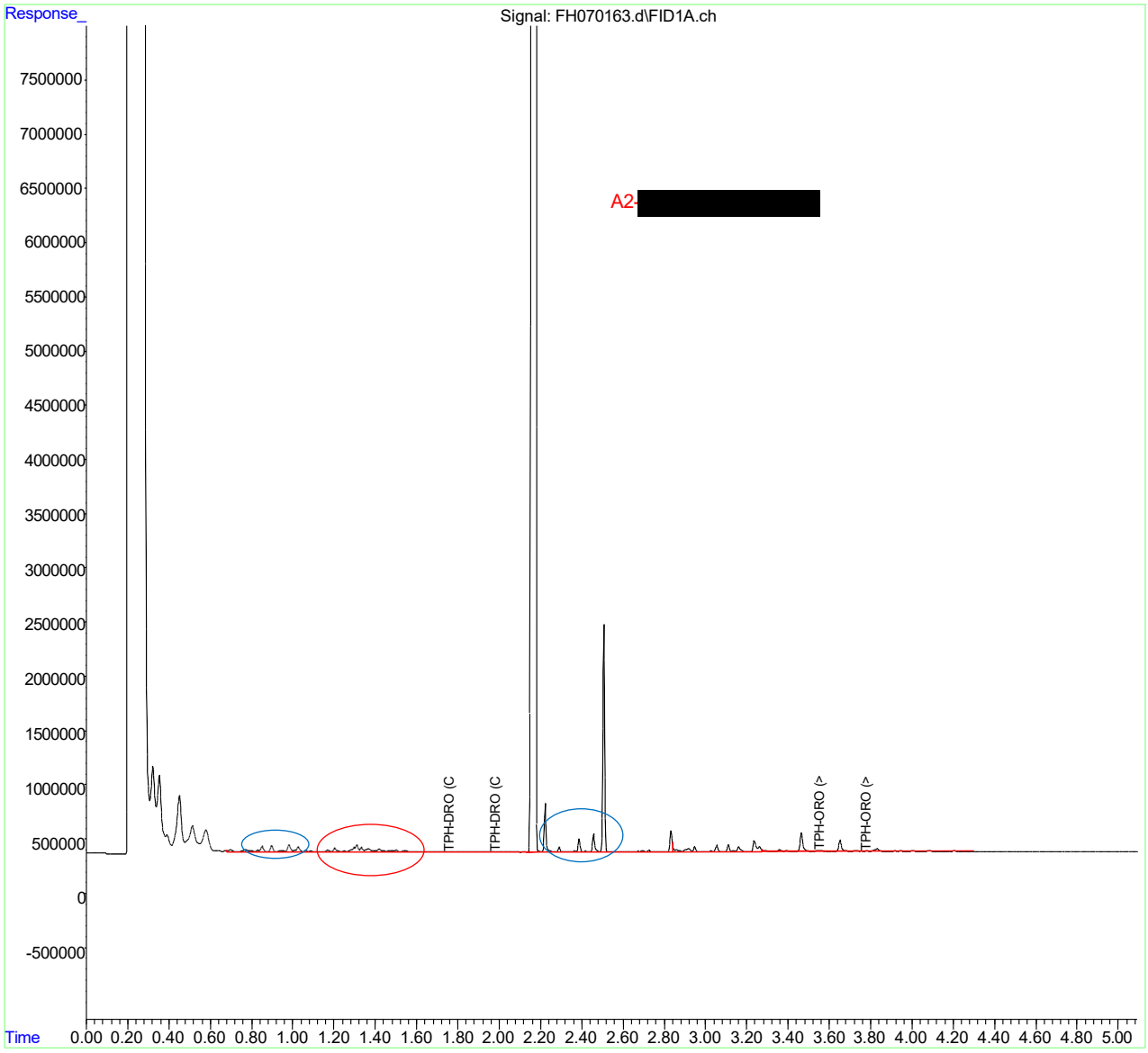
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070163.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 6:22 pm
Operator : trevorh
Sample : da60776-2
Misc : OP24787,GFH23679,1040,,,1,1
ALS Vial : 15 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:37 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



DRO-092023.M Sun Dec 24 14:13:35 2023 Page: 2

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070164.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 6:30 pm
Operator : trevorh
Sample : da60777-1 E1-[redacted]
Misc : OP24787,GFH23679,10
ALS Vial : 16 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:39 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.177	763547921	1476.439	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	37775700	101.702	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	33441946	90.778	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	6512335	37.256	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	11151220	35.893	ug/ml

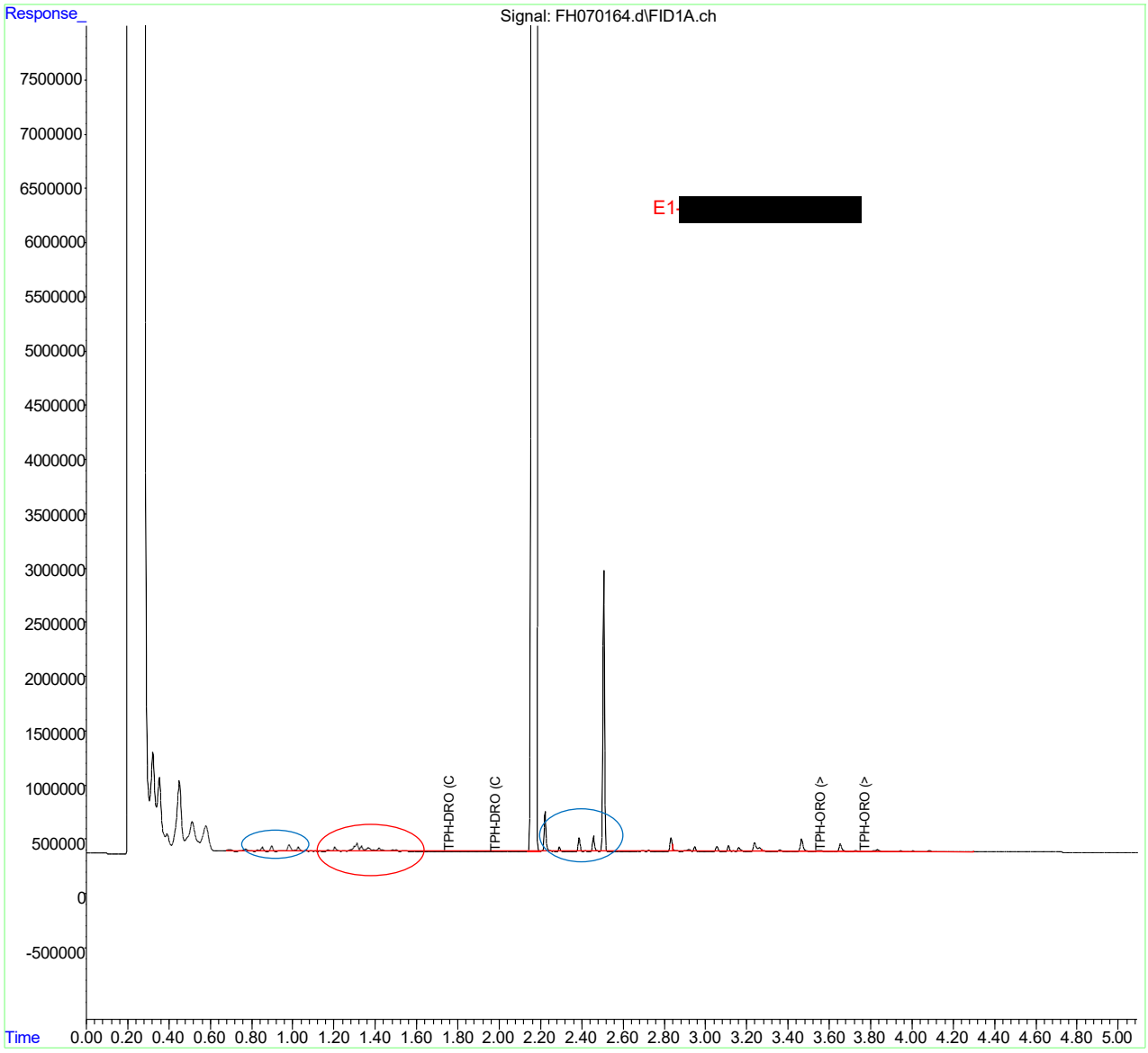
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070164.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 6:30 pm
Operator : trevorh
Sample : da60777-1
Misc : OP24787,GFH23679,1020,,,1,1
ALS Vial : 16 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:39 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070168.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:03 pm
Operator : trevorh
Sample : da60778-1 A1-[redacted]
Misc : OP24787,GFH23679,1040
ALS Vial : 18 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:47 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.175	719562222	1391.385	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	39676638	106.820	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	33091775	89.828	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	8310626	47.543	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	14963730	48.165	ug/ml

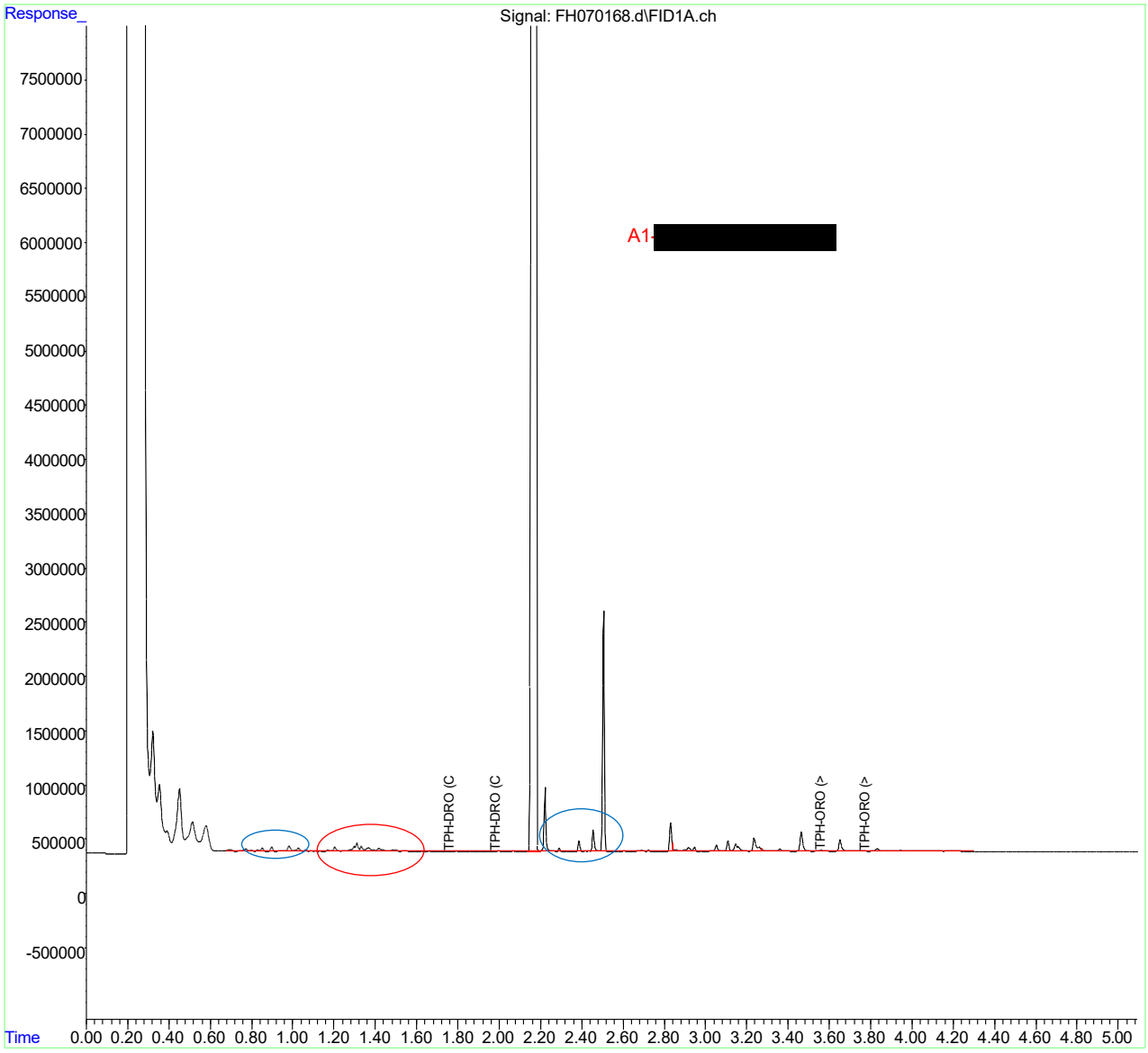
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070168.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:03 pm
Operator : trevorh
Sample : da60778-1
Misc : OP24787,GFH23679,1040,,,1,1
ALS Vial : 18 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:47 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070169.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:11 pm
Operator : trevorh
Sample : da60778-2 A1-[redacted]
Misc : OP24787,GFH23679,104
ALS Vial : 19 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:49 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.176	748797413	1447.916	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	42489278	114.393	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	38242428	103.809	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	6156033	35.217	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	10536178	33.914	ug/ml

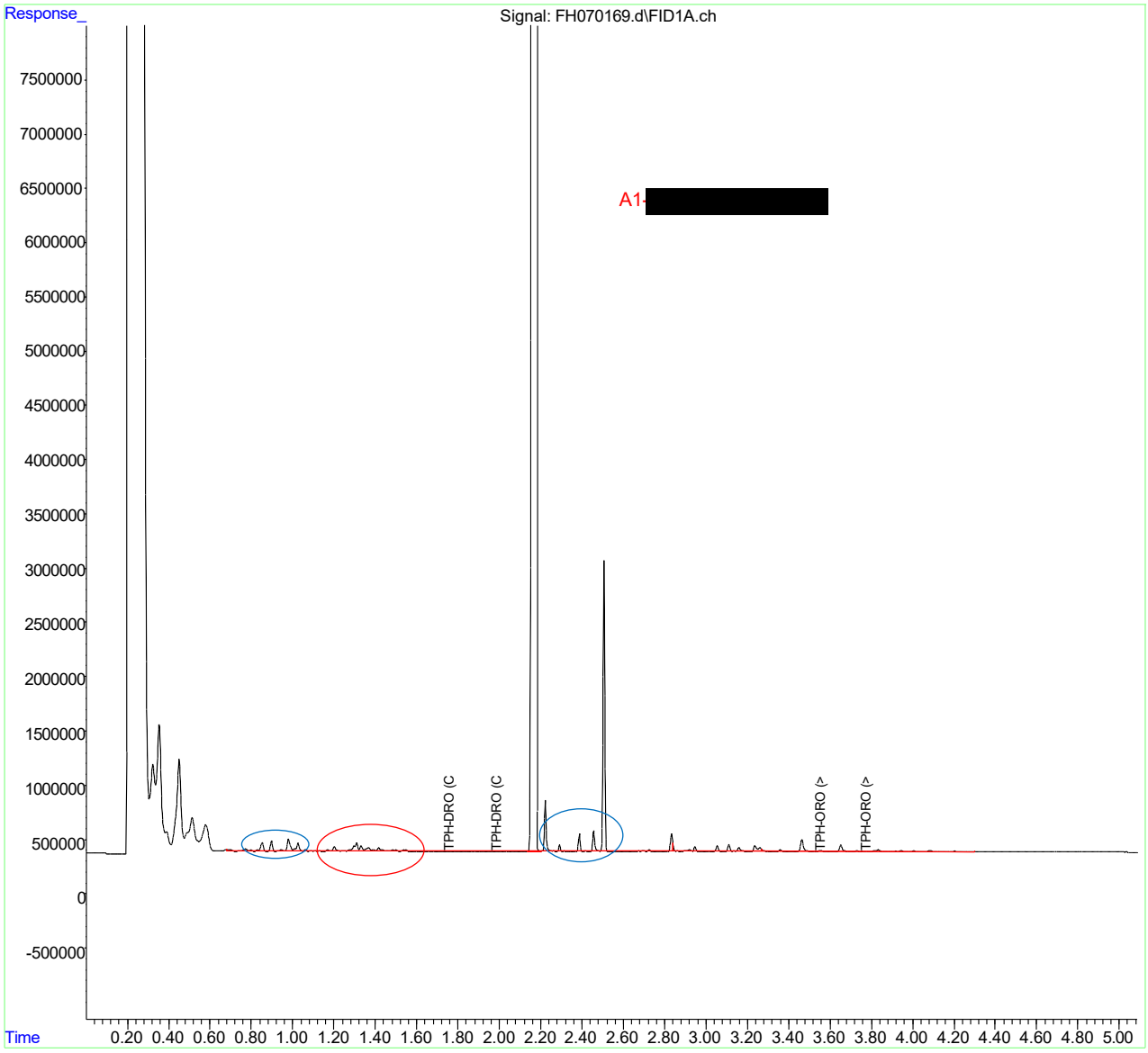
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070169.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:11 pm
Operator : trevorh
Sample : da60778-2
Misc : OP24787,GFH23679,1040,,,1,1
ALS Vial : 19 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:49 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070170.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:20 pm
Operator : trevorh
Sample : da60881-1 F2-[redacted]
Misc : OP24787,GFH23679,101
ALS Vial : 20 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:51 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.176	742411004	1435.567	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	29524285	79.487	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	26222618	71.181	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	5858860	33.517	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	8913894	28.692	ug/ml

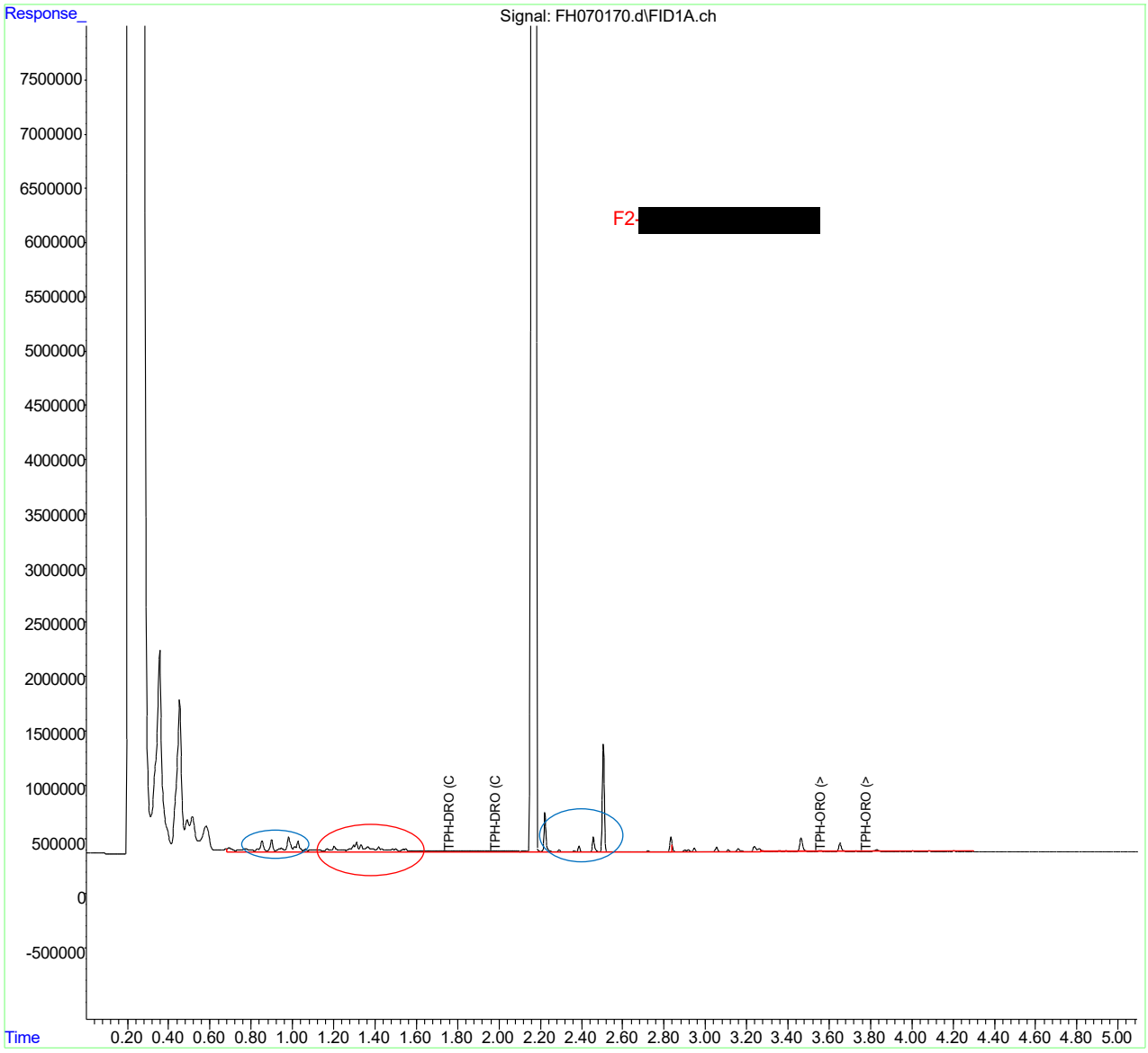
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070170.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:20 pm
Operator : trevorh
Sample : da60881-1
Misc : OP24787,GFH23679,1010,,,1,1
ALS Vial : 20 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:51 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070171.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:28 pm
Operator : trevorh
Sample : da60881-2 F2-[redacted]
Misc : OP24787,GFH23679,1020
ALS Vial : 21 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:53 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.170	442647881	855.928	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	24694702	66.485	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	19664894	53.380	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	6962860	39.833	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	11893962	38.284	ug/ml

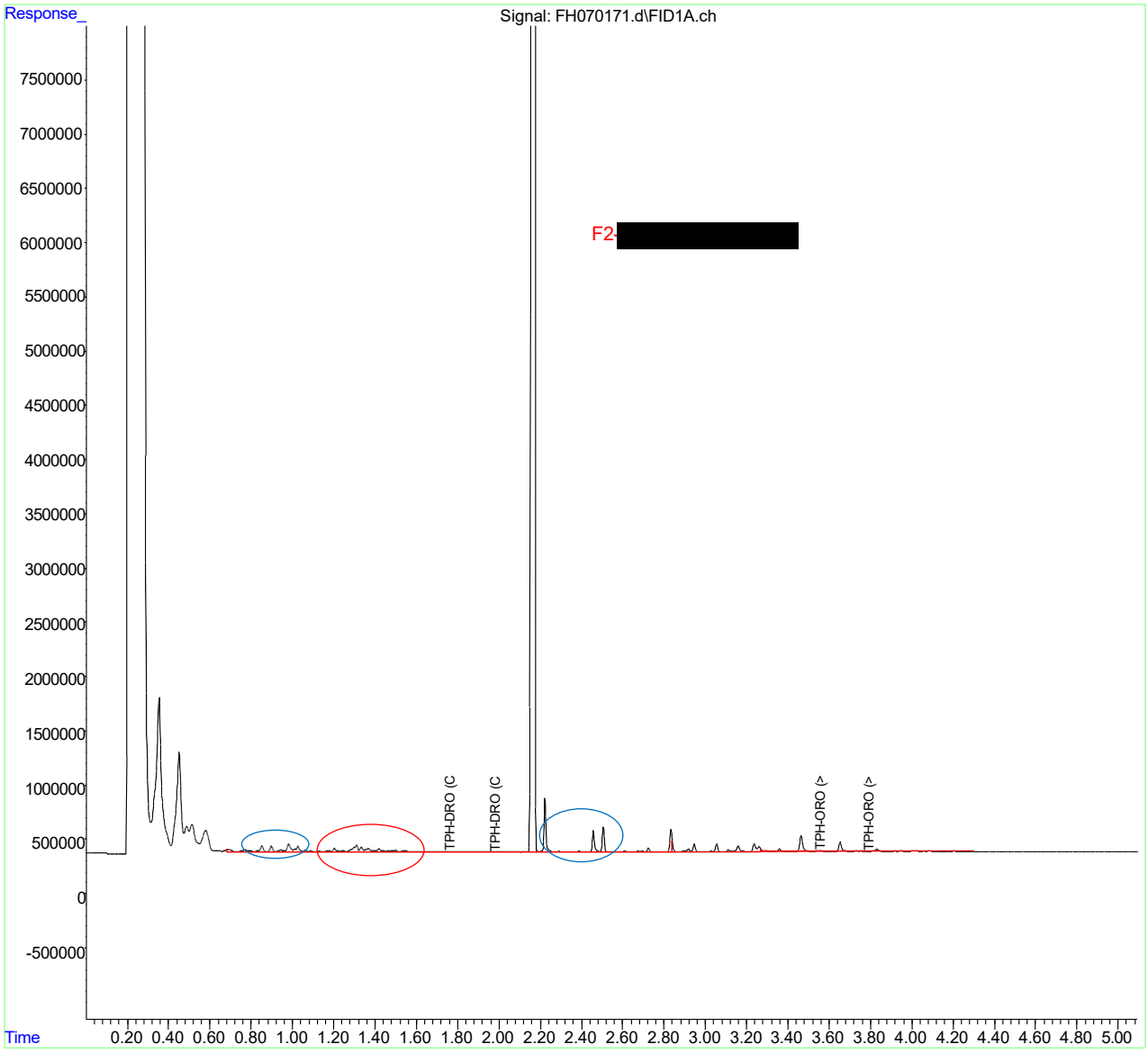
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070171.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:28 pm
Operator : trevorh
Sample : da60881-2
Misc : OP24787,GFH23679,1020,,,1,1
ALS Vial : 21 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:53 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070172.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:36 pm
Operator : trevorh
Sample : da60881-3 F2-[redacted]
Misc : OP24787,GFH23679,103
ALS Vial : 22 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:55 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.176	728490825	1408.650	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	25536048	68.750	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	22085472	59.951	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	5378744	30.771	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	8838263	28.449	ug/ml

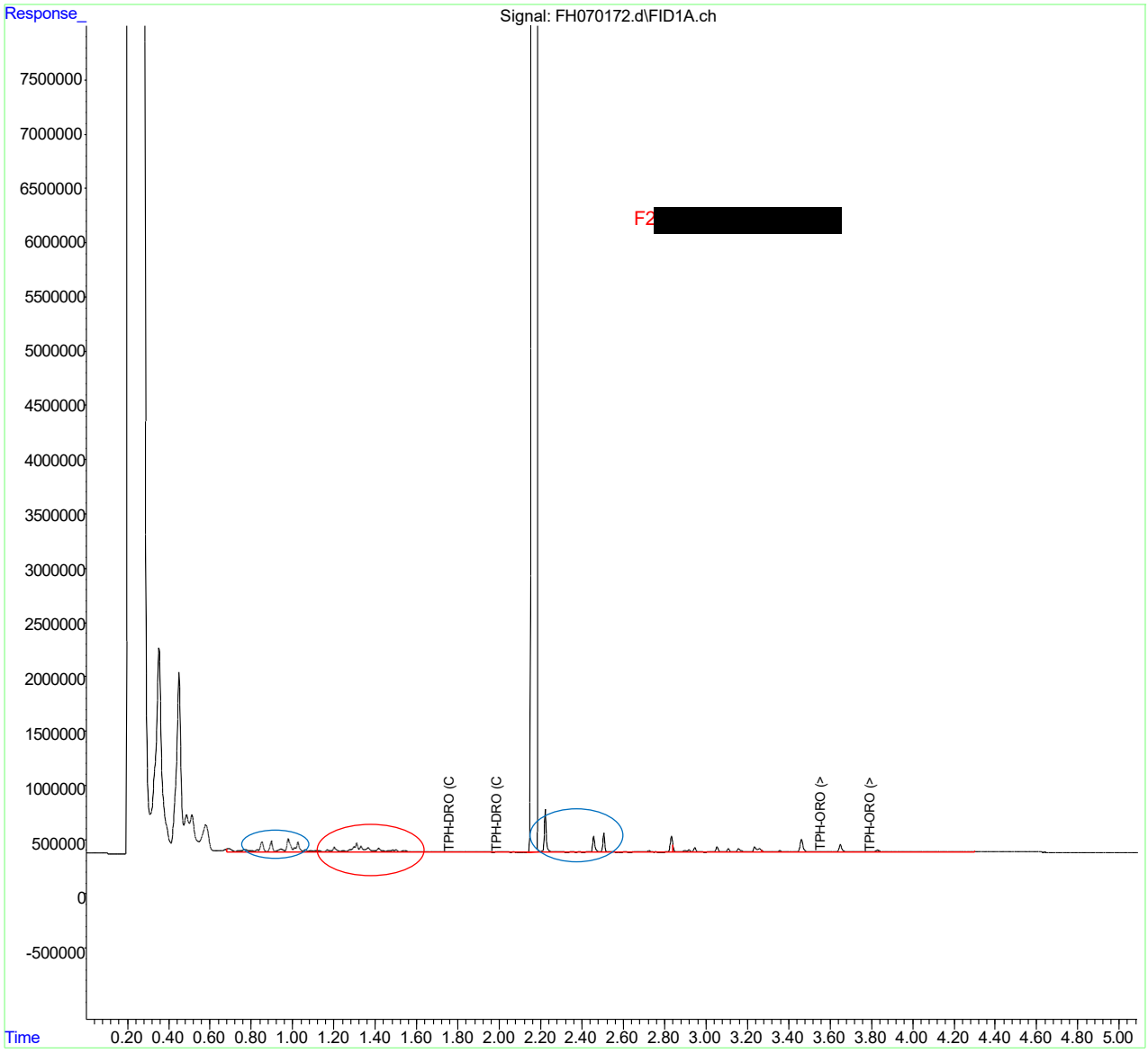
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070172.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:36 pm
Operator : trevorh
Sample : da60881-3
Misc : OP24787,GFH23679,1030,,,1,1
ALS Vial : 22 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:55 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070173.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:44 pm
Operator : trevorh
Sample : da60881-4 F2-[redacted]
Misc : OP24787,GFH23679,105
ALS Vial : 23 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:57 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.180	966996845	1869.839	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	22775156	61.317	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	19160182	52.010	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	6510833	37.247	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	9967512	32.083	ug/ml

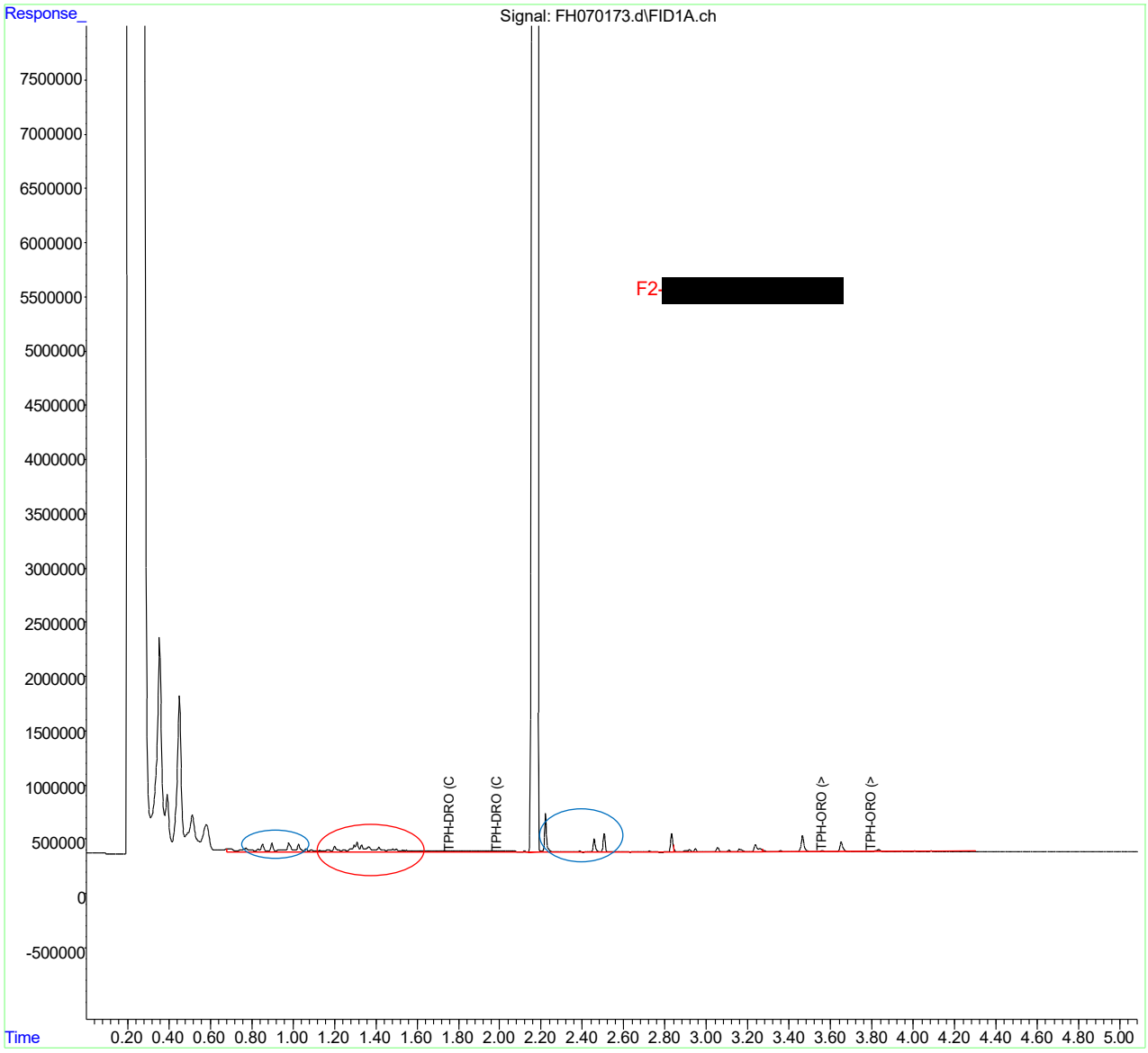
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070173.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:44 pm
Operator : trevorh
Sample : da60881-4
Misc : OP24787,GFH23679,1030,,,1,1
ALS Vial : 23 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:57 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



DRO-092023.M Sun Dec 24 14:13:59 2023 Page: 2

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070174.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:53 pm
Operator : trevorh
Sample : da60881-5 F2-[redacted]
Misc : OP24787,GFH23679,1040,,,1,1
ALS Vial : 24 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:59 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.176	777542210	1503.499	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	34115399	91.848	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	27916387	75.779	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	9368994	53.598	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	15806162	50.877	ug/ml

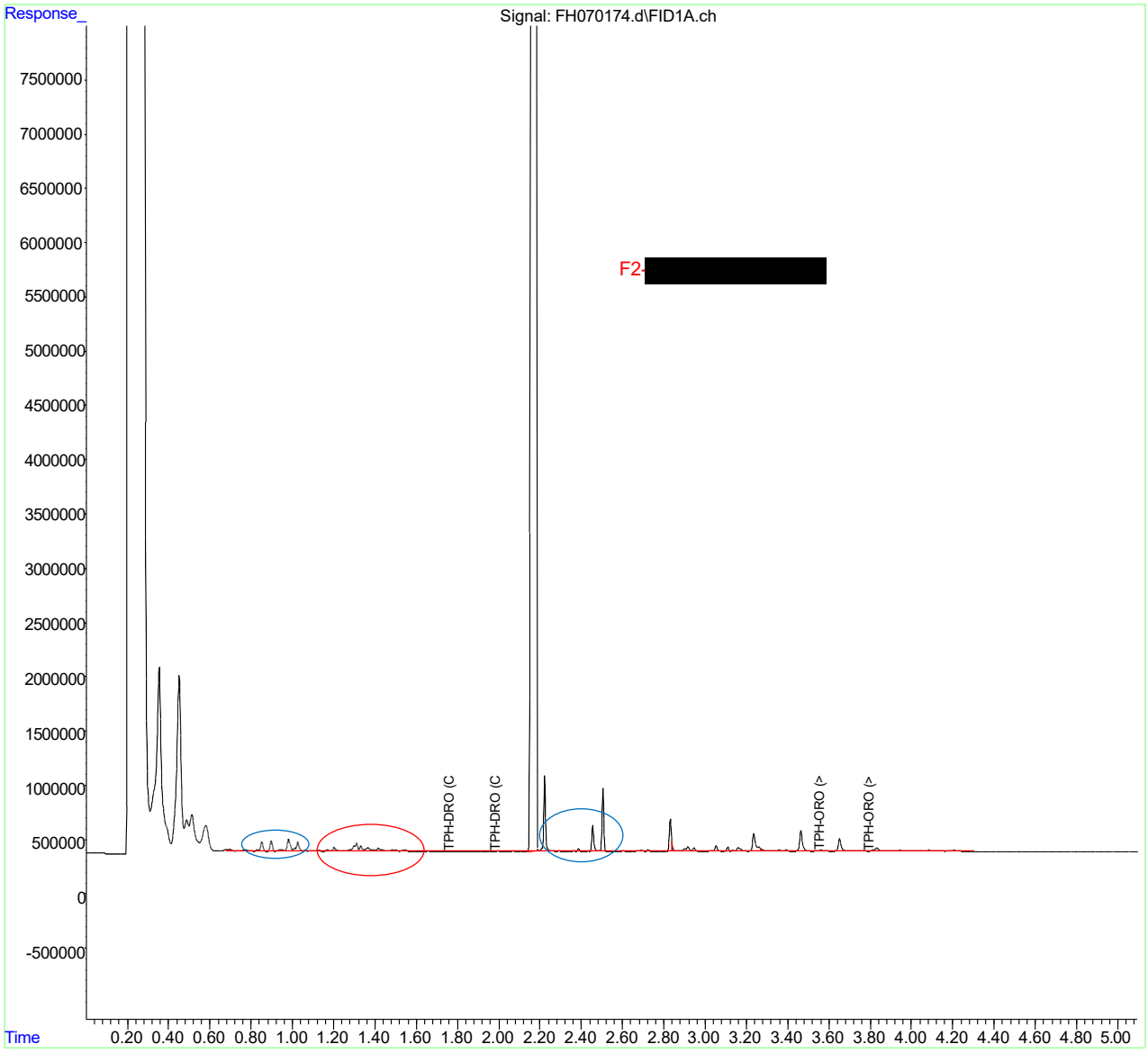
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070174.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 7:53 pm
Operator : trevorh
Sample : da60881-5
Misc : OP24787,GFH23679,1040,,,1,1
ALS Vial : 24 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:32:59 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070176.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 8:09 pm
Operator : trevorh
Sample : da60882-1 D1-[redacted]
Misc : OP24787,GFH23679,1030,,,1,1
ALS Vial : 26 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:33:03 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.174	637136330	1232.002	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	28976868	78.014	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	24521070	66.562	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	6544882	37.442	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	10736555	34.559	ug/ml

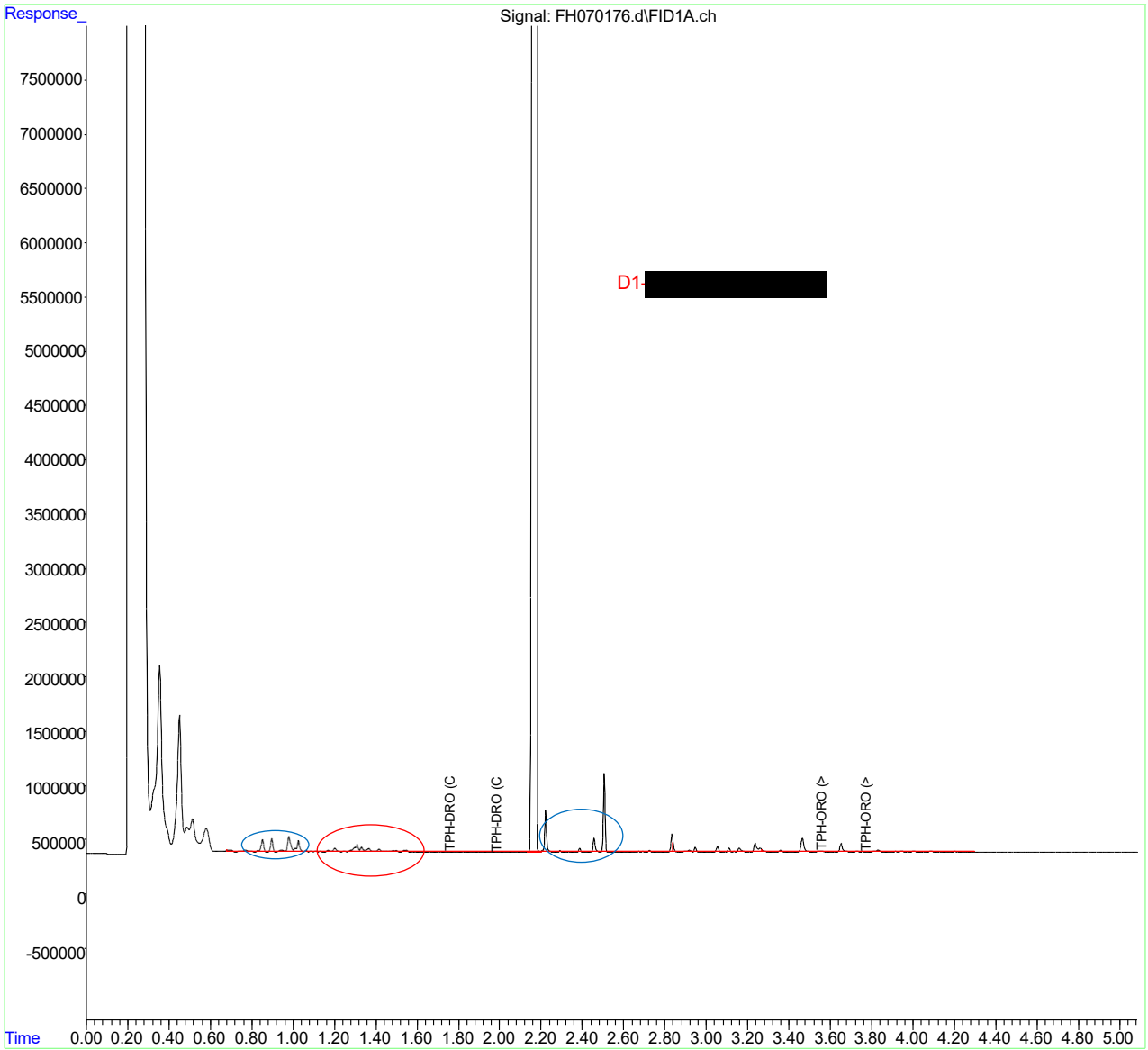
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070176.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 8:09 pm
Operator : trevorh
Sample : da60882-1
Misc : OP24787,GFH23679,1030,,,1,1
ALS Vial : 26 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:33:03 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070177.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 8:18 pm
Operator : trevorh
Sample : da60882-2 D1-[redacted]
Misc : OP24787,GFH23679,1040
ALS Vial : 27 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:33:05 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.176	743521712	1437.715	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	40670344	109.495	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	33720224	91.533	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	10997634	62.915	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	18074413	58.178	ug/ml

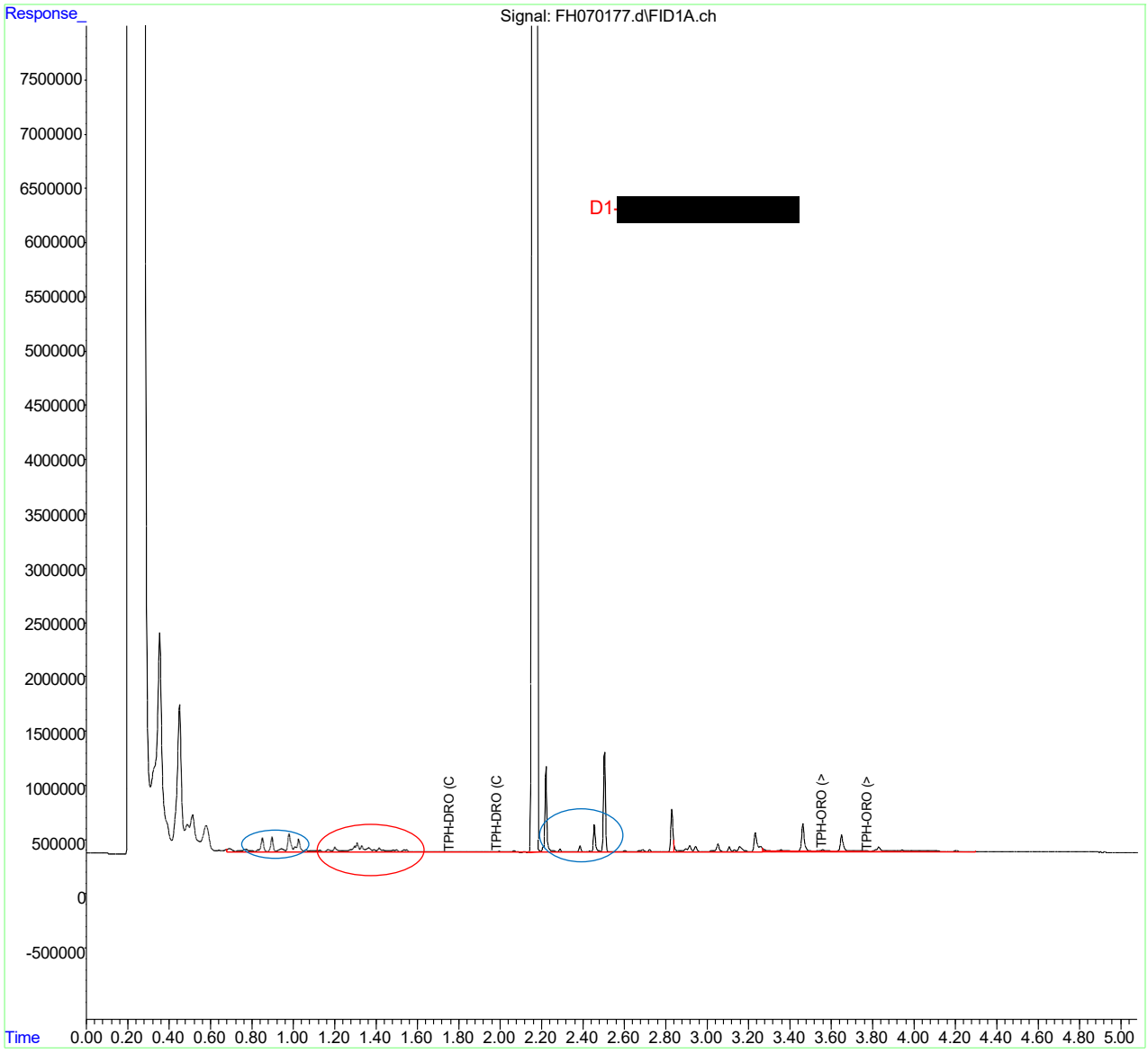
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070177.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 8:18 pm
Operator : trevorh
Sample : da60882-2
Misc : OP24787,GFH23679,1040,,,1,1
ALS Vial : 27 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:33:05 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



DRO-092023.M Sun Dec 24 14:14:11 2023 Page: 2

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070178.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 8:26 pm
Operator : trevorh
Sample : da60883-1 F1-[redacted]
Misc : OP24787,GFH23679,1030,,,1,1
ALS Vial : 28 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:33:07 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.173	631601403	1221.299	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	29237974	78.716	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	24598129	66.772	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	6607562	37.800	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	11215381	36.100	ug/ml

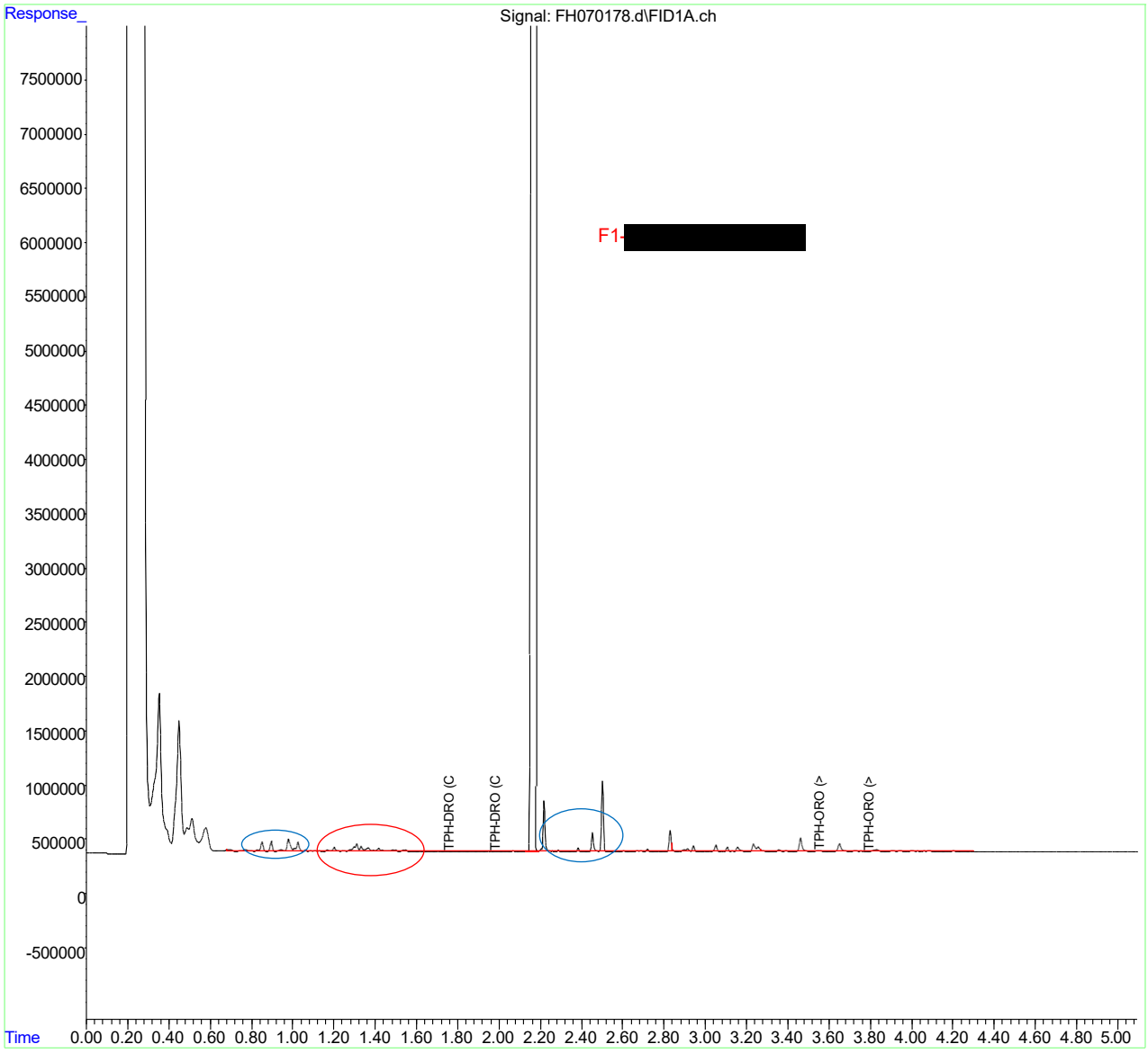
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070178.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 8:26 pm
Operator : trevorh
Sample : da60883-1
Misc : OP24787,GFH23679,1030,,,1,1
ALS Vial : 28 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:33:07 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



DRO-092023.M Sun Dec 24 14:14:14 2023 Page: 2

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070179.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 8:34 pm
Operator : trevorh
Sample : da60883-2 F1-[redacted]
Misc : OP24787,GFH23679,1040,
ALS Vial : 29 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:33:09 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
System Monitoring Compounds					
1) S	o-Terphenyl	2.176	746712649	1443.885	ug/ml
Target Compounds					
2) H	TPH-DRO (C10-C28)	1.980	30869534	83.109	ug/ml
3) H	TPH-DRO (C10-C24)	1.760	26460119	71.826	ug/ml
4) H	TPH-ORO (>C28-C40)	3.790	7602207	43.491	ug/ml
5) H	TPH-ORO (>C24-C40)	3.570	11870309	38.208	ug/ml

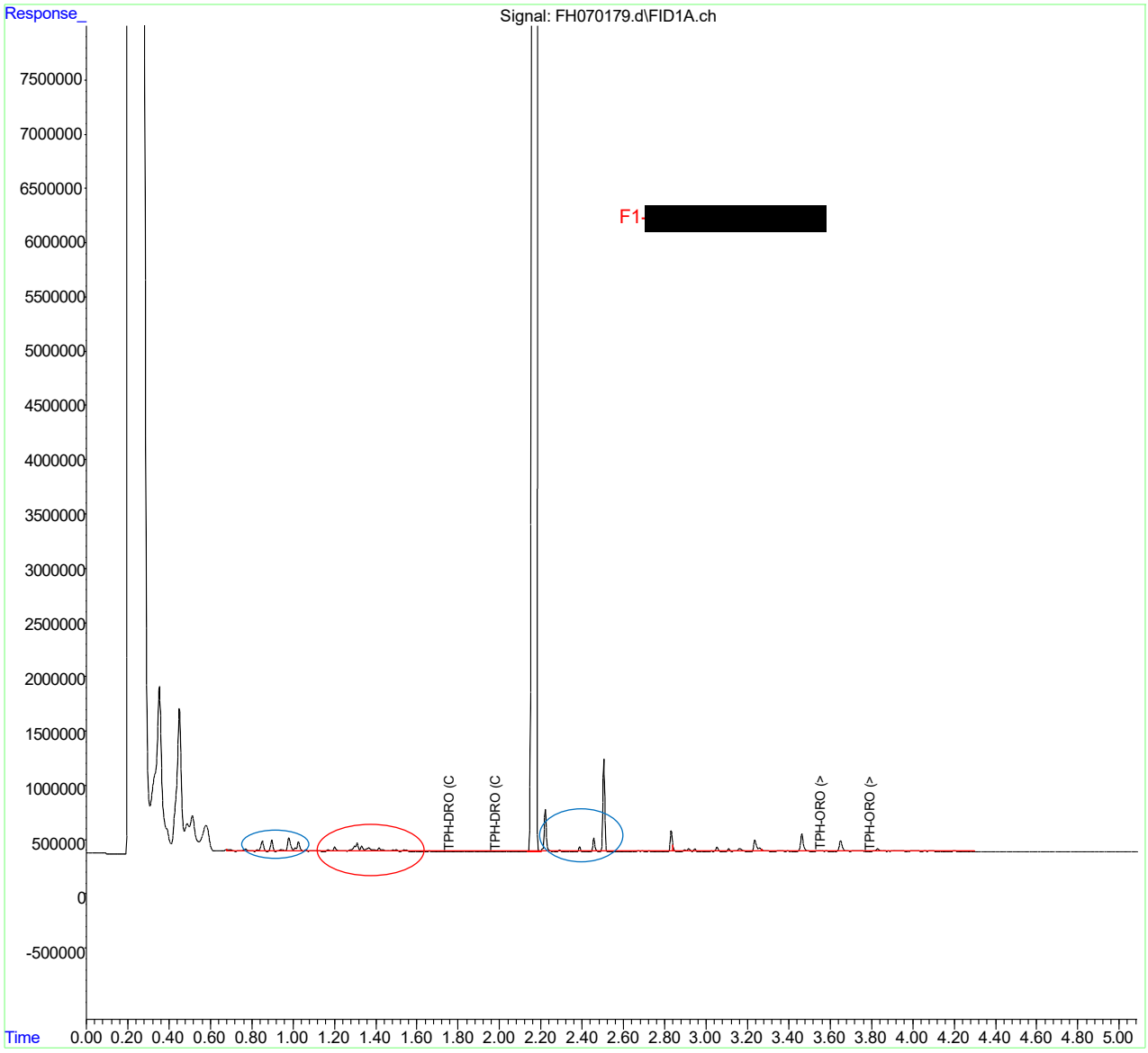
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh122323 - from new cpu\
Data File : FH070179.d
Signal(s) : FID1A.ch
Acq On : 23 Dec 2023 8:34 pm
Operator : trevorh
Sample : da60883-2
Misc : OP24787,GFH23679,1040,,,1,1
ALS Vial : 29 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 24 13:33:09 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Sun Dec 24 13:31:22 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Attachment 4:

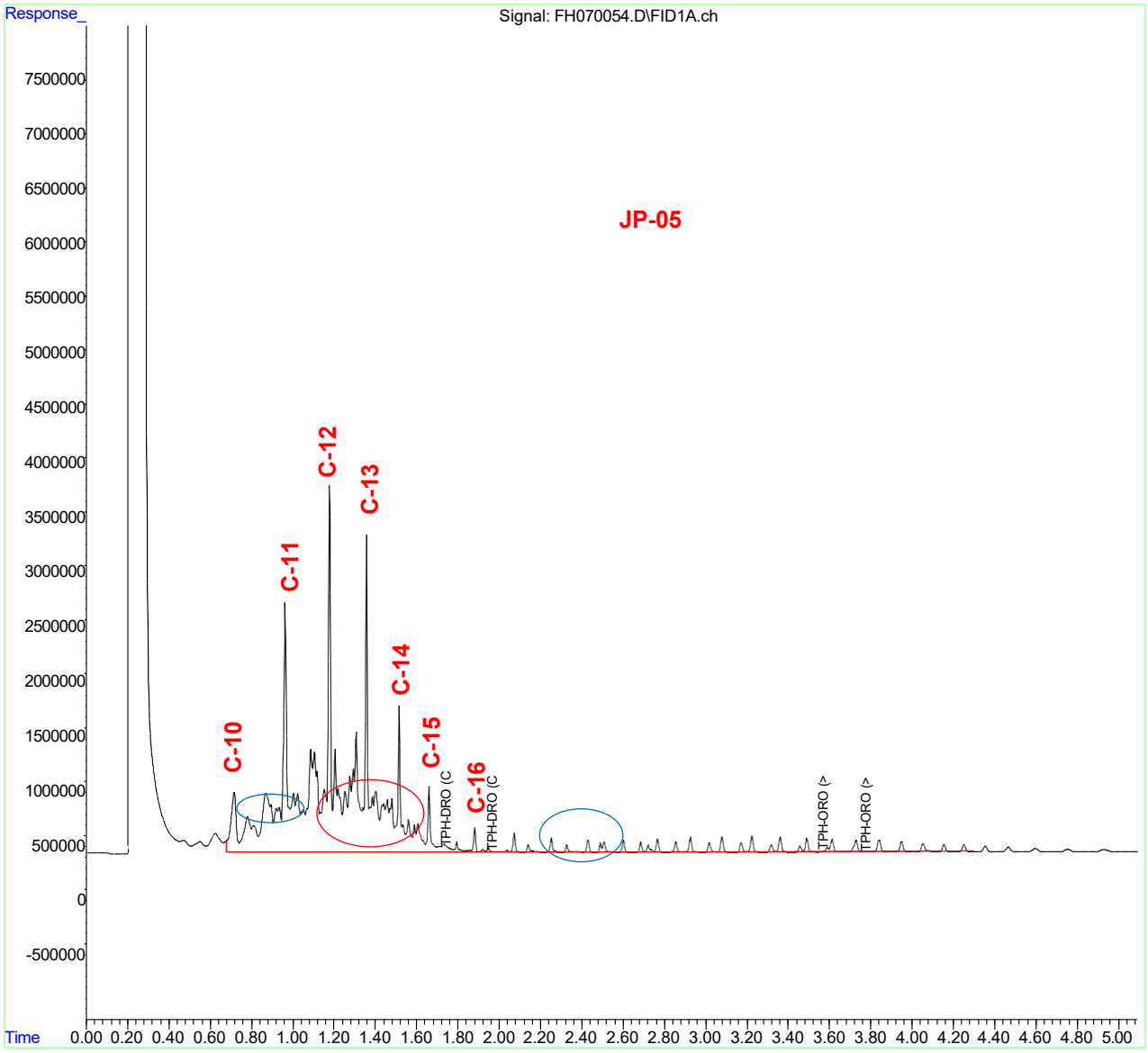
JP-5 Standard from DA60699

Quantitation Report (Not Reviewed)

Data Path : C:\msdchem\1\DATA\2023\12.23\fh121823a\
Data File : FH070054.D
Signal(s) : FID1A.ch
Acq On : 18 Dec 2023 8:10 pm
Operator : jackb
Sample : RT JP-05
Misc : OP20000,GFH23770,,,,,1
ALS Vial : 3 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Dec 19 14:18:53 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Wed Sep 20 16:12:50 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Attachment 5:

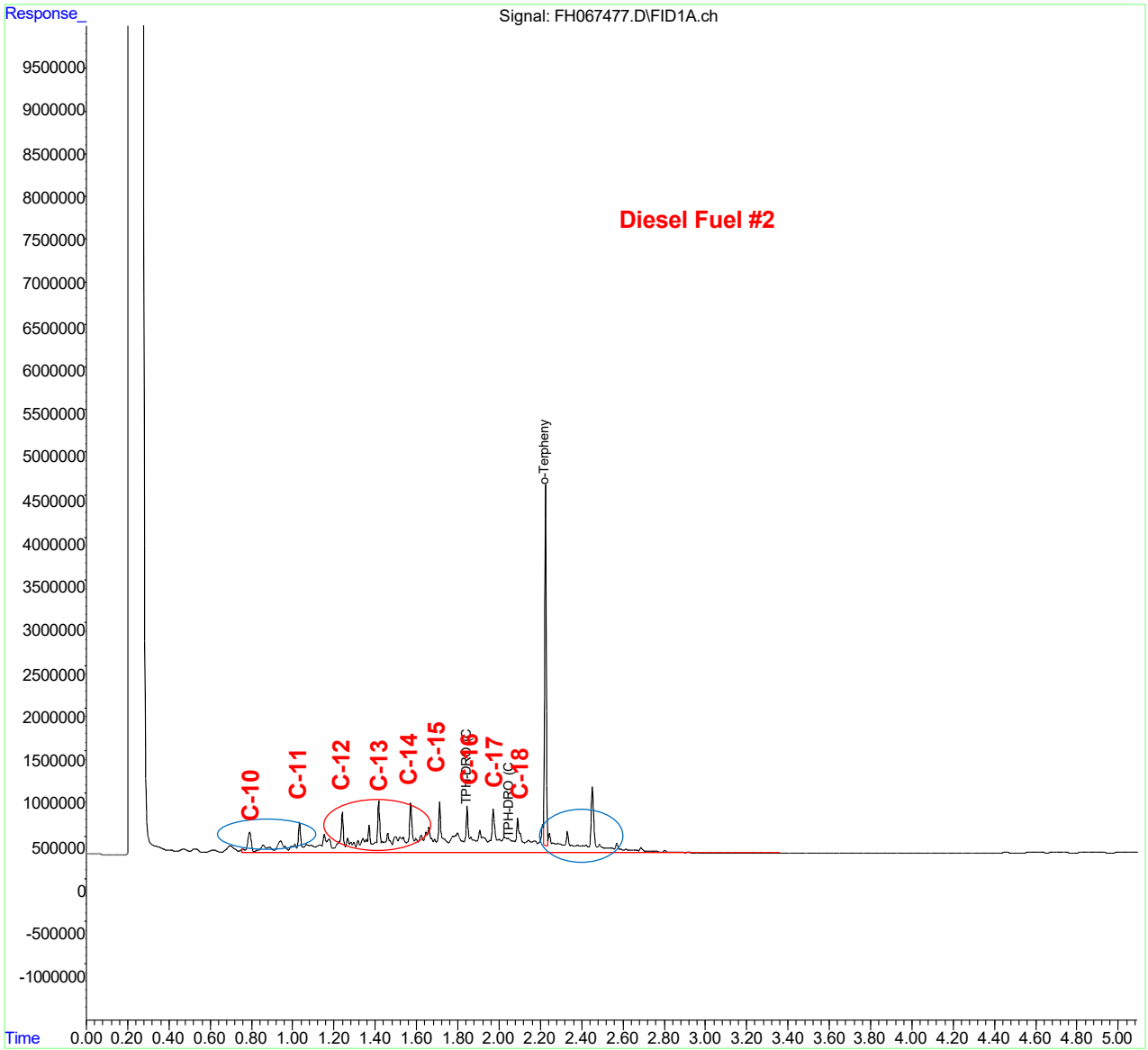
500 ppb Diesel Fuel #2 Standard from DA60699 (Attachment 4)

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\2023\August\FH092023a\
Data File : FH067477.D
Signal(s) : FID1A.ch
Acq On : 20 Sep 2023 1:50 pm
Operator : jackb
Sample : ic23708-500
Misc : OP20460,GFH23708,,,,,1
ALS Vial : 12 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Sep 20 15:36:20 2023
Quant Method : C:\msdchem\1\METHODS\DRO-092023.M
Quant Title : DRO-ORO FRONT
QLast Update : Fri Sep 08 15:51:12 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Appendix O

LTM Sample Analytical Results

Multiple Events
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu, Hawaii

Location ID:					Address A	Address B	Address C	Address D	Address D	Address E	SHFTWAIA-CP-PT
Location Type:					Residence	Residence	Residence	Residence	Residence	Residence	Well
Residence:					Address A	Address B	Address C	Address D	Address D	Address E	Waiawa Shaft Post-Chlorination
Field Sample ID:					A1-[redacted]	D2-[redacted]	D3-[redacted]	D3-[redacted]	D3-[redacted]	F2-[redacted]	SHAFT-HW-0016021-23130-N-R1
Sample Date:					2023-10-20	2023-10-20	2023-10-20	2023-10-20	2023-10-25	2023-11-03	2023-10-19
Sample Type:					N	N	N	N	N	N	N
Field Tests (mg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**							
Free Chlorine	None	None	None	4	0.280	0.370	0.0600	0.540	0.710	0.340	0.610
GENCHEM (mg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA59504**	**SDG: DA59503**	**SDG: DA59502**	**SDG: DA59502**	**SDG: DA59608**	**SDG: DA59796**	**SDG: DA59505**
Total Organic Carbon	2	None	None	None	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U
HC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA59504**	**SDG: DA59503**	**SDG: DA59502**	**SDG: DA59502**	**SDG: DA59608**	**SDG: DA59796**	**SDG: DA59505**
Petroleum Hydrocarbons (as Diesel)	200	400	None	None	**71.2 J**	**50.2 J**	50.0 UJ	**56.0 J**	**65.9 J**	78.0 U	76.0 U
Petroleum Hydrocarbons (as Gasoline)	200	300	None	None	50.0 U	50.0 U	50.0 U	50.0 U	50.0 U	50.0 U	50.0 U
Petroleum Hydrocarbons (as Motor Oil)	200	500	None	None	50.0 U	50.0 U	50.0 UJ	50.0 U	50.0 U	50.0 U	50.0 U
Petroleum Hydrocarbons, Total	266	None	None	None	71.2	50.2	ND	56	65.9	ND	ND
METAL (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA59504**	**SDG: DA59503**	**SDG: DA59502**	**SDG: DA59502**	**SDG: DA59608**	**SDG: DA59796**	**SDG: DA59505**
Antimony	6	6	6	6	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Arsenic	10	10	10	10	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U	0.500 U
Barium	2000	220	2000	2000	**2.10**	**2.00**	**2.00**	**2.20**	**1.90 J**	**2.00**	**1.90 J**
Beryllium	4	0.66	4	4	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U	0.150 U
Cadmium	5	3	5	5	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U
Chromium	100	11	100	100	0.500 U	0.500 U	0.500 U	0.500 U	**0.610 J**	**0.680 J**	0.500 U
Copper	1300	2.9	1300	1300	**20.3**	**78.0**	**6.20**	**51.2**	**3.40**	**102**	**12.2**
Lead	15	5.6	15	15	**0.230 J**	**0.350 J**	**0.280 J**	**0.400 J**	**0.910**	**0.160 J**	**0.300 J**
Mercury	2	0.025	2	2	0.0250 U	0.0250 U	0.0250 U	0.0250 U	0.0250 U	0.0250 U	0.0250 U
Selenium	50	5	50	50	**1.60**	**1.70**	**1.70**	**1.60**	**1.80**	**1.90**	**1.60**
Thallium	2	2	2	2	0.0500 U	**0.0520 J**	0.0500 U	0.0500 U	0.0500 U	0.0500 U	0.0500 U

Multiple Events
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu, Hawaii

Location ID:					Address A	Address B	Address C	Address D	Address D	Address E	SHFTWAIA-CP-PT
Location Type:					Residence	Residence	Residence	Residence	Residence	Residence	Well
Residence:					Address A	Address B	Address C	Address D	Address D	Address E	Waiawa Shaft Post-Chlorination
Field Sample ID:					A1-[redacted]-	D2-[redacted]	D3-[redacted]	D3-[redacted]	D3-T[redacted]-	F2-T[redacted]	SHAFT-HW-0016021-23130-N-R1
Sample Date:					2023-10-20	2023-10-20	2023-10-20	2023-10-20	2023-10-25	2023-11-03	2023-10-19
Sample Type:					N	N	N	N	N	N	N
ORG_GC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA59504**	**SDG: DA59503**	**SDG: DA59502**	**SDG: DA59502**	**SDG: DA59608**	**SDG: DA59796**	**SDG: DA59505**
Bromoacetic acid	None	None	None	None	0.700 U	0.700 U	0.700 U	0.700 U	0.700 U	0.700 U	--
Chloroacetic acid	None	None	None	None	0.900 U	0.900 U	0.900 U	0.900 U	0.900 U	0.900 U	--
Dibromoacetic acid	None	None	None	None	0.700 U	0.700 U	0.700 U	0.700 U	0.700 U	0.700 U	--
Dichloroacetic acid	None	None	None	None	0.700 U	0.700 U	0.700 U	0.700 U	0.700 U	0.700 U	--
Total Haloacetic acids	60	None	60	None	0.700	0.700	0.700	0.700	0.700	0.700	--
Trichloroacetic acid	None	None	None	None	0.700 U	0.700 U	0.700 U	0.700 U	0.700 U	0.700 U	--
SVOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA59504**	**SDG: DA59503**	**SDG: DA59502**	**SDG: DA59502**	**SDG: DA59608**	**SDG: DA59796**	**SDG: DA59505**
1-Methylnaphthalene	10	10	None	None	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
2-Methylnaphthalene	10	10	None	None	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Benzo(a)pyrene	0.2	0.06	0.2	0.2	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U	0.0100 U
Bis(2-ethylhexyl)phthalate	6	3	6	6	0.400 U	0.400 U	0.400 U	0.400 U	0.400 U	0.400 U	0.400 U
Naphthalene	17	17	None	None	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
VOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA59504**	**SDG: DA59503**	**SDG: DA59502**	**SDG: DA59502**	**SDG: DA59608**	**SDG: DA59796**	**SDG: DA59505**
1,1,1-Trichloroethane	200	11	200	200	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
1,1,2-Trichloroethane	5	5	5	5	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
1,1-Dichloroethene	7	7	7	7	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
1,2,4-Trichlorobenzene	70	70	70	70	0.270 U	0.270 U	0.270 U	0.270 U	0.270 U	0.270 U	0.270 U
1,2-Dichlorobenzene	600	10	600	600	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
1,2-Dichloroethane	5	5	5	5	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
1,2-Dichloroethene (Total)	70	None	70	None	0.250	0.250	0.250	0.250	0.250	0.250	0.250
1,2-Dichloropropane	5	5	5	5	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
1,4-Dichlorobenzene	75	5	75	None	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Benzene	5	5	5	5	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Bromodichloromethane	None	None	None	None	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Bromoform	None	None	None	None	**2.20**	**1.10**	0.250 U	0.250 U	0.250 U	**0.310 J**	0.250 U
Carbon Tetrachloride	5	5	5	5	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Chlorobenzene	100	25	100	100	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U

Multiple Events
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu, Hawaii

Location ID:					Address A	Address B	Address C	Address D	Address D	Address E	SHFTWAIA-CP-PT
Location Type:					Residence	Residence	Residence	Residence	Residence	Residence	Well
Residence:					Address A	Address B	Address C	Address D	Address D	Address E	Waiawa Shaft Post-Chlorination
Field Sample ID:					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	SHAFT-HW-0016021-[redacted]
Sample Date:					2023-10-20	2023-10-20	2023-10-20	2023-10-20	2023-10-25	2023-11-03	2023-10-19
Sample Type:					N	N	N	N	N	N	N
VOC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA59504**	**SDG: DA59503**	**SDG: DA59502**	**SDG: DA59502**	**SDG: DA59608**	**SDG: DA59796**	**SDG: DA59505**
Chloroform	None	None	None	None	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
cis-1,2-Dichloroethene	70	70	70	70	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Dibromochloromethane	None	None	None	None	**0.560**	**0.490 J**	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Ethylbenzene	700	7.3	700	700	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
m,p-Xylene	10000	13	None	None	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Methylene chloride	5	5	5	5	0.400 U	0.400 U	0.400 U	0.400 U	0.400 U	0.400 U	0.400 U
o-Xylene	10000	13	None	None	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Styrene	100	10	100	100	0.330 U	0.330 U	0.330 U	0.330 U	0.330 U	0.330 U	0.330 U
Tetrachloroethene (PCE)	5	5	5	5	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Toluene	1000	9.8	1000	1000	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Total Trihalomethanes	80	None	80	None	**2.76**	**1.59**	0.250	0.250	0.250	**0.310**	0.250
trans-1,2-Dichloroethene	100	100	100	100	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Trichloroethene (TCE)	5	5	5	5	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Vinyl chloride	2	2	2	2	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U	0.250 U
Xylenes, Total	10000	13	10000	10000	0.250	0.250	0.250	0.250	0.250	0.250	0.250

Notes:

-- indicates that the sample was Not Analyzed for the analyte
Results highlighted yellow exceed the ISP
Results in purple font also exceed the EALs
Results in green font also exceed the DOH MCL
Results in blue font also exceed the EPA MCL
Results from G1/G3 sampling, where the G3 result is greater than the G1 result, have a red border and the associated G1/G3 result in parentheses for comparison

mg/L = Milligrams per Liter

µg/L = Micrograms per Liter

Water Heater Samples
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu, Hawaii

Location ID:					Address A	Address A	Address A	Address G	Address G	Address G	Address C	Address C
Location Type:					Residence	Residence	Residence	Residence	Residence	Residence	Residence	Residence
Residence:					Address A	Address A	Address A	Address G	Address G	Address G	Address C	Address C
Field Sample ID:					[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sample Date:					2023-11-22	2023-11-22	2023-11-22	2023-11-20	2023-11-20	2023-11-20	2023-11-21	2023-11-21
Sample Type:					N	N	N	N	N	N	N	N
Field Tests (mg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**								
Free Chlorine	None	None	None	4	0.200-0.590	0.200-0.590	0.200-0.590	0.0900-0.590	0.0900-0.590	0.0900-0.590	0.410-0.470	0.410-0.470
HC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA60212**	**SDG: DA60212**	**SDG: DA60212**	**SDG: DA60154**	**SDG: DA60154**	**SDG: DA60154**	**SDG: DA60184**	**SDG: DA60184**
Petroleum Hydrocarbons (as Diesel)	200	400	None	None	51.0 UJ	51.0 UJ	51.0 UJ	**66.6 J**	**55.2 J**	**55.7 J**	51.0 UJ	51.0 UJ
Petroleum Hydrocarbons (as Gasoline)	200	300	None	None	50.0 U	50.0 U	50.0 U	50.0 U	50.0 U	50.0 U	50.0 U	50.0 U
Petroleum Hydrocarbons (as Motor Oil)	200	500	None	None	51.0 UJ	**54.8 J**	51.0 UJ	**75.9 J**	**56.7 J**	**81.1**	51.0 UJ	**54.5 J**
Petroleum Hydrocarbons, Total	266	None	None	None	ND	54.8	ND	142.5	111.9	136.8	ND	54.5

Notes:

-- indicates that the sample was Not Analyzed for the analyte
Results highlighted yellow exceed the ISP
Results in purple font also exceed the EALs
Results in green font also exceed the DOH MCL
Results in blue font also exceed the EPA MCL
Results from G1/G3 sampling, where the G3 result is greater than the G1 result, have a red border and the associated G1/G3 result in parentheses for comparison

mg/L = Milligrams per Liter

µg/L = Micrograms per Liter

Water Heater Samples
Chemistry Results
Drinking Water Sampling, JBPHH, Oahu, Hawaii

Location ID:					Address C	Address D	Address D	Address D
Location Type:					Residence	Residence	Residence	Residence
Residence:					Address C	Address D	Address D	Address D
Field Sample ID:					[redacted]	[redacted]	[redacted]	[redacted]
Sample Date:					2023-11-21	2023-11-21	2023-11-21	2023-11-21
Sample Type:					N	N	N	N
Field Tests (mg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**				
Free Chlorine	None	None	None	4	0.410-0.470	0.570-0.740	0.570-0.740	0.570-0.740
HC (µg/L)	**Incident Specific Parameters**	**DOH Environmental Action Levels Table D-1A Groundwater Action Levels**	**DOH Safe Drinking Water Branch (SDWB) Regulatory Constituents**	**Environmental Protection Agency Maximum Contaminant Levels**	**SDG: DA60184**	**SDG: DA60183**	**SDG: DA60183**	**SDG: DA60183**
Petroleum Hydrocarbons (as Diesel)	200	400	None	None	**71.7 J**	50.0 UJ	51.0 U	**70.6 J**
Petroleum Hydrocarbons (as Gasoline)	200	300	None	None	50.0 U	50.0 U	50.0 U	50.0 U
Petroleum Hydrocarbons (as Motor Oil)	200	500	None	None	**63.9 J**	50.0 UJ	51.0 U	51.0 U
Petroleum Hydrocarbons, Total	266	None	None	None	135.6	ND	ND	70.6

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

			Location ID:	Address A			A1-HYD1195	A1-HYD1293	Address H		
			Location Type:	Residence			Hydrant	Hydrant	Residence		
			Address:	Address A			Physical Number: 76	Physical Number: 75	Address H		
			Field Sample ID:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
			Sample Date:	2023-11-22	2023-11-22	2023-11-22	2023-12-19	2023-12-19	2023-12-06	2023-12-06	2023-12-06
			Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**								
Field Test (ppb)	Free Chlorine	4000	MCL	200-590	200-590	200-590	480	280	120-380	120-380	120-380
Hydrocarbons (ppb)	Petroleum Hydrocarbons (as Diesel)	-	-	ND	ND	ND	99.8	86.4	50.5	51.2	102
	Petroleum Hydrocarbons (as Gasoline)	-	-	ND	ND	ND	ND	ND	ND	ND	ND
	Petroleum Hydrocarbons (as Oil)	-	-	ND	54.8	ND	ND	ND	ND	ND	ND
	Petroleum Hydrocarbons, Total	266	ISP	ND	54.8	ND	99.8	86.4	50.5	51.2	102

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

				Location ID:	A2-HYD[redacted]	A2-HYD[redacted]	D1-HYD[redacted]	D1-HYD[redacted]	Address I			
				Location Type:	Hydrant	Hydrant	Hydrant	Hydrant	Residence			
				Address:	[redacted]	[redacted]	[redacted]	[redacted]	Address I			
				Field Sample ID:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
				Sample Date:	2023-12-19	2023-12-19	2023-12-20	2023-12-20	2023-12-07	2023-12-07	2023-12-07	2023-12-27
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**									
Field Test (ppb)	Free Chlorine	4000	MCL	450	560	530	570	170-270	170-270	170-270	40.0-50.0
General Chemistry (ppb)	Total Organic Carbon	2000	ISP	-	-	-	-	-	-	-	ND
Hydrocarbons (ppb)	Petroleum Hydrocarbons (as Diesel)	-	-	68.2	78.0	64.6	88.0	ND	ND	59.5	ND
	Petroleum Hydrocarbons (as Gasoline)	-	-	ND	ND	ND	ND	ND	68.5	ND	ND
	Petroleum Hydrocarbons (as Oil)	-	-	ND	ND	ND	55.9	ND	ND	ND	ND
	Petroleum Hydrocarbons, Total	266	ISP	68.2	78.0	64.6	144	ND	68.5	59.5	ND
Metals (ppb)	Antimony	6	MCL	-	-	-	-	-	-	-	0.130
	Arsenic	10	MCL	-	-	-	-	-	-	-	ND
	Barium	2000	MCL	-	-	-	-	-	-	-	1.80
	Beryllium	4	MCL	-	-	-	-	-	-	-	ND
	Cadmium	5	MCL	-	-	-	-	-	-	-	ND
	Chromium	100	MCL	-	-	-	-	-	-	-	0.940
	Copper	1300	MCL	-	-	-	-	-	-	-	108
	Lead	15	MCL	-	-	-	-	-	-	-	0.930
	Mercury	2	MCL	-	-	-	-	-	-	-	ND
	Selenium	50	MCL	-	-	-	-	-	-	-	2.10
	Thallium	2	MCL	-	-	-	-	-	-	-	0.0540
Synthetic Organic Compounds (ppb)	1-Methylnaphthalene	10	EAL	-	-	-	-	-	-	-	ND
	2-Methylnaphthalene	10	EAL	-	-	-	-	-	-	-	ND
	Benzo(a)pyrene	0.2	MCL	-	-	-	-	-	-	-	ND
	Bis(2-ethylhexyl)phthalate	6	MCL	-	-	-	-	-	-	-	ND
	Naphthalene	17	EAL	-	-	-	-	-	-	-	ND
Volatile Organic Compounds (ppb)	1,1,1-Trichloroethane	-	-	-	-	-	-	-	-	-	ND
	1,1,2-Trichloroethane	5	MCL	-	-	-	-	-	-	-	ND

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

			Location ID:	A2-[redacted]	A2-[redacted]	D1-[redacted]	D1-[redacted]	Address I			
			Location Type:	Hydrant	Hydrant	Hydrant	Hydrant	Residence			
			Address:	[redacted]	[redacted]	[redacted]	[redacted]	Address I			
			Field Sample ID:	[redacted]				[redacted]	[redacted]	[redacted]	[redacted]
			Sample Date:	2023-12-19	2023-12-19	2023-12-20	2023-12-20	2023-12-07	2023-12-07	2023-12-07	2023-12-27
			Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**								
Volatile Organic Compounds (ppb)	1,1-Dichloroethene	7	MCL	-	-	-	-	-	-	-	ND
	1,2,4-Trichlorobenzene	70	MCL	-	-	-	-	-	-	-	ND
	1,2-Dichlorobenzene	600	MCL	-	-	-	-	-	-	-	ND
	1,2-Dichloroethane	5	MCL	-	-	-	-	-	-	-	ND
	1,2-Dichloroethene (Total)	70	MCL	-	-	-	-	-	-	-	ND
	1,2-Dichloropropane	5	MCL	-	-	-	-	-	-	-	ND
	1,4-Dichlorobenzene	75	MCL	-	-	-	-	-	-	-	ND
	Benzene	5	MCL	-	-	-	-	-	-	-	ND
	Carbon Tetrachloride	5	MCL	-	-	-	-	-	-	-	ND
	Chlorobenzene	100	MCL	-	-	-	-	-	-	-	ND
	cis-1,2-Dichloroethene	70	MCL	-	-	-	-	-	-	-	ND
	Ethylbenzene	700	MCL	-	-	-	-	-	-	-	ND
	m,p-Xylene	-	-	-	-	-	-	-	-	-	ND
	Methylene chloride	5	MCL	-	-	-	-	-	-	-	ND
	o-Xylene	-	-	-	-	-	-	-	-	-	ND
	Styrene	100	MCL	-	-	-	-	-	-	-	ND
	Tetrachloroethene (PCE)	5	MCL	-	-	-	-	-	-	-	ND
	Toluene	1000	MCL	-	-	-	-	-	-	-	ND
	trans-1,2-Dichloroethene	100	MCL	-	-	-	-	-	-	-	ND
	Trichloroethene (TCE)	5	MCL	-	-	-	-	-	-	-	ND
	Vinyl chloride	2	MCL	-	-	-	-	-	-	-	ND
	Xylenes, Total	10000	MCL	-	-	-	-	-	-	-	ND
Haloacetic Acids (ppb)	Bromoacetic acid	-	-	-	-	-	-	-	-	-	ND
	Chloroacetic acid	-	-	-	-	-	-	-	-	-	ND

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

				Location ID:	A2-HYD[redacted]	A2-HYD[redacted]	D1-HYD[redacted]	D1-HYD[redacted]	Address I			
				Location Type:	Hydrant	Hydrant	Hydrant	Hydrant	Residence			
				Address:	[redacted]	[redacted]	[redacted]	[redacted]	Address I			
				Field Sample ID:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
				Sample Date:	2023-12-19	2023-12-19	2023-12-20	2023-12-20	2023-12-07	2023-12-07	2023-12-07	2023-12-27
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**									
Haloacetic Acids (ppb)	Dibromoacetic acid	-	-	-	-	-	-	-	-	-	ND
	Dichloroacetic acid	-	-	-	-	-	-	-	-	-	ND
	Trichloroacetic acid	-	-	-	-	-	-	-	-	-	ND
	Total Haloacetic acids	60	MCL	-	-	-	-	-	-	-	ND
Trihalomethanes (ppb)	Bromodichloromethane	-	-	-	-	-	-	-	-	-	0.490
	Bromoform	-	-	-	-	-	-	-	-	-	3.30
	Chloroform	-	-	-	-	-	-	-	-	-	ND
	Dibromochloromethane	-	-	-	-	-	-	-	-	-	1.90
	Total Trihalomethanes	80	MCL	-	-	-	-	-	-	-	5.69

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

				Location ID:	Address I			D2-HYD[redacted]	D2-HYD[redacted]	Address B		
				Location Type:	Residence			Hydrant	Hydrant	Residence		
				Address:	Address I			[redacted]	[redacted]	Address B		
				Field Sample ID:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
				Sample Date:	2023-12-27	2023-12-27	2023-12-27	2023-12-19	2023-12-19	2023-12-07	2023-12-07	2023-12-07
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**									
Field Test (ppb)	Free Chlorine	4000	MCL	40.0-50.0	40.0-50.0	40.0-50.0	510	390	340-600	340-600	340-600
General Chemistry (ppb)	Total Organic Carbon	2000	ISP	ND	ND	ND	-	-	-	-	-
Hydrocarbons (ppb)	Petroleum Hydrocarbons (as Diesel)	-	-	ND	ND	ND	53.8	52.8	64.3	ND	ND
	Petroleum Hydrocarbons (as Gasoline)	-	-	ND	ND	ND	ND	ND	ND	ND	ND
	Petroleum Hydrocarbons (as Oil)	-	-	ND	ND	ND	ND	ND	ND	ND	ND
	Petroleum Hydrocarbons, Total	266	ISP	ND	ND	ND	53.8	52.8	64.3	ND	ND
Metals (ppb)	Antimony	6	MCL	ND	ND	ND	-	-	-	-	-
	Arsenic	10	MCL	ND	ND	ND	-	-	-	-	-
	Barium	2000	MCL	2.70	1.80	2.80	-	-	-	-	-
	Beryllium	4	MCL	ND	ND	ND	-	-	-	-	-
	Cadmium	5	MCL	ND	ND	ND	-	-	-	-	-
	Chromium	100	MCL	1.10	0.860	1.20	-	-	-	-	-
	Copper	1300	MCL	103	69.4	65.8	-	-	-	-	-
	Lead	15	MCL	0.530	0.150	0.320	-	-	-	-	-
	Mercury	2	MCL	ND	ND	ND	-	-	-	-	-
	Selenium	50	MCL	ND	1.70	ND	-	-	-	-	-
	Thallium	2	MCL	ND	ND	ND	-	-	-	-	-
Synthetic Organic Compounds (ppb)	1-Methylnaphthalene	10	EAL	ND	ND	ND	-	-	-	-	-
	2-Methylnaphthalene	10	EAL	ND	ND	ND	-	-	-	-	-
	Benzo(a)pyrene	0.2	MCL	ND	ND	ND	-	-	-	-	-
	Bis(2-ethylhexyl)phthalate	6	MCL	ND	ND	ND	-	-	-	-	-
	Naphthalene	17	EAL	ND	ND	ND	-	-	-	-	-
Volatile Organic Compounds (ppb)	1,1,1-Trichloroethane	-	-	ND	ND	ND	-	-	-	-	-
	1,1,2-Trichloroethane	5	MCL	ND	ND	ND	-	-	-	-	-
	1,1-Dichloroethene	7	MCL	ND	ND	ND	-	-	-	-	-

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

			Location ID:	Address I			D2-HYD[redacted]	D2-HYD[redacted]	Address B		
			Location Type:	Residence			Hydrant	Hydrant	Residence		
			Address:	Address I			[redacted]	[redacted]	Address B		
			Field Sample ID:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	23157-N-WH-R2
			Sample Date:	2023-12-27	2023-12-27	2023-12-27	2023-12-19	2023-12-19	2023-12-07	2023-12-07	2023-12-07
			Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**								
Volatile Organic Compounds (ppb)	1,2,4-Trichlorobenzene	70	MCL	ND	ND	ND	-	-	-	-	-
	1,2-Dichlorobenzene	600	MCL	ND	ND	ND	-	-	-	-	-
	1,2-Dichloroethane	5	MCL	ND	ND	ND	-	-	-	-	-
	1,2-Dichloroethene (Total)	70	MCL	ND	ND	ND	-	-	-	-	-
	1,2-Dichloropropane	5	MCL	ND	ND	ND	-	-	-	-	-
	1,4-Dichlorobenzene	75	MCL	ND	ND	ND	-	-	-	-	-
	Benzene	5	MCL	ND	ND	ND	-	-	-	-	-
	Carbon Tetrachloride	5	MCL	ND	ND	ND	-	-	-	-	-
	Chlorobenzene	100	MCL	ND	ND	ND	-	-	-	-	-
	cis-1,2-Dichloroethene	70	MCL	ND	ND	ND	-	-	-	-	-
	Ethylbenzene	700	MCL	ND	ND	ND	-	-	-	-	-
	m,p-Xylene	-	-	ND	ND	ND	-	-	-	-	-
	Methylene chloride	5	MCL	ND	ND	ND	-	-	-	-	-
	o-Xylene	-	-	ND	ND	ND	-	-	-	-	-
	Styrene	100	MCL	ND	ND	ND	-	-	-	-	-
	Tetrachloroethene (PCE)	5	MCL	ND	ND	ND	-	-	-	-	-
	Toluene	1000	MCL	ND	ND	ND	-	-	-	-	-
	trans-1,2-Dichloroethene	100	MCL	ND	ND	ND	-	-	-	-	-
	Trichloroethene (TCE)	5	MCL	ND	ND	ND	-	-	-	-	-
	Vinyl chloride	2	MCL	ND	ND	ND	-	-	-	-	-
	Xylenes, Total	10000	MCL	ND	ND	ND	-	-	-	-	-
Haloacetic Acids (ppb)	Bromoacetic acid	-	-	ND	ND	ND	-	-	-	-	-
	Chloroacetic acid	-	-	ND	ND	ND	-	-	-	-	-
	Dibromoacetic acid	-	-	0.800	ND	0.630	-	-	-	-	-
	Dichloroacetic acid	-	-	ND	ND	ND	-	-	-	-	-

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

				Location ID:	Address I		D2-HYD[redacted]	D2-HYD[redacted]	Address B		
				Location Type:	Residence		Hydrant	Hydrant	Residence		
				Address:	Address I		[redacted]	[redacted]	Address B		
				Field Sample ID:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
				Sample Date:	2023-12-27	2023-12-27	2023-12-27	2023-12-19	2023-12-19	2023-12-07	2023-12-07	2023-12-07
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**									
Haloacetic Acids (ppb)	Trichloroacetic acid	-	-	ND	ND	ND	-	-	-	-	-
	Total Haloacetic acids	60	MCL	0.800	ND	0.630	-	-	-	-	-
Trihalomethanes (ppb)	Bromodichloromethane	-	-	0.590	0.510	ND	-	-	-	-	-
	Bromoform	-	-	5.10	3.30	ND	-	-	-	-	-
	Chloroform	-	-	ND	ND	ND	-	-	-	-	-
	Dibromochloromethane	-	-	2.20	1.80	ND	-	-	-	-	-
	Total Trihalomethanes	80	MCL	7.89	5.61	ND	-	-	-	-	-

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

				Location ID:	D3-HYD[redacted]	D3-HYD[redacted]	D3-HYD[redacted]	D3-HYD[redacted]	D3-HYD[redacted]	D3-HYD[redacted]	Address G	
				Location Type:	Hydrant	Hydrant	Hydrant	Hydrant	Hydrant	Hydrant	Residence	
				Address:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	Address G	
				Field Sample ID:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
				Sample Date:	2023-12-15	2023-12-15	2023-12-15	2023-12-15	2023-12-15	2023-12-15	2023-11-20	2023-11-20
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**									
Field Test (ppb)	Free Chlorine	4000	MCL	470	380	380	420	50.0	520	90.0-590	90.0-590
Hydrocarbons (ppb)	Petroleum Hydrocarbons (as Diesel)	-	-	59.0	57.6	ND	55.9	58.1	62.8	66.6	55.2
	Petroleum Hydrocarbons (as Gasoline)	-	-	ND	ND	ND	ND	ND	ND	ND	ND
	Petroleum Hydrocarbons (as Oil)	-	-	ND	ND	ND	ND	ND	ND	75.9	56.7
	Petroleum Hydrocarbons, Total	266	ISP	59.0	57.6	ND	55.9	58.1	62.8	143	112

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

				Location ID:	Address G	Address C			Address D			E1-HYD[redacted]
				Location Type:	Residence	Residence			Residence			Hydrant
				Address:	Address G	Address C			Address D			Physical Number:[redacted]
				Field Sample ID:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
				Sample Date:	2023-11-20	2023-11-21	2023-11-21	2023-11-21	2023-11-21	2023-11-21	2023-11-21	2023-12-19
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**									
Field Test (ppb)	Free Chlorine	4000	MCL		90.0-590	410-470	410-470	410-470	570-740	570-740	570-740	200
Hydrocarbons (ppb)	Petroleum Hydrocarbons (as Diesel)	-	-		55.7	ND	ND	71.7	ND	ND	70.6	ND
	Petroleum Hydrocarbons (as Gasoline)	-	-		ND	ND	ND	ND	ND	ND	ND	ND
	Petroleum Hydrocarbons (as Oil)	-	-		81.1	ND	54.5	63.9	ND	ND	ND	ND
	Petroleum Hydrocarbons, Total	266	ISP		137	ND	54.5	136	ND	ND	70.6	ND

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

			Location ID:	E1-HYD[redacted]	Address J			F1-HYD[redacted]	F1-HYD[redacted]	Address K	
			Location Type:	Hydrant	Residence			Hydrant	Hydrant	Residence	
			Address:	Physical Number: [redacted]	Address J			Physical Number: [redacted]	Physical Number: [redacted]	Address K	
			Field Sample ID:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
			Sample Date:	2023-12-19	2023-12-06	2023-12-06	2023-12-06	2023-12-20	2023-12-20	2023-12-08	2023-12-08
			Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**								
Field Test (ppb)	Free Chlorine	4000	MCL	410	60.0-500	60.0-500	60.0-500	360	450	150-240	150-240
Hydrocarbons (ppb)	Petroleum Hydrocarbons (as Diesel)	-	-	89.0	ND	ND	59.7	64.8	69.1	ND	ND
	Petroleum Hydrocarbons (as Gasoline)	-	-	ND	ND	ND	ND	ND	ND	ND	ND
	Petroleum Hydrocarbons (as Oil)	-	-	ND	ND	ND	ND	ND	ND	ND	75.4
	Petroleum Hydrocarbons, Total	266	ISP	89.0	ND	ND	59.7	64.8	69.1	ND	75.4

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

				Location ID:	Address K					Address L		
				Location Type:	Residence					Residence		
				Address:	Address K					Address L		
				Field Sample ID:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
				Sample Date:	2023-12-08	2023-12-27	2023-12-27	2023-12-27	2023-12-27	2023-12-08	2023-12-08	2023-12-08
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**									
Field Test (ppb)	Free Chlorine	4000	MCL	150-240	20.0-240	20.0-240	20.0-240	20.0-240	120-540	120-540	120-540
General Chemistry (ppb)	Total Organic Carbon	2000	ISP	-	ND	ND	ND	ND	-	-	-
Hydrocarbons (ppb)	Petroleum Hydrocarbons (as Diesel)	-	-	ND	88.3	ND	ND	ND	ND	ND	ND
	Petroleum Hydrocarbons (as Gasoline)	-	-	ND	ND	ND	ND	ND	ND	ND	ND
	Petroleum Hydrocarbons (as Oil)	-	-	89.2	ND	ND	ND	ND	66.4	ND	60.4
	Petroleum Hydrocarbons, Total	266	ISP	89.2	88.3	ND	ND	ND	66.4	ND	60.4
Metals (ppb)	Antimony	6	MCL	-	ND	ND	ND	ND	-	-	-
	Arsenic	10	MCL	-	ND	ND	ND	ND	-	-	-
	Barium	2000	MCL	-	1.80	2.80	1.90	2.80	-	-	-
	Beryllium	4	MCL	-	ND	ND	ND	ND	-	-	-
	Cadmium	5	MCL	-	ND	ND	ND	ND	-	-	-
	Chromium	100	MCL	-	0.950	1.10	0.830	1.20	-	-	-
	Copper	1300	MCL	-	40.3	52.3	43.0	36.2	-	-	-
	Lead	15	MCL	-	0.140	ND	0.130	ND	-	-	-
	Mercury	2	MCL	-	ND	ND	ND	ND	-	-	-
	Selenium	50	MCL	-	2.00	ND	1.90	ND	-	-	-
	Thallium	2	MCL	-	ND	ND	ND	ND	-	-	-
Synthetic Organic Compounds (ppb)	1-Methylnaphthalene	10	EAL	-	ND	ND	ND	ND	-	-	-
	2-Methylnaphthalene	10	EAL	-	ND	ND	ND	ND	-	-	-
	Benzo(a)pyrene	0.2	MCL	-	ND	ND	ND	ND	-	-	-
	Bis(2-ethylhexyl)phthalate	6	MCL	-	ND	ND	ND	ND	-	-	-
	Naphthalene	17	EAL	-	ND	ND	ND	ND	-	-	-
Volatile Organic Compounds (ppb)	1,1,1-Trichloroethane	-	-	-	ND	ND	ND	ND	-	-	-
	1,1,2-Trichloroethane	5	MCL	-	ND	ND	ND	ND	-	-	-
	1,1-Dichloroethene	7	MCL	-	ND	ND	ND	ND	-	-	-

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

			Location ID:	Address K					Address L		
			Location Type:	Residence					Residence		
			Address:	Address K					Address L		
			Field Sample ID:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
			Sample Date:	2023-12-08	2023-12-27	2023-12-27	2023-12-27	2023-12-27	2023-12-08	2023-12-08	2023-12-08
			Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**								
Volatile Organic Compounds (ppb)	1,2,4-Trichlorobenzene	70	MCL	-	ND	ND	ND	ND	-	-	-
	1,2-Dichlorobenzene	600	MCL	-	ND	ND	ND	ND	-	-	-
	1,2-Dichloroethane	5	MCL	-	ND	ND	ND	ND	-	-	-
	1,2-Dichloroethene (Total)	70	MCL	-	ND	ND	ND	ND	-	-	-
	1,2-Dichloropropane	5	MCL	-	ND	ND	ND	ND	-	-	-
	1,4-Dichlorobenzene	75	MCL	-	ND	ND	ND	ND	-	-	-
	Benzene	5	MCL	-	ND	ND	ND	ND	-	-	-
	Carbon Tetrachloride	5	MCL	-	ND	ND	ND	ND	-	-	-
	Chlorobenzene	100	MCL	-	ND	ND	ND	ND	-	-	-
	cis-1,2-Dichloroethene	70	MCL	-	ND	ND	ND	ND	-	-	-
	Ethylbenzene	700	MCL	-	ND	ND	ND	ND	-	-	-
	m,p-Xylene	-	-	-	ND	ND	ND	ND	-	-	-
	Methylene chloride	5	MCL	-	ND	ND	ND	ND	-	-	-
	o-Xylene	-	-	-	ND	ND	ND	ND	-	-	-
	Styrene	100	MCL	-	ND	ND	ND	ND	-	-	-
	Tetrachloroethene (PCE)	5	MCL	-	ND	ND	ND	ND	-	-	-
	Toluene	1000	MCL	-	ND	ND	ND	ND	-	-	-
	trans-1,2-Dichloroethene	100	MCL	-	ND	ND	ND	ND	-	-	-
	Trichloroethene (TCE)	5	MCL	-	ND	ND	ND	ND	-	-	-
	Vinyl chloride	2	MCL	-	ND	ND	ND	ND	-	-	-
	Xylenes, Total	10000	MCL	-	ND	ND	ND	ND	-	-	-
Haloacetic Acids (ppb)	Bromoacetic acid	-	-	-	ND	ND	ND	ND	-	-	-
	Chloroacetic acid	-	-	-	ND	ND	ND	ND	-	-	-
	Dibromoacetic acid	-	-	-	ND	ND	ND	0.670	-	-	-
	Dichloroacetic acid	-	-	-	ND	ND	ND	ND	-	-	-

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

				Location ID:	Address K				Address L		
				Location Type:	Residence				Residence		
				Address:	Address K				Address L		
				Field Sample ID:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
				Sample Date:	2023-12-08	2023-12-27	2023-12-27	2023-12-27	2023-12-27	2023-12-08	2023-12-08	2023-12-08
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**								
Haloacetic Acids (ppb)	Trichloroacetic acid	-	-	-	ND	ND	ND	ND	-	-	-
	Total Haloacetic acids	60	MCL	-	ND	ND	ND	0.670	-	-	-
Trihalomethanes (ppb)	Bromodichloromethane	-	-	-	ND	ND	ND	ND	-	-	-
	Bromoform	-	-	-	6.00	3.80	ND	ND	-	-	-
	Chloroform	-	-	-	ND	ND	ND	ND	-	-	-
	Dibromochloromethane	-	-	-	0.830	ND	ND	ND	-	-	-
	Total Trihalomethanes	80	MCL	-	6.83	3.80	ND	ND	-	-	-

Summary of Chemistry Results
Multiple Zones
Drinking Water Sampling, Joint Base Pearl Harbor - Hickam, Oahu, Hawaii

Notes:
ND = Not Detected
ISP = Incident Specific Parameter
EAL = DOH Environmental Action Level
EPA MCL = EPA Maximum Contaminant Level
All Results shown in Parts per Billion (ppb)
§ - Exceeds Screening Level
- = No Information Available
N (Normal) = Full compliance sample
FD (Field Duplicate) = Extra sample taken for quality control
N (Grab, Resample) = Additional follow-up sample

				Location ID:	F2-HYD[redacted]	F2-HYD[redacted]	F2-HYD[redacted]	F2-HYD[redacted]	F2-HYD[redacted]	F2-HYD[redacted]
				Location Type:	Hydrant	Hydrant	Hydrant	Hydrant	Hydrant	Hydrant
				Address:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
				Field Sample ID:	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
				Sample Date:	2023-12-20	2023-12-20	2023-12-20	2023-12-20	2023-12-20	2023-12-20
				Sample Type:	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)	N (Normal)
Method Group	**Analyte**	**DOH Project Screening Level**	**Basis of Project Screening Level**							
Field Test (ppb)	Free Chlorine	4000	MCL	360	530	620	580	630	590
Hydrocarbons (ppb)	Petroleum Hydrocarbons (as Diesel)	-	-	ND	72.9	70.5	52.3	58.2	50.5
	Petroleum Hydrocarbons (as Gasoline)	-	-	ND	ND	ND	ND	ND	ND
	Petroleum Hydrocarbons (as Oil)	-	-	ND	ND	ND	ND	ND	ND
	Petroleum Hydrocarbons, Total	266	ISP	ND	72.9	70.5	52.3	58.2	50.5

Appendix P

EPA Drinking Water Complaints Investigation Report of 20Dec2023

Appendix P: EPA Investigation Report - 20 December 2023

REGION 9
SAN FRANCISCO, CA 94105

December 20, 2023

Sent via electronic mail only

RDML Steve Barnett, USN
Commander, Navy Region Hawaii
850 Ticonderoga St, Ste 110
JBPHH, HI 96860-5101

Subject: EPA Investigation Report on October 2023 Drinking Water Complaints

Dear Rear Admiral Barnett,

On October 19, 2023, the United States Environmental Protection Agency, Region 9 (EPA) conducted an investigation into complaints about the drinking water served by the Joint Base Pearl Harbor Hickam public water system ("System"). Enclosed is EPA's Investigation Report ("Report") for the System. The Report evaluates the System's complaint process to ensure safe drinking water in accordance with the Safe Drinking Water Act (SDWA) and its implementing regulations.

EPA understands that Navy is conducting a premise plumbing investigation in response to the drinking water complaints from October 2023. Please promptly share all data collected (i.e. full laboratory reports) as a result of the premise plumbing investigation with EPA and Hawaii Department of Health.

Upon completion of the premise plumbing investigation, please update the System's drinking water complaint Standard Operating Procedures and send to EPA for review. In addition, EPA would like to see long-term drinking water monitoring continue past February 2024, which is when the Drinking Water Long-Term Monitoring Plan is set to expire. EPA requests Navy to propose a new long-term monitoring plan that incorporates the findings and efforts from the ongoing premise plumbing investigation.

Should you have any technical questions regarding the Report, please feel free to direct them to Christopher Chen at (213) 244-1853.

Sincerely,

AMY MILLER-BOWEN

Digitally signed by AMY MILLER-BOWEN
Date: 2023.12.20 14:41:56 -08'00'

Amy C. Miller-Bowen, Director
Enforcement and Compliance Assurance Division

cc: Karnig Ohannessian, U.S. Navy
Captain Marc Williams, U.S. Navy
Vice Admiral John Wade, Joint Task Force – Red Hill
Kathleen Ho, Hawaii Department of Health
Healani Sonoda-Pale, Red Hill Community Representation Initiative

EPA Drinking Water Complaints
Investigation Report

Joint Base Pearl Harbor-Hickam Public Water System

Investigation Date: October 19, 2023
Report Date: December 18, 2023
EPA Inspectors: Christopher Chen (author), Heidi Rausch

REGION 9
SAN FRANCISCO, CA 94105

SECTION I – INTRODUCTION

EPA was notified of a number of complaints from residents served by the Joint Base Pearl Harbor-Hickam public water system (System). The System is located in Hawaii on the island of Oahu. I conducted the complaint investigation on October 19, 2023. Heidi Rausch accompanied me on all the home visits. I called all the homes prior to arrival to ensure availability and consent. I attempted to contact a sixth resident but was unable to reach the resident after repeated phone calls.

After conducting the investigation, I notified DOH of all the residents who were interested in drinking water samples in accordance with the Drinking Water Long-Term Monitoring Plan (LTMP).[1] LTMP, effective June 2022 after agreement between Navy and DOH, was developed as a surveillance tool to ensure water served by the System is meeting all state and federal drinking water standards and is free of petroleum. The LTMP became an enforceable document when EPA and Navy signed an Administrative Consent Order on June 2, 2023.[2]

DOH coordinated with Navy and Navy collected samples at all the identified homes on October 20, 2023. DOH was present to oversee the collection of the LTMP samples. The samples were analyzed for total organic carbons, petroleum hydrocarbons, metals, synthetic organic compounds, volatile organic compounds, and disinfection byproducts. Results are compared to DOH's screening levels and can also be compared to any applicable EPA Maximum Contaminant Levels (MCLs). An MCL is the highest level of a contaminant that is allowed in drinking water and is an enforceable standard.

SECTION II – OBSERVATIONS

Resident #1

A) Concerns

When explaining symptoms, the resident never had migraines until right after the November 2021 incident. The resident stated that the water periodically would have an oily sheen. In the past week, the resident has had drier skin.

B) Emergency Operations Center (EOC) Response

The resident had not contacted the EOC recently as the resident did not think there was any point as the EOC always just says the water is safe. The resident acknowledged that the EOC responded quickly and the Navy representatives were respectful. The resident added that the Navy representatives did not explain what they were sampling for, and the resident was not notified of the results. The resident did not believe the Navy

[1] Weblink to the LTMP: https://health.hawaii.gov/about/files/2022/08/JBPHH-Drinking-Water-LTM-Plan-FINAL-20220823.pdf

[2] Weblink to EPA's Administrative Consent Order: https://www.epa.gov/red-hill/red-hill-2023-consent-order. The provision about the LTMP may be found in Section 6.2 of the Statement of Work (pg. 59 of the pdf).

website was very good – it was not intuitive, it lagged a lot, and sometimes did not work.

The resident last contacted the EOC around February 2023 due to an oily sheen in the water.

C) Additional Sampling

I did not inquire with the resident about additional drinking water samples pursuant to the LTMP conducted by Navy as I was not aware this was an option until later in the day, after a phone call with Department of Health (DOH).

Resident #2

A) Concerns

The resident's infant had a severe rash. Resident acknowledged that the infant has eczema but shared that the rash was occuring on top of the eczema. According to the resident, the doctor believed the cause of the rash was different than the eczema but did not know the cause. The resident further explained that the rash seemed to occur after the infant began to routinely take baths with the tap water. The symptoms seemed worse after bathing. The resident also shared that they were aware of a couple other residents who had children with rashes as well.

The resident has periodically observed an oily sheen in the water, which was last observed one week ago. The resident has not noted any odor or taste concerns recently. During the November 2021 incident, the sprinklers smelled like gas.

The resident's partner had back pain during the peak of the November 2021 incident and has had lipomas on the back ever since moving to Hawaii. The resident also shared that they have had stomach issues and allergies that began a couple of years ago as well.

B) EOC Response

The resident called the EOC on 10/17/2023. The EOC responded quickly, sending two Navy representatives out the same day to take a rapid test at two locations within the home. The resident received results after calling the next day. The resident asked for paperwork demonstrating the negative result; EOC instructed the resident to look up the result on Safe Waters website for documentation.

C) Additional Sampling

I asked the resident whether I could share contact information so the Navy could collect more comprehensive drinking water samples pursuant to the LTMP with oversight from DOH. The resident expressed interest in this sampling effort.

The drinking water samples did not detect the presence of petroleum hydrocarbons. There were detects for some metals but levels were far below DOH's screening level and EPA MCLs.

Resident #3

A) Concerns

The resident recently developed a rash on the chest on 10/17/23 and went to the doctor. The doctor prescribed some allergy drugs. The resident also developed headaches the night of 10/18/23. The resident became very sick during the November 2021 incident and stated the development of these symptoms was very similar to the November 2021 incident. The resident was scared of a repeat of what happened in 2021 due to the similarities and wanted to do whatever possible to prevent the same health problems from a couple of years ago.

During the November 2021 incident, the resident also had migraines. Toxicology results showed presence of flame retardant and gasoline. The resident's dog had diarrhea and blood in the stool during the November 2021 incident. In addition, the resident shared that their previous neighbors got tinnitus and digestive issues during the incident and moved off the island because of the issues.

B) EOC Response

The resident called the EOC the morning of my visit. By chance, I was present at the home when the Navy representative visited the home in response to the call. I asked the Navy representative what type of samples would be collected. The representative did not know the answer and called a supervisor. I spoke to the supervisor on the phone about the sampling and also asked about adding this home as a site for more comprehensive drinking water testing pursuant to the LTMP. We agreed that I would coordinate with DOH instead about the addition of any homes for monitoring.

I observed the representative collect two samples of the rapid response test, one from the master bathroom and the other from the kitchen.

Navy collected LTMP samples back on March 29, 2022. Resident showed me the results briefly on the phone. From a glance, the results were non-detect for gasolines but appeared to have some detects on metals (I did not have a chance to observe the details as it was only a quick look when the resident showed it on the phone).

C) Additional Sampling

I asked the resident whether I could share contact information so the Navy could collect LTMP drinking water samples with oversight from DOH. The resident expressed interest in this sampling effort.

The drinking water samples detected the presence of petroleum hydrocarbons as diesel.

Resident #4

A) EOC Response

On 10/11/23, resident called the EOC. Two representatives came the same day and took a rapid response test from the kitchen sink. They tried to take off the aerator prior to sampling but were unable to remove it so took a sample with the aerator on. The resident received an email with the sample result the day of the visit (10/19/23); the result was non-detect. The representatives did not inform the resident what they were testing for and didn't share additional information.

B) Concerns

The family that lived in this home went off island for a long weekend and returned on 10/9/23. The following day, the resident began to wash clothes and dishes. The resident observed an oily film in the water, especially in the hot water setting. The resident had multiple cups in the row with an oily film and took photographs showing the oily film. To test that the cups were not contaminated, the resident poured bottled water into the cups and there was no oily film.

On 10/12/23, Resident #4's partner and child developed diarrhea symptoms. Resident #4 had heartburn and a burning stomach, a symptom that the resident had only ever had during the November 2021 incident and was particularly alarming to the resident. Resident #4 also had a rash on the chest/shoulder area develop the night of 10/18/23, which lasted for a few hours; photographs from the resident are available upon request. Another child in the home had ongoing headaches the past week.

The resident shared that one of the children began screaming after taking a shower on 10/16/23. The child screamed about pain on the bottom portion of the body for 30 minutes although no rash was observable. The adult resident stated that this unexplained screaming after a shower last happened for this child during the November 2021 incident.

I asked the resident to fill a cup of water from the kitchen sink. I noticed a light oily film in the water. The resident stated that the cold water seemed to have less of an oily film. The kitchen and showers all have filters attached.

The resident requested a water heater replacement but was declined. The resident was informed that the water heater would only ever be replaced if the unit was unable to actually heat the water.

C) Additional Sampling

I asked the resident whether I could share contact information so the Navy could collect LTMP drinking water samples with oversight from DOH. The resident expressed interest in this sampling effort.

The drinking water samples detected the presence of petroleum hydrocarbons as diesel.

Resident #5

A) Concerns

The resident has lived at the home since 2021, prior to the November 2021 incident. Resident has had sinus issues and been congested and groggy every morning for approximately the last year. The resident was diligent about preventing exposure to the tap water during the November 2021 incident and continued to limit exposure for at least four months after Navy gave the all-clear.

In the last 2-3 months, resident has had an irritation on the chest area but wasn't sure whether it was a rash since it wasn't very visible. The resident believes that the health problems of the past year are associated with water usage as they only developed after continuous usage of the tap water.

During the 2021 incident, resident observed the water had an oily film and an odor. The resident has not observed these issues with the water recently.

The resident also believed that the contaminated tap water may have killed pet fish. The water for the tank was replaced approximately four months ago using the tap water and all the fish died overnight.

B) EOC Response

This resident has not called the EOC recently. The Navy has never taken samples at the home but the resident believed University of Hawaii may have collected samples once. The resident expressed frustration about Navy claiming the water was safe in the neighborhood (Pearl City peninsula) before everywhere else after only flushing the water with no samples to demonstrate safety. Resident alleged that Navy claimed the Pearl City peninsula was unaffected by the November 2021 incident.

C) Additional Sampling

I asked the resident whether I could share contact information so the Navy could collect LTMP drinking water samples with oversight from DOH. The resident expressed interest in this sampling effort.

The drinking water samples detected the presence of petroleum hydrocarbons as diesel.

Sample Results

Five samples were collected on October 19 and 20, 2023: from the four residences discussed in this report and one from the Waiawa Shaft, the primary groundwater well providing the drinking water for the System.

A) Petroleum Hydrocarbons: Three of the four homes had detections of petroleum hydrocarbons as diesel, ranging from 56 ppb to 71.2 ppb. None of the samples detected petroleum hydrocarbons as gasoline or oil. All petroleum hydrocarbon results were

below DOH's screening level of 266 ppb for total petroleum hydrocarbons. EPA has not set an MCL for petroleum hydrocarbons.

This may indicate the potential for a lingering presence of petroleum hydrocarbons somewhere within the distribution system or premise plumbing. As there were no petroleum hydrocarbons detected from Waiawa Shaft, there was no evidence of petroleum hydrocarbon contamination from the source (Waiawa Shaft is the only active groundwater well for the System at the time of this investigation).

It should be noted that the laboratory's method detection limit (MDL) was 50 ppb. The MDL is the minimum concentration of a substance that can be measured and reported with 99% confidence that the substance concentration is greater than zero. The analytical results are slightly above the MDL, which indicate the presence of the substance but at levels close to what the laboratory can actually quantify and may not be reliable.

B) Metals: All the residences and Waiawa Shaft had very low-level detections of barium, copper, lead, and selenium. The levels do not likely pose any health risk and may be naturally occuring from the groundwater source due to the similar levels across all samples.

C) Other Contaminants: There were no detections of synthetic organic compounds, volatile organic compounds, and haloacetic acids. Two homes had low-level detection of trihalomethanes, which are a disinfection byproduct – the levels are not likely to pose any health risk.

SECTION III – AREAS OF CONCERN AND RECOMMENDATIONS

After conducting an investigation into the complaints, I noted the following broader observations and have included recommendations for consideration.

1. The EOC was consistently very prompt at sending representatives to homes, always sending a representative out the same day as a received complaint.
2. The representatives sent by the EOC were always respectful but did not appear to clearly communicate with the residents their purpose or attempt to alleviate concerns.
3. The delivery of results from any rapid response tests was not always timely nor easily accessible to the residents.
4. Four of the residents stated the water had an oily sheen at some point since the November 2021 incident, with three reporting a sheen within the past year. One home had an oily film during my visit.
5. Four of the residents stated that rashes and/or skin irritation as a symptom within the last week. The rashes may have a potential connection with showering/bathing based on residents' descriptions.
6. Sampling results appeared to demonstrate the potential trace presence of petroleum hydrocarbons as diesel in three of the four homes.

Recommendations

1. Ensure that any representatives that engage with residents are trained to clearly communicate their mission and how residents will receive results. Results should be conveyed to the residents within 24-48 hours of Navy's notification of the sample results.
2. A one-page pamphlet may be an effective way for representatives to easily convey a clear and consistent message to all residents. Some information to consider including in a one-page pamphlet:
    a. What is a rapid response test;
    b. Why a rapid response test is being collected;
    c. How and when results will be shared with residents;
    d. If/when would Navy consider collecting samples in accordance with LTMP;
    e. EOC contact information and any other relevant contact information; and
    f. Information about Safe Waters and how to navigate the website to find results.
3. A number of complaints were associated with bathing, which may indicate an issue with water heaters at the homes. Inspection and/or sampling of water heaters and premise plumbing may help identify potential causes. Investigate whether flushing, maintenance and/or replacement of the water heaters at affected homes may resolve symptoms.
4. Further investigation by Navy into the oily film observed in the water and the potential trace presence of petroleum hydrocarbons from the samples is warranted. If the investigation determines it is not related to petroleum hydrocarbons from the public water system, then the investigation should seek to identify the root cause for what may be

producing the oily film and the detection of petroleum hydrocarbons due to the potentially widespread health concerns expressed by residents. Further investigation considerations could include, but are not limited to, petroleum hydrocarbon buildup in water heaters and bacterial contamination of premise plumbing.

5. If Navy's investigations point towards petroleum hydrocarbon contamination in the System's water mains, a full flushing of the distribution system may help clear any lingering contamination.
6. In Navy's complaint investigation procedures, the Navy should continue to investigate a complaint even if the rapid response test is non-detect. If the symptoms are not related to the presence of petroleum hydrocarbons in the drinking water, there may be other issues that need to be identified and resolved so customers are drinking potable water.
7. Navy should consider providing alternative water to any residents that alert the EOC of drinking water concerns, especially if waiting for sampling results or longer investigations.

Should you have any questions regarding this report, please direct them to:

Christopher Chen
SDWA Enforcement Officer
Enforcement and Compliance Assurance Division
U.S. Environmental Protection Agency, Region 9
600 Wilshire Blvd, Suite 940
Los Angeles, CA 90017
Phone: (213) 244-1853

END OF APPENDICES