Field Investigation of the Chemistry and Toxicity of TPH in Petroleum Vapors: Implications for Potential Vapor Intrusion Hazards

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Executive Summary

This report presents a field-based investigation of the chemistry and toxicity of vapors associated with subsurface, petroleum-contaminated soil and groundwater. The project was carried out by staff of the Hawai‘i Department of Health (HDOH), Hazard Evaluation and Emergency Response office (HEER) with assistance from Hickam Air Force Base in Honolulu as well as a number of local and mainland-based consultants. The study focuses on the nature of vapors in the immediate source area of petroleum contamination. The fate and transport of vapors away from the source area was not directly evaluated.

Particular emphasis is placed on the study of the aliphatic and aromatic, carbon range makeup of Total Petroleum Hydrocarbon (TPH) vapors and the potential for TPH to drive potential vapor intrusion hazards (“risks”) over individual compounds such as benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN) and methane. For the purposes of this study, TPH represents the sum of non-specific, aliphatic and aromatic hydrocarbon compounds exclusive targeted, individual compounds. An evaluation of both TPH and targeted, individual compounds is required under HDOH guidance (HDOH 2009, 2011).

Five study sites in Hawai‘i were targeted for the collection and detailed analysis of soil gas associated with petroleum-contaminated soil and groundwater. Each of the sites was known through prior investigations to be heavily contaminated. Fuels released at the sites ranged from gasolines, including AVGAS and JP-4 jet fuel, to middle distillates, including diesel fuel and JP-8 jet fuel. Several of the study sites are suspected to be contaminated with both gasolines and middle distillates. Pipeline releases with widespread contamination and existing soil vapor monitoring points were targeted in order to ensure that vapors would be encountered and to minimize field sample collection costs.

Key study questions addressed as part of this study included:

1. How are the chemistry and toxicity of petroleum vapors characterized and evaluated?
2. What is the overall composition of vapors emitted from fresh fuels and petroleum-contaminated soil and groundwater in terms of non-specific, TPH compounds and traditionally targeted, individual compounds such as benzene?
3. What is the chemical makeup of the non-specific, TPH component of petroleum vapors in terms of aliphatic and aromatic carbon range compounds?
4. What is the average or weighted toxicity (e.g., noncancer Reference Concentration) of vapor-phase TPH at a given site in terms of the overall carbon range makeup of the vapors?

5. What is the critical ratio of TPH to benzene in indoor air or soil gas (and TPH to other, targeted compounds) where the potential noncancer hazard posed by TPH overrides the cancer risk or noncancer hazard posed by the individual compound?

6. Do the results of the study indicate that there are conditions where risk-based decision making for potential vapor intrusion concerns would be based on or driven by the noncancer TPH hazard rather than the cancer risk and/or noncancer hazard ("risk") posed by individual compounds? and

7. Based on the findings of this study, is an update to the 2008 HDOH indoor air and soil gas air action levels for TPH warranted?

As summarized below and discussed in detail in this report, the answer to the latter two questions is clearly "Yes." The vapor intrusion risk (in general terms) posed by the non-specific, TPH component of petroleum vapors can override the risk posed by posed by individual compounds such as benzene due to its overwhelming dominance of vapor phase compounds. This is especially true for contamination associated with diesel or similar middle distillate fuels. The results also indicated that the 2008 HDOH indoor air and soil gas air action levels for TPH were based on an overly conservative assumption of TPH composition and needed to be revised (included in the Fall 2011 update of the HEER office EHE guidance; HDH 2011).

The field investigation was designed to help answer these questions and to update HDOH soil gas action levels for TPH. A limited number of vapor samples were also collected over containers of fresh fuels for comparison to soil gas data from the targeted study sites. Summa canisters were used to collect vapor samples during the first phase of the study. Laboratories reported that they cannot fully recover >C12 aliphatic and >C10 aromatic compounds from canisters, however, which could be of concern at middle distillate-release sites. Both Summa canister and sorbent tube samples were therefore collected during the second phase of the study. Sorbent tube TPH and carbon range data were used to evaluate the presence of heavy, vapor-phase aliphatic compounds and aromatic compounds in the samples that might have been missed in the Summa canister data. Field methods for the collection of soil gas samples and tests for leaks in the sampling train were also evaluated.

1. How are the chemistry and toxicity of petroleum vapors characterized and evaluated?

Petroleum vapors are evaluated in terms of a limited number of individual compounds (e.g., benzene, ethylbenzene, toluene, xylenes and naphthalene or BTEXN) and non-specific compounds collectively reported as TPH. The chemistry and toxicity of vapor-phase TPH is evaluated in terms of three groups of aliphatic and aromatic carbon range compounds:

- C5-C8 aliphatics,
- C9-C18 aliphatics, and
- C9-C16 aromatics.

Inhalation toxicity factors or "Reference Concentrations (RfCs)" published by USEPA were used to develop fraction-specific action levels for indoor air and subslab, soil gas based on the sample approach used by HDOH for individual compounds. For example, a residential, indoor air action level of 630 µg/m^3 was calculated for C5-C8 aliphatics, based on an RfC of 600 µg/m^3. An indoor action level of 100 µg/m^3 was calculated for both C9-C18 aliphatics and C9-C16 aromatics based on an RfC of 100 µg/m^3. This is because C9-C18 aliphatic and C9-C16 aromatic components of TPH are considered to be slightly more toxic than C5-C8 aliphatics. Correlative soil gas action levels for potential vapor intrusion hazards are set at 1,000 times the indoor air action level (HDOH 2011).

The overall, average toxicity of TPH in a vapor plume can be evaluated in terms of the relative makeup and contribution of the targeted carbon ranges to the total TPH. An initial evaluation of TPH carbon range makeup allows for development of site-specific screening levels for TPH in soil gas without the need for carbon range analysis of each sample collected. Conservative assumptions regarding TPH composition can also allow development of risk-based action levels for more widespread use, such as those published by the HEER office.

2. What is the overall composition of vapors emitted from fresh fuels and petroleum-contaminated soil and groundwater in terms of non-specific, TPH compounds and traditionally targeted, individual compounds such as benzene?

TPH compounds dominated petroleum vapors at all sites investigated during the study, with the exception of a former gas manufacturing site (GASCO) where benzene and naphthalene were produced for commercial purposes. Vapors collected over containers of fresh, gasoline and middle distillate fuels were characterized by 86-96% TPH and 4-14% BTEXN (dominated by TEX). Soil gas samples collected from study sites show an even greater dominance of TPH, with less than 1% of the total vapors generally attributable to BTEXN. Although the data are limited, the reduction of aromatic BTEXN compounds in subsurface vapors at the study sites could reflect preferential removal of vapor-phase aromatic compounds over aliphatic compounds due to a greater affinity for soil moisture and resulting higher susceptibility to biodegradation. Note that vapor-phase, aliphatic compounds are also highly biodegradable in the subsurface, as illustrated by the rapid attenuation of TPH in general away from source areas at petroleum-contaminated sites. Aromatics appear to be even more efficiently removed from soil vapors, however.

Although data are limited, a higher proportion of total BTEXN was reported in vapors collected over fresh fuels in comparison to soil gas samples collected at aged-release sites. The ratio of TPH to benzene for vapors collected over fresh fuels was in turn relatively low, ranging from approximately 50:1 to 300:1 and not that significantly different between gasoline, JP-8 and diesel fuel. This suggests that either TPH or benzene could drive vapor intrusion risks for fresh fuels, again depending on the carbon range chemistry and associated toxicity of the TPH and the target

risk used to screen benzene. As the ratio decreases, however, the chance that benzene will drive vapor intrusion concerns over TPH increases.

The average ratio of TPH to benzene was significantly higher in soil gas samples collected at the study sites, ranging from an average of approximately 1,500:1 at the Hickam AFB VP26 site (JP-4/AVGAS) site to over 18,000:1 at both the Hickam AFB SP43 site (mix of gasolines and middle distillates) and the Honolulu Harbor Fishing Village site (primarily diesel and other middle distillates). The average TPH:Benzene ratio exceeded 2,000:1 at the three sites were diesel and other middle distillate contamination was known to be present. This indicates TPH will dominate vapor intrusion risks at these sites over benzene and other individual VOCs regardless of the actual carbon range makeup of the TPH or the use of a conservative, target risk for benzene. The average TPH:Benzene ratio at an aged, gasoline release site included in the study also exceeded the critical ratio of 2,000:1 (>9,000:1; Hickam AFB ST03). This could be associated with a preferential removal of vapor-phase, aromatic compounds over aliphatic compounds at aged release sites in comparison to vapors from fresh fuels. Although data are limited and this could simply be related to the original fuels released, other consultants have reported similar findings.

3. What is the chemical makeup of the non-specific, TPH component of petroleum vapors in terms of aliphatic and aromatic carbon range compounds?

4. What is the average or weighted toxicity (e.g., noncancer Reference Concentration) of vapor-phase TPH at a given site in terms of the overall carbon range makeup of the vapors?

5. What is the critical ratio of TPH to benzene in indoor air or soil gas (and TPH to other, targeted compounds) where the potential noncancer hazard posed by TPH overrides the cancer risk or noncancer hazard posed by the individual compound?

A comparison of the highest-possible indoor air action level for TPH (e.g., 630 µg/m^3, assuming 100% C5-C8 aliphatics) to the most conservative soil gas action level for benzene (e.g., 0.31 µg/m^3, based on a 10^{-6} cancer risk) suggests that TPH will *always* drive vapor intrusion risk over benzene if the ratio of TPH to benzene in indoor air or soil gas exceeds approximately 2,000:1 (rounded from 2,032:1). This "critical ratio" is an important and very useful screening tool that represents the point at which the collective mass of vapor-phase TPH aliphatic and aromatic compounds will overwhelm the risk posed by benzene, even though the relative toxicity of the latter is substantially greater. Either TPH *or* benzene could drive potential vapor intrusions concerns below a TPH:Benzene ratio of 2,000:1, depending on the actual carbon range makeup of the TPH and the target risk used to evaluate benzene. Note that this depends in part on the toxicity factors assigned to individual carbon range fractions. The relative risk posed by TPH could increase or decrease if alternative toxicity factors for TPH carbon ranges were used. Note that exceeding the critical ratio does not in itself imply that the TPH in soil vapors poses an actual vapor intrusion risk, since this will be governed by the concentration of TPH and

individual VOCs present in the soil vapors, the location of the vapor plume with respect to nearby or future buildings, building design and related factors.

Similar "critical TPH ratios" were calculated for other targeted compounds (i.e., TEXN). The ratio increases for compounds that are more toxic than benzene (e.g., naphthalene critical ratio 8,800:1) and decreases for compounds that are less toxic (e.g., toluene critical ratio 0.6:1). In other words, a higher proportion of TPH in soil gas (or indoor air) is required to overwhelm the vapor intrusion risk posed by an individual compound as the toxicity of the targeted compound increases. Based on this approach, the results of the study suggest that ethylbenzene, toluene and xylenes are unlikely to significantly contribute to vapor intrusion risks at petroleum-contaminated sites in comparison to either TPH or benzene due to their relatively low proportion of the total vapors present their lower toxicity. Naphthalene was not detected above laboratory reporting limits in the majority of the samples outside of samples over containers of fresh JP-8 and diesel. This suggests that naphthalene has limited use as a tool to screen for potential vapor intrusion hazards at petroleum-contaminated sites in Hawai'i. Methylnaphthalene data were still pending at the date of this draft report but are anticipated to be similar to naphthalene.

6. Do the results of the study indicate that there are conditions where risk-based decision making for potential vapor intrusion concerns would be based on or driven by the noncancer TPH hazard rather than the cancer risk and/or noncancer hazard ("risk") posed by individual compounds?

The study indicated benzene generally drives risk at the scale of an individual compound and that TEXN data are not reliable, stand-alone indicators of potential vapor intrusion hazards. For benzene, the above question could be rephrased to ask: *Can benzene soil gas data be used as a standalone tool to screen for potential vapor intrusion hazards at petroleum-contaminated sites, in the absence of TPH data?* The answer for benzene varies based on a number of factors, including: 1) The type and original composition of the fuel released, 2) The proportion of vapor-phase TPH to benzene, 3) The carbon range makeup of the TPH and 4) The target risk applied to benzene.

Based on the dominance of C5-C8 aliphatics and the relatively low ratio of TPH to benzene in vapors collected over fresh gasoline, benzene could be used as a stand-alone indicator of potential vapor intrusion hazards even if a less conservative, target cancer risk 10^{-5} were applied. For example, a benzene indoor air action level 3.1 $\mu g/m^3$ and a subslab, soil gas action level 3,100 $\mu g/m^3$ can be used as stand-alone tool to evaluate potential vapor intrusion hazards). If the reported concentration of benzene in indoor air or soil gas meets these action levels then the noncancer risk posed by the TPH component of the soil gas will likewise not exceed a Hazard Quotient of 1.0. Based on (very limited) vapor samples collected over fresh diesel fuel and JP-8 jet fuel, benzene could still be used as a standalone tool to screen for vapor intrusion provided that a target cancer risk of 10^{-6} was applied (e.g., target benzene indoor air action level 0.31 $\mu g/m^3$ and soil gas action level 310 $\mu g/m^3$).

The use of benzene as a stand-alone tool to screen for potential vapor intrusion hazards was less clear cut in the field. Soil gas data from two, gasoline-release sites included in the study identified significantly lower proportions of benzene relative to TPH in comparison with vapors from fresh fuel samples. At the Hickam AFB VP26 site, benzene was still adequate as a stand-alone tool to screen for potential vapor intrusion hazards but only if a target cancer risk of 10^{-6} was applied. Significant vapors were being emitted from this site, with concentrations of TPH in soil gas over 100,000,000 µg/m^3 reported for some samples and benzene up to 470,000 µg/m^3 reported (average TPH:Benzene ratio 1,500). A vapor intrusion soil gas action level of 560,000 µg/m^3 was calculated for this site.

At the forty year-old, Hickam ST03 gasoline release site (major break in a JP-4/AVGAS pipeline), however, the amount of benzene in soil gas samples was so low (average TPH:Benzene ratio >9,000:1) and the toxicity of the TPH so high (weighted RfC 211 µg/m^3) that TPH could still pose a significant vapor intrusion risk even if very conservative action levels were applied to benzene. A soil gas action level of 220,000 µg/m^3 was calculated for the site. Vapor concentrations in the source area of this site were significantly lower than identified for the more recent release at the Hickam VP26 site, however, with a maximum TPH soil gas concentration of just under 1,000,000 µg/m^3 reported. Benzene was not reported above a detection level of 42 µg/m^3 in the same sample. This suggests that the original JP-4 or AVGAS fuel contained a very low proportion of benzene or benzene and/or a significant, preferential removal of aromatics over aliphatics due to biodegradation is taking place at the site. A bioventing remedial action was also underway at this site and may have affected the TPH and BTEXN composition of the vapors.

Vapor intrusion risks at sites where diesel or other middle distillate fuels were present were consistently driven by TPH, regardless of the target risk used to screen for benzene. This is due to both a lower relative proportion of benzene in soil gas in comparison to TPH and an increased toxicity of the TPH due to the increased proportion of vapor-phase, C9-C12 aliphatic compounds. Naphthalene (and most likely methylnaphthalenes) was rarely identified above laboratory detection levels or did not make up a significant enough proportion of the total vapors present to drive vapor intrusion risks over TPH.

7. Is an update to the 2008 HDOH soil gas action levels for TPH warranted?

Revisions of the 2008 HDOH indoor air and soil gas action levels for TPH were incorporated into the Fall 2011 update of the HEER office EHE guidance, based on an initial review of data from this study (HDOH 2011). The 2008 action levels were based on an overly conservative assumption of the C9-C12+ aromatic carbon range compound component of TPH vapors, as well as the use of outdated toxicity factors.

In the subject study, TPH vapors collected over fresh fuels and in soil gas at all of the study sites were dominated by aliphatic compounds. Sorbent tube data indicated a minimal amount of C12 and higher aliphatic and aromatic compounds in the samples. Vapors collected over containers

of fresh gasoline contained only traces of C9-C12 aliphatic compounds reported (98-99% C5-C8 aliphatics). Vapors collected over fresh diesel were dominated by C5-C8 aliphatics, with moderate proportions of C9-C12 aliphatics (14 and 21% for Summa canister samples and up to 35% for a sorbent tube sample). Aromatic compounds >C10 were present in only trace amounts in the gasoline samples (<1% in the Summa canister samples and 2% in the sorbent tube samples) and only slightly higher in vapors collected over fresh JP-8 and diesel (2-5%).

Weighted TPH Reference Concentrations and associated indoor air and soil as action levels based on the carbon range makeup of the TPH follow a similar trend. The weighted TPH RfC and associated action levels calculated for vapors collected over fresh gasoline and for soil gas associated with a relatively recent, gasoline-contaminated site (e.g., Hickam AFB VP26 and Honolulu Harbor OU1C) approach those for C5-C8 aliphatics (e.g., TPH RfC 400 to 600 µg/m^3). The weighted TPH RfC and associated action levels calculated for vapors collected over diesel and JP-8 and for soil gas associated with sites dominated by diesel or other middle distillate fuels (e.g., Honolulu Harbor Fishing Village) approach those for the more toxic, C9-C12 aliphatic compounds (e.g., TPH RfC 100 to 200 µg/m^3) and are reflective of the higher proportion of these compounds in the vapors. The weighted toxicity factor calculated for the Honolulu Fishing Village site was used as a reference for updates to the HDOH soil gas action levels for TPH.

Study site Hickam AFB ST03, a forty year-old gasoline pipeline release, is again an exception. Although highly variable, TPH in soil gas samples collected from the site were on average composed of 35% C9-C12 and very atypical of fresh gasoline. The age of the release and the type of fuel released is known with a high degree of certainty. A weighted RfC of 211 µg/m^3 and indoor air action level of 220 µg/m^3 was calculated for the site, similar to what might be calculated for a relatively fresh diesel release.

Summary

In summary, the results of this study support the need for quantitative evaluation of TPH in soil gas in order to accurately evaluate vapor intrusion risks posed by subsurface, petroleum-contaminated soil and groundwater. Benzene (and other individual VOCs) could potentially be used as a standalone tool to screen soil gas data for vapor intrusion concerns at gasoline-contaminated, provided that a conservative target risk and associated indoor air and soil gas action levels are applied (e.g., 10^{-6} cancer risk). Vapor intrusion hazards could be driven by TPH over benzene at some gasoline-contaminated sites, however, due to the preferential removal of aromatics through biodegradation at aged sites and/or a low proportion of benzene and other aromatics in the original fuel released. This issue requires further study.

The TPH component of vapors drove vapor intrusion risk over benzene and other individual VOCs at the study sites where diesel fuel and other middle distillates had been released. The potential presence of co-mingled diesel or other middle distillate fuels at typical petroleum-release sites and the apparent preferential removal of benzene and other aromatics from vapors at

aged releases suggest that it would be prudent to collect and evaluate TPH soil gas data at all petroleum-release sites (required in HDOH guidance; HODH 2009, 2011).

It is important to note that the results of this study reflect in part both the composition of the petroleum fuels produced or otherwise used in Hawai‘i as well as environmental conditions at release sites. The vapor signatures reported in this study for TPH carbon range fractions (i.e., proportions of non-specific, TPH aliphatics to aromatics) are likely to be similar to sites outside of Hawai‘i. The BTEXN component of the vapors and the relative proportion of TPH to individual compounds could vary dramatically, however, depending on the blending process used by the refinery that produced the fuel. For example, MTBE is not widely added to fuels in Hawai‘i. The BTEXN component of fuels used (and released) in Hawai‘i can differ dramatically, however, depending on the processes used by the two refineries that operate here. Weathering of fuel over time can also significantly affect the both the TPH and individual compound signatures in soil vapors. Temperatures of subsurface soil and groundwater could affect both vapor concentrations and composition. For example, vapor emissions from contaminated soil and groundwater is likely to be greater in Hawai‘i versus Alaska, due to the higher average subsurface temperature here. Higher subsurface temperatures could also promote more rapid biodegradation, however. This emphasizes the need for site-specific data.

This study was not intended to evaluate actual vapor intrusion risks at the study sites where soil vapor samples were collected. Significant vapor intrusion impacts have not been identified at any of the sites. Factors that control long-term, vapor intrusion problems include the vertical or lateral distance of a building from heavily contaminated soil or groundwater, building design and ventilation and in particular biodegradation of the source area over time. Natural biodegradation of petroleum in contaminated soil and groundwater will significantly reduce the long-term vapor-intrusion risk of subsurface contamination in comparison to soil contaminated with an equal amount of chlorinated solvents. Note, however, that default indoor air:soil gas attenuation factors incorporated into HEER soil gas action levels are intended to apply to subslab soil vapors at the point that the vapors are about to be drawn into the affected building. Given the assumed, short transit time of the vapor through building slab (e.g., via gaps around utilities, likely to be seconds or minutes), any reduction in VOC concentrations due to biodegradation will be negligible.

The results of this study were recently used to update HEER office indoor air and soil gas action levels for TPH (HDOH 2011). As discussed in the report, secondary objectives of the study included an evaluation of the design of vapor monitoring points, leak detection methods, the overall representativeness of soil vapor data using current sample collection methods and the fate and transport of petroleum vapors in the subsurface. These topics will continue to be evaluated in future studies and incorporated into updates of the HEER Technical Guidance Manual.

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1 BACKGROUND

The intrusion of vapors into existing or future buildings is one of several potential environmental hazards posed by petroleum-contaminated soil and groundwater (refer to HDOH 2009, 2011). Vapors emitted from subsurface petroleum contamination will diffuse upwards (and outwards) from the source area. If an overlying building is under pressured in comparison to area immediately beneath the floor (e.g., in the fill material under a slab or in the crawl space under a post-and-pier structure), then vapors that diffuse into this area could be advectively drawn into the building via cracks or utility gaps in the floor and mix with indoor air.

The ratio of the concentration of a chemical in indoor air after mixing (excluding background from indoor sources) to the original concentration of the chemical in vapors immediately beneath the building slab (or in the crawl space) is referred to for the purposes of this report as the "Attenuation Factor." Vapor intrusion is of particular concern in colder climates where heating of buildings can lead to relatively low indoor air pressures and high rates of vapor flux through building floors. This combined with poor ventilation of the buildings to reduce heating costs can lead to substantial vapor intrusion problems. The risk of vapor intrusion in Hawai'i is generally much lower, since buildings tend to be air-conditioned and over pressured or windows routinely kept open for ventilation. Even air conditioned buildings can become under pressured under windy conditions, however, so potential vapor intrusion hazards cannot be completely ruled out. As a conservative measure, HEER office guidance assumes a default Indoor Air:Subslab Soil Gas Attenuation Factor of 0.001 for residential homes (e.g., 1,000-fold dilution of subslab vapors) and 0.0005 for commercial/industrial buildings (e.g., 2,000 fold dilution of subslab vapors; see HDOH 2011).

The HEER office *Environmental Hazard Evaluation* guidance ("EHE" guidance; HDOH 2011) and *Technical Guidance Manual* ("TGM;" HDOH 2009) recommends that soil gas samples be collected at sites with petroleum contaminated soil and groundwater in order to evaluate potential vapor intrusion hazards. Ideally, samples are collected immediately beneath the slab of an existing building or immediately under paved areas. Deeper samples may also be useful in some cases (e.g., to evaluate upward attenuation of vapors from the source area). HDOH guidance requires that soil gas samples from petroleum-contaminated sites be tested for Total Petroleum Hydrocarbons (TPH, or equivalent) as well as targeted individual compounds, including benzene, toluene, ethylbenzene and xylenes and naphthalene (BTEXN). Concentrations of the latter are subtracted from the reported TPH if this is not done by the lab. Methane levels must also be evaluated. Site soil gas data are compared to action levels for potential vapor intrusion hazards published by HDOH. If the reported concentrations of TPH and targeted compounds are below action levels then no further action is generally needed, although periodic monitoring may be required. If action levels are exceeded then further action is necessary, as described in HDOH guidance.

Soil gas action levels for TPH originally published by the HEER office in 2005 and again in 2008 are noted in Table 1 (HDOH 2008, updated in 2011). The action levels were based on conservative assumptions regarding the toxicity and overall predominance of TPH in soil gas at petroleum release sites. A default, noncancer inhalation Reference Concentration (RfC) of 50 $\mu g/m^3$ was assigned for TPH vapors associated with gasolines, based on the most conservative RfC for carbon range fractions published by the Massachusetts Department of Environmental Protection (C11-C22 aromatics; MADEP 2003). A slightly less toxic mixture of aliphatics and aromatics was assumed for vapors associated with diesel and other middle distillate fuels, resulting in a default RfC of 110 $\mu g/m^3$ (discussed in Appendix 1 of the 2008 EHE guidance). The TPH action levels were also based on a conservative, noncancer Hazard Quotient of 0.5 for calculation of TPH risk-based action levels. This was done in order to take into account the cumulative, noncancer risk posed by targeted, individual compounds (i.e., TPH + BTEXN).

These assumptions were intentionally conservative, given the lack of field data and published information on the chemistry and toxicity of TPH in soil vapors available at that time. Guidance on the use of TPH carbon range fractions to more accurately evaluate the chemistry and toxicity of TPH in subsurface vapors was published by the environmental office of Hickam Air Force Base Air Force in Honolulu and their consultant in 2009 and updated in 2011 (Parsons 2011). Soil gas action levels for individual carbon ranges are included in the guidance (based on Massachusetts DEP toxicity factors). The Air Force and its consultants also began to collect TPH carbon range soil gas data for petroleum releases associated with its operations in Hawai‘i.

The Air Force data, as well as data from other sites, confirmed that vapors associated with petroleum fuels of all types were overwhelmingly dominated by TPH aliphatics, with BTEXN and other aromatic compounds making up only a minor component of the total vapors present. This suggested that an update of the HDOH TPH soil gas action levels was warranted and served as the impetus for the study described in this report. The resulting information was ultimately used to update the HEER office guidance on potential vapor intrusion hazards associated with petroleum-contaminated soil and groundwater (HDOH 2011), with a focus on updates to risk-based soil gas screening levels for “Total Petroleum Hydrocarbon” or “TPH” in soil gas.

2 STUDY OBJECTIVES

The objective of this project was to evaluate the chemistry and toxicity of the non compound-specific, aliphatic and aromatic component of vapors associated with subsurface petroleum contamination. Key study questions formulated as part of this study included:

1. How are the chemistry and toxicity of petroleum vapors characterized and evaluated?
2. What is the overall composition of vapors emitted from fresh fuels and petroleum-contaminated soil and groundwater in terms of non-specific, TPH compounds and traditionally targeted, individual compounds such as benzene?
3. What is the chemical makeup of the non-specific, TPH component of petroleum vapors in terms of aliphatic and aromatic carbon range compounds?
4. What is the average or weighted toxicity (e.g., noncancer Reference Concentration) of vapor-phase TPH at a given site in terms of the overall carbon range makeup of the vapors?
5. What is the critical ratio of TPH to benzene in soil gas (and TPH to other, targeted compounds) where the potential noncancer hazard posed by TPH overrides the cancer risk or noncancer hazard posed by the individual compound?
6. Do site data indicate that there are conditions where risk-based decision making for potential vapor intrusion concerns would be based on or driven by the noncancer TPH hazard rather than the cancer risk and/or noncancer hazard ("risk") posed by individual compounds? and
7. Based on the findings of this study, is an update to the 2008 HDOH indoor air and soil gas air action levels for TPH warranted?

A field investigation was designed to help answer these questions and in particular the potential for non-specific, aliphatic and aromatic compounds in soil gas to pose potential vapor intrusion hazards at petroleum-release sites even though benzene and naphthalene are below levels of concern. The locations of sites included in the study are noted in Figure 1. As described in Section 4, soil gas samples were collected at key petroleum release sites in Hawai'i and submitted for detailed, carbon range testing as well as BTEXN and a small number of other, individual compounds. Sample collection was carried out between May and October 2011 by staff of the Hawai'i Department of Health (HDOH) Hazard Evaluation and Emergency Response (HEER) office with assistance by staff of the Underground Storage Tank (UST) section of the HDOH Solid and Hazardous Waste Branch.

Answering and addressing the study questions required a review of the chemical makeup of petroleum fuels, especially in terms of carbon range fractions. The next section provides a brief over view of this topic with references for additional details.

Note that this study does not address biodegradation of petroleum vapors as the vapors migrate away from the source area. The study focused instead on the initial chemistry and toxicity of petroleum vapors *in the immediate source area*. The fate and transport of vapors in the vadose zone represents the next, important step in evaluation of the vapor intrusion threat posed by petroleum-contaminated soil and groundwater. Petroleum is highly biodegradable in the subsurface under aerobic conditions (see discussion in HDOH 2011). Recent field studies and modeling efforts have suggested that ten meters or less of clean soil (i.e., TPH <100 mg/kg) is adequate under most circumstances to reduce petroleum vapor concentrations to below levels of concern for potential vapor intrusion hazards, regardless of the mass or concentration of petroleum in underlying soil, the presence of free product on groundwater or the design and vulnerability of overlying buildings (e.g., Abreu et. al 2009, API 2010, McHugh 2010). This issue will be discussed in more detail in updates to Section 7 of the HEER office *Technical Guidance Manual* (Soil Vapor and Indoor Air Sampling Guidance, anticipated Fall 2012).

3 TPH CARBON RANGE FRACTIONS

The study was initiated with a review of risk-based methods for evaluation of TPH in soil gas. As discussed in this section, this included the selection of target carbon range fractions and associate toxicity factors as well as development of risk-based action levels for indoor air and soil gas. These toxicity factors and action levels were used to evaluate soil gas data collected at the study sites. A brief discussion of the chemistry of petroleum fuels is provided in Appendix 1 of the HEER office EHE guidance and included in Attachment 1 of this report. Models used to develop risk-based action levels for Total Petroleum Hydrocarbons (TPH) in soil, soil gas and groundwater is also described in the EHE document.

Petroleum is a complex mixture of hundreds of different compounds composed of hydrogen and carbon (i.e., "hydrocarbon" compounds). For the purposes of this study, petroleum mixtures are subdivided into "gasolines", "middles distillates" and "residual fuels", following the methodology used by the American Petroleum Institute (API 1994). Gasolines include commercial gasoline used in autos and aviation fuels such as AVGAS. Middle distillates include common diesel fuel, kerosene and jet fuels such as JP-8. Jet fuel JP-4 is a mixture of gasoline and kerosene. Most of the largest subsurface petroleum releases in Hawai‘i are associated with jet fuels. Several of these sites were targeted for the study.

The general carbon range makeup of common petroleum fuels is depicted in Figures 2a. Non-specific, aliphatic and aromatic compounds collectively reported as Total Petroleum Hydrocarbons or “TPH” make up the overwhelming majority of the hydrocarbon mass in fuels and in vapors emitted from fuels (e.g., refer to Hartman 1998). As documented in this study, individual, “indicator” compounds such as benzene, toluene, ethylbenzene and xylenes (BTEX) as well as naphthalene and other targeted polyaromatic hydrocarbons (PAHs) make up only a small percentage of the total mass of hydrocarbon compounds in fuels and in vapors.

The TPH component of petroleum can be further subdivided into groups or “fractions” of aliphatic and aromatic compounds based on the number of carbon molecules in compounds within that range (Figure 2b; e.g., TPHCWG 1998; MADEP 1997, 2002, 2003; WADOE 2006). An overview of the carbon range method published by Massachusetts is provided in Attachment 2. Representative fate and transport parameter values and toxicity factors are then assigned to each fraction, allowing for risk-based action levels to be developed in the same manner as done for individual chemicals. Carbon range fractions established by Massachusetts are the most commonly referenced and have been incorporated into past editions of the HEER office EHE guidance and associated action levels (see Figure 2b, MADEP 2002; see also HDOH 2011):

- C5-C8 aliphatics;
- C9-C12 aliphatics;
- C13-C18 aliphatics;
- C19-C36 aliphatics;

- C9-C10 aromatics;
- C11-C22 aromatics.

Physiochemical constants assigned to each carbon range are summarized in Table 2 (after MADEP 2002). Each of the carbon ranges can have an associated vapor-phase component in air or soil gas. The dominance of petroleum-related vapors by lighter-weight aliphatics (e.g., C5-C16 aliphatics) can be predicted by the typical carbon range makeup of fuels and theoretical partitioning between fuels and air based on the physiochemical constants noted in Table 2 (e.g., Hartman 1998). Aliphatic compounds will preferentially remain in the vapor phase, as indicated by a Henry Law Constant greater than one (ratio of vapor-phase component to dissolved-phase component).

The Henry's Law Constants for aromatic compounds such as BTEXN, in contrast, are consistently less than one (see Table 2). This indicates that aromatic compounds will preferentially partition into soil moisture. As a result, these compounds will also be more susceptible to bacteria-driven biodegradation. As discussed below, this may explain increased TPH:Benzene ratios in soil gas samples collected from the study sites in comparison to TPH:Benzene ratios for vapors collected over a limited number of fresh fuel samples (i.e., preferential loss of vapor-phase aromatics at aged releases due to biodegradation).

An evaluation of vapor-phase TPH in terms of vapor intrusion risk depends in part on the toxicity factors assigned to individual carbon range fractions. The relative risk posed by TPH could increase or decrease if other toxicity factor values are used. A number of organizations and agencies have published toxicity factors for carbon ranges (see Table 3). A consortium of regulators, oil companies and private consultants lead by the Air Force and referred to as the "TPH Criteria Working Group" published a thorough summary of the carbon range chemistry of petroleum fuels in the late 1990s and assigned preliminary toxicity factors to each fraction (TPHCWG 1998). The Massachusetts Department of Environmental Protection (MADEP), which was preparing similar guidance at the time, published initial guidance during the same time period and last updated their toxicity factors for carbon range fractions in 2003. The Washington Department of Ecology published TPH carbon range guidance in 2005 and 2006 using a slightly different approach but again including toxicity factors for targeted carbon range fractions (WADE 2006). The USEPA National Center for Environmental Assessment published a detailed review of TPH carbon range toxicity and recommended Provisional Peer-Reviewed Toxicity Values (PPRTVs) in 2009 (USEPA 2009). The California EPA Department of Toxics Substances Control also published guidance and proposed toxicity factors similar to those proposed by MADEP in 2009 (CalEPA 2009; currently withdrawn pending review of the USEPA report).

The PPRTV toxicity factors published by the USEPA in 2009 were ultimately selected for use in the Fall 2011 update of the HEER office EHE guidance and calculation of risk-based, Environmental Action Levels for individual carbon ranges and TPH in general (EALs, HDOH

2011). Note that PPRTV values are routinely used by USEPA and other agencies to develop screening levels in the absence of more thoroughly reviewed toxicity factors, including calculation of USEPA Regional Screening Levels (see USEPA 1012). From a toxicity standpoint, vapor-phase compounds can be combined into three fractions: C5-C8 aliphatics, C9-C18 aliphatics and C11-C16 aromatics (Figure 2c). Risk-based indoor air and soil gas action levels for individual TPH carbon ranges are provided in Table 4 (see also Appendix 1 of the 2011 EHE guidance). Action levels for C5-C8 aliphatics are the least stringent (e.g., indoor air action level 630 µg/m^3), reflecting the higher inhalation Reference Concentration assigned to this fraction of 600 µg/m^3. Action levels for C9-C18 aliphatics and C9-C16 aromatics are most stringent, reflecting the lower Reference Concentration of 100 µg/m^3 common to both fractions and generating an identical indoor air action level of 100 µg/m^3, after rounding. The action levels are based on a target, noncancer hazard quotient of 1.0. Cancer- and noncancer-based action levels for benzene and naphthalene based on alternative target risks are provided for comparison in Tables 5a and 5b. As discussed in the next section, a comparison of TPH action levels to action levels for individual compounds provides a useful screening tool to quickly determine if the former might drive vapor intrusion over the latter at a site.

The use of TPH soil gas data is generally preferable for initial screening of petroleum-contaminated sites due to the added cost the limited number of laboratories that can provide vapor-phase carbon range data. The following equation can be used to calculate weighted inhalation Reference Concentration (RfC) for TPH based on the site-specific carbon range makeup of TPH in soil gas or indoor air (see Appendix 1 of HDOH 2011 EHE guidance):

$$\text{Weighted RfC } (\mu g/m^3) = \frac{1}{\left[\frac{(Fraction\ C5\ to\ C8\ Aliphatics)}{C5\ to\ C8\ Aliphatics\ RfC} + \frac{(Fraction\ C9\ to\ C18\ Aliphatics)}{C9\ to\ C18\ Aliphatics\ RfC} + \frac{(Fraction\ C9\ to\ C16\ Aromatics)}{C9\ to\ C16\ Aromatics\ RfC}\right]}$$

As discussed in Section 6, this approach was used in the study to estimated weighted TPH toxicity factors (RfCs) and associated indoor air and soil gas action levels for each of the sites included in the study. As also discussed, vapor-phase aliphatic compounds >C12 and aromatic compounds >C10 did not represent a significant component of any of the samples collected. This allowed a reasonable estimation of TPH RfCs based on Summa canister data limited to C5-C12 aliphatic compounds and C9-C10 aromatic compounds (heavier compounds not extractable from canisters).

4 TPH:INDIVIDUAL COMPOUND CRITICAL RATIOS

The relative risk posed by two (or more) different chemicals under a given exposure pathway (e.g., vapor intrusion) is in part a function of concentration and toxicity. The risk posed by exposure to high concentrations of a chemical with a relatively low toxicity can exceed the risk posed by exposure to low concentrations of a highly toxic chemical. For example, TPH is significantly less toxic than benzene based on a simple comparison of indoor air action levels (see Tables 4 and 5a&b). At some critical ratio of TPH to benzene, however, the sheer mass of TPH will override the risk posed by benzene and TPH will "drive" vapor intrusion risk. In these cases, consideration of only benzene to screen or remediate a site will not be sufficient, since the remaining TPH could still pose a vapor intrusion risk. Note that exceeding the critical ratio does not in itself imply that the TPH in soil vapors poses an actual vapor intrusion risk, since this will be governed by the concentration of TPH and individual VOCs present in the soil vapors, the location of the vapor plume with respect to nearby or future buildings, building design and related factors (refer to HDOH 2011).

The point at which the transition from benzene to TPH as the primary risk driver occurs is the ratio of target TPH action level to the target benzene action level (see Tables 4 and 5a&b). (Note that the term "risk" is used in a generic fashion to denote "noncancer hazard" and/or "excess cancer risk.") This provides a very simple and quick tool to determine the potential significance of TPH as a vapor intrusion risk driver at a site where both TPH and benzene soil gas data are available. The same method can be used for TEX and naphthalene, although the former and in most cases the latter are unlikely to drive vapor intrusion risk at a site over TPH or benzene based on the results of the study discussed in this report.

As noted in Tables 4 and 5a, action levels for TPH in indoor air or soil gas can be up to 2,000 times higher than action levels for benzene (e.g., maximum TPH carbon range indoor air action level of 630 $\mu g/m^3$ divided by most conservative benzene indoor air action level of 0.31 $\mu g/m^3$ = 2,032). Similarly, action levels for TPH can be almost 8,800 times higher than action levels for naphthalene (maximum TPH indoor air action level of 630 $\mu g/m^3$ divided by minimum naphthalene indoor air action level of 72 $\mu g/m^3$).

These ratios can be used to initially screen soil gas data from a site and determine if TPH will or could drive potential vapor intrusion risks over benzene and/or naphthalene (Table 6a and 6b). For example, if the TPH:Benzene ratio exceeds approximately 2,000:1 at a site then TPH will *always* drive vapor intrusion risk over benzene, regardless of the carbon range makeup of the TPH (i.e., even if TPH composed of 100% C5-C8 aliphatics) and even if a very conservative benzene action level is used (i.e., based on an excess cancer risk of 10^{-6} or one-in-a-million). The same is true when the TPH:Naphthalene ratio exceeds 8,800:1. In such cases, TPH vapors could still pose a vapor intrusion risk when concentrations of individual met their respective action levels.

In a similar manner, benzene will *always* drive risk when the TPH:Benzene ratio is less than approximately three (Table 6a), the ratio of the lowest possible TPH action level (100,000 µg/m^3 for 100% C9-C12 aliphatics) to the highest acceptable benzene action level (31,000 µg/m^3, coincidentally based on both an excess cancer risk of 10^{-4} *and* a noncancer Hazard Quotient of 1.0). The equivalent TPH:Naphthalene ratio for instances where the latter will always drive vapor intrusion risk is 32 (point at which the naphthalene noncancer Hazard Quotient will exceed 1.0; see Table 6b).

For TPH:Benzene and TPH:Naphthalene ratios in between the ratios noted above (e.g. 2,000:1 to for benzene and 8,800:1 for naphthalene) in Tables 6a and 6b, either TPH or the individual chemical could drive vapor intrusion risk. This will ultimately depend on the actual carbon range chemistry of the TPH and the associated toxicity and the target risk used to screen for benzene and naphthalene. Less TPH is required to overwhelm the risk posed by an individual chemical as the proportion of more toxic, C9-C18 aliphatics (or C9-C16 aromatics) increases. As discussed below, this was used as a tool to initially screen soil gas data collected from the study site and also to screen TPH versus benzene data from other sites. As discussed below, naphthalene was rarely detected in soil gas samples from most sites and appears to be less useful in vapor intrusion studies.

Similar ratios at which TPH will always drive vapor intrusion risk ratios can be calculated for other, targeted individual compounds such as ethylbenzene, toluene, xylenes and methylnaphthalenes. A summary of critical ratios for these compounds is provided Table 6c. A lower critical ratio reflects a lower toxicity for the individual compound. For example, A proportion of TPH that exceeds just 650 times that of ethylbenzene is required for TPH to *always* drive vapor intrusion risk over ethylbenzene, even when the TPH is dominated by relatively low-toxicity C5-C8 aliphatics. The chemical 1-methylnaphthalene is more toxic, but TPH will dominate risks posed by this chemical when the TPH:1-methylnaphthalene ratio exceeds 2,200:1. Toluene is the least toxic, targeted individual compound. TPH will *always* drive vapor intrusion risk over toluene when the concentration of TPH in soil gas (or indoor air) exceeds just 60% of the concentration of toluene (critical ratio 0.6:1).

The next step of the study involved the selection of key, petroleum-contaminated sites and the collection of soil gas samples from the sites. The carbon range Reference Concentrations and action levels and critical ratios of TPH to targeted, individual compounds presented in this section were used to evaluate soil data collected at these sites.

5 SELECTION OF STUDY SITES

A survey of petroleum release sites overseen by the HDOH HEER office and the UST office was carried out to identify potential candidates for the collection of soil gas samples. An attempt was made to incorporate a variety of fuel types, ranging from gasolines to diesel fuel and other middle distillate fuels. Budget constraints were anticipated to restrict testing to approximately 20 to 25 samples for each of the two field phases of the study. Three to five samples per site were deemed desirable, with the potential for sample collection from five to eight sites. Sites with existing soil vapor monitoring points were preferentially targeted in order to minimize field costs. Site access was also considered.

Six, previously investigated petroleum-release sites were initially selected for inclusion in the study (see Figure 1 and Table 7a):

- Hickam AFB Site VP26;
- Honolulu Harbor OU1C;
- Hickam AFB Site ST03;
- Fishing Village;
- Aloha Petroleum–School Street; and
- GASCO.

Two phases of sample collection were carried out. The first phase focused on the collection of Summa samples and identification of sites with sufficient levels of petroleum vapors for more detailed, followup sample collection and analyses using sorbent tubes. The six sites selected included an operating service station and four sites associated with fuel pipeline releases (Hickam AFB SP43 not included). The sites represented a mix of gasoline and diesel fuel releases, with larger releases associated with pipelines that transported jet fuels to military bases on the island. While the extent and magnitude of contamination may not be representative of typical underground storage tank (UST) release sites, the chemistry of the petroleum vapors should be similar. For comparison, soil gas samples were also collected from the GASCO site in Honolulu, a former manufactured gas plant facility that is known to be heavily contaminated with benzene and naphthalene, two of the main products that were produced at the facility. Vapor samples were also collected over open containers of fresh gasoline and diesel fuel.

Soil gas and/or groundwater contamination maps from published reports for each site were used to initially target vapor monitoring points for sample collection (Figures 3-9, see references in Table 7a). The targeted sample points are noted on the maps. The depth to groundwater at the sites ranged from five to twenty feet below the ground surface (bgs). An exception was Hickam AFB ST03 (Site D), a significant pipeline release of JP-4 jet fuel (mix of gasoline and kerosene) that impacted groundwater at a depth over 500 feet bgs (see Figure 6). Soil vapor monitoring had been installed from the surface to groundwater. Samples collected as part of this project were collected from fixed monitoring points at depths of 250 to 490 feet. This site had also

undergone a bioventing pilot study, where ambient air was pumped into the vadose zone to provide oxygen and enhance biodegradation. Oxygen levels at the vapor points had returned to normal (i.e., <5%) at the time that the samples were collected.

Four of the originally sampled samples sites were carried through to the second phase of sample collection. Soil gas results for the active service station site were non-detect, due mostly likely to vapor extraction remedial actions carried out since discovery of the release but also potentially due to heavy rainfall on the day of sample collection. The GASCO site was not resampled in the second phase of field work since it is not representative of typical petroleum releases. Hickam AFB site SP43, another jet fuel pipeline release site, was added. As was the case for the majority for the other sites, the depth to groundwater at SP43 was very shallow (less than ten feet bgs) and the soil gas samples were collected very close to source areas. The final sites included in the primary study were therefore as follows:

- Hickam AFB Site VP26 (Site A);
- Honolulu Harbor OU1C (Site B);
- Hickam AFB Site SP43 (Site C);
- Hickam AFB Site ST03 (Site D); and
- Fishing Village (Site E).

The purpose of this study was to obtain general information on the chemical makeup of vapors at petroleum-contaminated sites. The most heavily impacted areas of the sites were intentionally targeted for sample collection. **The data collected and discussed below are not intended to be representative of overall site conditions or potential vapor intrusion hazards at the sites.** More detailed investigations of the sites are being carried out separately by the responsible parties, under the oversight of HDOH. A generic designation was assigned to each of the sites for use in discussions of data subsequently collected at the sites (see above list; Site B, Site B, etc.).

Information regarding the nature of contamination (e.g., vadose zone soils and/or product on groundwater), vapor point identification number and depth to groundwater at the five, key study sites is summarized in Table 7b. Vapor points for most sites were installed in soil (including saprolite, marine sediments or fill material) and situated within five to fifteen feet of contaminated soil and/or groundwater. Vapor points at the Hickam AFB ST03 site were installed in basalt. As discussed above, sample points within or within a few feet of the source media were intentionally targeted in order to obtain data on the chemistry of petroleum vapors at the source. Consultants familiar with the Hickam AFB ST03 site suggested that some of the vapor probes could be as much as fifty to seventy-five feet or more from free product trapped in the basalt or on groundwater, even though reported levels of petroleum vapors at the points was extremely high.

Reports referenced in Table 7a and associated with the HEER office case file for the site include more detailed data for other measurements collected at the vapor points and project areas, including oxygen, carbon dioxide and methane levels over time. A summary of this information and review of degradation, vapor fate and transport, etc., was beyond the scope of this study but is being evaluated at several of the subject sites by the responsible parties and their consultants.

Additional vapor samples were collected over open containers of fresh gasoline and diesel fuel as well as JP-8 jet fuel. A limited number of auto exhaust samples were collected to determine if petroleum vapors associated with exhaust have a distinct signature in comparison to vapors from fresh fuel. Based on the few samples collected, it appears that the TPH:BTEX ratio for exhaust could be higher than typically observed for vapors from pure fuels. In the future, and with additional research, this could assist in determining the origin of petroleum vapors identified in the shallow subsurface or indoor or ambient air. As discussed below, sorbent tube samples were collected in addition to Summa samples during the second phase of the study.

6 SAMPLE COLLECTION AND ANALYSIS

6.1 SAMPLE COLLECTION

As discussed below, Summa canisters were used to collect soil vapor samples during Phase I of the study. Both Summa canisters and sorbent tubes were used to collect samples during Phase II of the study. Based on discussions with Air Toxics and other laboratories, Summa canister sample analysis methods are also only able to report up to C10 aromatic and C12 aliphatic compounds. Heavier compounds cannot be adequately extracted from the canisters after sample collection. Published data for headspace samples collected over different fuel types have suggested that a significant fraction of petroleum vapors could be dominated by these compounds, especially C12+ aliphatics (e.g., e.g., >10% and even >50%; see Hayes 2007). If so, then reliance of traditional Summa canister methods for the collection and analysis of soil gas samples (e.g., TO3 and TO15 methods) could significantly underestimate of actual concentration of TPH in soil gas samples and subsequently underestimate potential vapor intrusion risk.

In such cases the use of sorbent tube sample collection and analysis methods would be required to more accurately determine TPH concentrations. As discussed below, this was evaluated at the target study sites through the co-collection of both Summa canister and sorbent tube samples at each vapor point during Phase II of the field program.

6.2 TARGET ANALYTES

The primary target analytes for the study included the following:

- C5-8 aliphatic compounds;
- C9-C12 aliphatic compounds;
- C13-C18 aliphatic compounds (Phase II only);
- C9-C10 aromatic compounds;
- C11-C16 aromatic compounds (Phase II study only);
- TPHgasoline (Phase II only)
- TPHdiesel (Phase II only)
- Benzene, toluene, ethylbenzene, xylenes (BTEX);
- Naphthalene.

All samples were analyzed by Air Toxics laboratory in Folsom, California. The sum of C2-4 aliphatics, hexane and additional volatile organic chemicals (VOCs, e.g., methylnaphthalenes) were reported for selected samples. The data were not directly used as part of this study but may be of use at a later time. Helium was reported as part of the leak tests. Although biodegradation was not a focus of this study, carbon dioxide and methane were also reported. Oxygen was recorded in the field at some vapor monitoring points, although not consistently due to equipment problems (also available from previous soil gas studies carried out at the sites).

6.3 Carbon Range Laboratory Analysis of soil gas

A vapor-phase analytical procedure developed by the laboratory and referred to as "MA-APH" was used to quantify targeted carbon range concentrations in the samples. Although the procedure is proprietary, a summary of the basic aspects of the method provided by Air Toxics is included in Attachment 3. Chromatograph elution times for key carbon range markers using both Summa canister and sorbent tube samples are noted in Table 8 of the main report. The laboratory method is similar to the approach developed by the Massachusetts DEP for carbon range analysis of soil and water samples.

6.4 Phase I sample collection and Analysis

6.4.1 Study Sites

Six sites were initially targeted for sample collection during Phase I of the study (see Table 7a):

- Hickam AFB Site VP26;
- Honolulu Harbor OU1C;
- Hickam AFB Site ST03;
- Fishing Village;
- Aloha Petroleum–School Street; and
- GASCO.

Each of the sites was known through past investigations to be heavily contaminated with a range of petroleum fuels. Soil vapor data were also available for most of the sites, including carbon range data at the Hickam Air Force Base sites. Vapor samples were also collected over open containers of gasoline and diesel fuel.

6.4.2 Soil Gas Sample Collection

Soil gas samples were collected from targeted sites between May and August 2011 for Phase I of the study. The locations of vapor points used to collect samples at the study sites are noted in Figures 3-9. The soil vapor monitoring points were typically constructed of ¼ inch Teflon tubing with a wire mesh screen installed at the targeted subsurface horizon. Sample screen points were typically located within five to twenty feet of known, contaminated soil or groundwater. Surface completions of well points varied between the sites and even within a given site and ranged from flush-mounted traffic boxes with or without valves for vapor ports to temporary concrete plugs over well points with unions included for hookup to sample collection equipment (e.g., see Figures 10-11).

One sample was collected from each targeted monitoring point using a one-liter Summa canister. Summa canisters and flow meters were pre-ordered and provided by Air Toxics laboratory in Folsom, California. Flow meters were typically pre-set to 53.3 ml/minute (15 minute samples), although some samples collected in areas of known higher permeability soils were collected

using flow rates of 125 ml/minute (approximately eight minute samples) and 200 ml/minute (five minute samples).

A PID was typically used to purge vapor monitoring points of at least three volumes of tubing volumes and until PID readings stabilized (flow rate 200 ml/minute; Figure 10). This was relatively easy to accomplish given the shallow depth to groundwater at most targeted sites (five to twenty feet bgs). Purging was accomplished by calculating the volume of the vapor point tubing and punning the PID an appropriate amount of time to remove at least three air volumes. In some cases additional purging was carried out until the PID reached a stable reading for total vapors present. In cases of tight formations, the PID would automatically switch off if an excess vacuum was applied, likewise indicating that vapor point had been adequately purged. The final Total VOC reading was recorded for each sample as was oxygen, although less consistently due to problems with the field meter. An electric pump was used by the Hickam AFB consultant to purge the vapor monitoring wells at Site ST03, where vapor wells were up to 500 feet deep (approximate depth to groundwater). A Tedlar bag sample was collected by the consultant after purging was completed and PID readings recorded.

The Summa sampling train was prepared by connecting the canister to the flow controller and attaching a six- to twelve-inch length of ¼ inch Teflon tubing to the top of the controller. A short length (typically <three inches) of flexible tubing (e.g., Tygon) was used to connect the Teflon tubing to the vapor monitoring point at well points. If the well point was completed with a union and Swage Lok then a small length of Teflon tubing was attached and a small length of flexible tubing was used to attached the to the sampling train and allow a point to pinch the monitoring point shut if needed (see Figure 11). Vapor monitoring points were fitted with valves at some sites that allowed the well point to be closed without the need to include a short length of flexible tubing.

Polyethylene and other flexible tubing (e.g., Tygon) are known to absorb VOCs during sample collection. The short lengths used to collect samples during the study are not anticipated to have significantly affected concentrations or ratios of targeted VOCs originally in soil vapors, especially given the elevated levels of petroleum vapors at the study sites. The need to minimize or even eliminate the use of potentially sorptive tubing will be discussed in upcoming updates to the HEER office Technical Guidance Manual.

Vapor samples were collected over open containers of gasoline and diesel fuel. Samples were collected by placing a short length of ¼" Teflon tubing from the flow controller adjacent to the top of the container and opening the valve on the canister a target vacuum of -5mm Hg was reached. This allowed more significant dilution of the vapors in comparison to a traditional, headspace test using baggies or a jar with a only a small opening. This was done in part to help ensure that the sorbent tube samples did not become saturated. Trace levels of petroleum in ambient air were also not anticipated to significantly affect overall ratios of targeted carbon

range compounds and targeted individual VOCs (e.g., ambient air typically <1,000 µg/m^3 TPH and 1-5 µg/m^3 benzene).

6.4.3 LEAK DETECTION

Leak detection was carried out during Phase I of the study by covering the entire Summa canister sample train a large, plastic garbage bag and using this as a helium shroud (Figure 12). The shroud was fitted to the ground surface to the extent feasible and then filled with helium. (Note that "party grade" helium such as that used in this study has been reported to contain trace amounts of benzene and other petroleum compounds which could be released into the sample if a significant leak occurred, although not at concentrations anticipated to exceed soil gas action levels.) A helium concentration inside the shroud of 10-30% was targeted and measured base on the use of a field helium meter at some sites. A detection of helium in the Summa sample would reflect a leak somewhere along the sampling train.

This leak detection approach was carried out for all samples collected during Phase I of the study. Note that although the leakage of ambient air into a Summa canister would affect the reported concentrations of VOCs in the sample, it would not significantly affect the relative ratios of targeted carbon ranges, which was the primary objective of the study. Anticipated levels of TPH in the samples based on previous testing (e.g., >100,000 µg/m^3) were orders of magnitude above potential concentrations in outdoor air (typically <100 µg/m^3). A moderate leakage of the ambient air into the Summa canister (e.g., <10%) would not significantly alter these ratios.

After helium was released into the shroud the valve to the Summa canister was opened and the soil gas sample was collected. Additional helium was released into the shroud as needed to keep it reasonably inflated. In some cases a field meter was used by a consultant to monitor the level of helium in the shroud.

This approach worked adequately for some sample points but not for others. Fitting the bag shroud over the sampling train was awkward and inefficient in many cases, especially for points with flush-mounted traffic boxes where an adequately tight seal against the ground surface could not be obtained. Keeping the bag inflated and stable on windy days was also difficult. In one case the tubing came undone during sample collection at the juncture of the Teflon and flexible tubing but went unnoticed under the bag. A consultant brought a shroud made with a five-gallon, plastic bucket to one site as an alternative (Figure 13, also discussed in the HEER TGM) but the combined Summa canister and flow controller was too tall to fit under the bucket. As discussed below, an alternative leak detection method was used during Phase II of the study based on further discussions with consultants. A summary of this approach is provided in Attachment 4.

6.4.4 SAMPLE ANALYSIS

Samples were shipped to Air Toxics for analysis. The following analyses were carried out on each sample (primary analytes noted):

- TO-15 Massachusetts APH (GC/MS; targeted carbon ranges, BTEX and naphthalene);
- ASTM 1945M (C2-4 hydrocarbons, helium, CO2, methane);
- TO-15 (GC/MS; TPHg).

The concentration of TPHg (based on a gasoline standard) reported using Method TO-15 is based on the full range of C5-C24, vapor-phase compounds. Sample collection methods and analyses were slightly modified during phase II of the study, as summarized below. Data for C2-4 hydrocarbons, helium, CO2 and methane are included in Attachment 6 but not summarized in the main tables of the report.

6.5 PHASE II SAMPLE COLLECTION AND ANALYSIS

6.5.1 TARGETED SITES

Five sites were targeted for the collection of additional soil gas during Phase II of the study (see Figure 1 and Tables 7a&b):

- Hickam AFB Site VP26 (Site A);
- Honolulu Harbor OU1C (Site B);
- Hickam AFB Site SP43 (Site C);
- Hickam AFB Site ST03 (Site D); and
- Fishing Village (Site E).

Four of the six, Phase I sites were retained and a JP-4 and JP-8 release site at Hickam Air Force Base was added (Hickam AFB Site SP43/Site C). Samples were collected from the same vapor monitoring points used in Phase I of the study. An exception was well point B8 at the VP26 [HAFB-VP26-B08(21)]. This monitoring point was not resampled during Phase II of the study due to the similarity with the other four sample points at this site a need to reduce analytical costs. Vapor points used for Hickam AFB Site SP43 are noted in Figure 5. The Aloha Petroleum gas station was dropped due to a lack of significant petroleum vapors in any of the samples collected during Phase I of the study. The GASCO site (former manufactured gas plant) was not resampled since it is not typical of petroleum-release sites. A significant amount of soil gas data is available for this site in other investigation reports.

An alternative leak detection approach was used, however, as described below. Additional vapor samples were collected over open containers of gasoline, diesel fuel and JP-8 jet fuel. Samples were again collected by placing a ¼ inch Teflon tubing from the flow controller adjacent to the container lid and opening the valve on the canister a target vacuum of -5mm Hg was reached.

6.5.2 SUMMA CANISTER SAMPLE COLLECTION AND LEAK DETECTION

Vapor points were purged and field data recorded in the same manner as done during Phase I of the study. The Summa sample was collected immediately after purging. The sampling train was connected to the vapor points in the same manner as described before.

An alternative and ultimately much more efficient leak detection approach was used during Phase II of the study. This included the use of a small (3.25 quart), see-through Tuperware plastic bowl as a helium shroud (Figure 14). The following steps were followed for each of the samples collected (see also Attachment 4):

1) Thread Teflon tubing from flow controller through the Tupperware shroud with precut holes (see photos in Attachment 4);
2) Connect the Summa sampling train to the well monitoring point;
3) Close well point valve or pinch flexible connector tubing shut;
4) Carry out a "shut-in" test by opening Summa canister valve and monitoring vacuum gauge on flow controller to check Summa canister and flow controller connections (main locations of potential leaks; no significant leaks assumed if vacuum holds for sixty seconds);
5) Recheck Summa canister and flow controller connections if a leak is detected and repeat vacuum-hold test until the vacuum gage indicates tight sampling train connections;
6) Open monitoring point valve (or unpinch tubing) and place Tupperware shroud over well point, fill with helium;
7) Open Summa canister valve and collect sample (e.g., until vacuum gage reads 3-5 mmHg);
8) Reclosed vapor monitoring point valve or pinch flexible tubing closed to prevent ambient air from being drawn into the well point;
9) Disconnect Summa sampling train from well point.

If a drop in the vacuum pressure was identified during the shut-in test then the Summa canister valve was immediately closed and the connections checked and tightened as needed. If the vacuum on the Summa canister dropped below 25 mm Hg then the canister would have been replaced, although this was not necessary for any of the samples collected. The sorbent tube sampling train was connected to the well point immediately following collection of the Summa canister sample and a second sample was collected as described in following section.

This approach has an advantage over a large shroud in its simplicity and the immediate identification of a significant leak at the canister and flow controller connections. Only one leak was identified in the field and was due to a faulty connection between the Summa canister and the flow controller. A leak around well point itself was indicated if helium was identified in the sample by the laboratory. A helium meter could also have been used in the field to monitor for leaks at the well point during sample collect but was not available (see figures in Attachment 4).

Addition notes on leak detection methods for soil gas samples will be included in future updates of the HEER office Technical Guidance Manual (HDOH 2009).

In Step 8, the monitoring point valve or the flexible tubing connected pinched shut immediately after collection of the Summa canister sample and before the canister connection was undone (see Attachment 4). This prevented the potential backflow of ambient air into the well tubing due to a residual vacuum in the soil where the sample was extracted.

6.5.3 SORBENT TUBE SAMPLE COLLECTION

Sorbent Tube Preparation

A sorbent tube sample was collected from each vapor point in addition to a Summa canister sample (see Figure 15). Existing soil gas data for the selected study sites were discussed with Air Toxics laboratory staff prior to the initiation of field work. This information allowed the laboratory to identify the most appropriate sorbent materials for the site in order to adequately capture targeted compounds. As discussed below, this also helped to establish the maximum volume of vapors that could be drawn without risk of saturating the tubes. This was particularly important for petroleum-contaminated sites, given the wide carbon range and sorptive properties of compounds in the vapors anticipated to be present.

Sorbent tube methods for the collection of vapor-phase samples were originally developed for indoor air and relatively low concentrations of volatile, organic compounds (e.g., 10s or 100s $\mu g/m^3$). In the case of the TO-17 method proposed for the study, for example, a single tube pack with a series of three, increasingly sorptive materials is used to capture VOCs in air that is pulled though the tube. The concentration of the VOC in the air sample is calculated as the mass of the compound sorbed divided by the volume of air pulled through the tube.

The collection of high-concentration, soil gas samples (e.g., 1,000s to 1,000,000s $\mu g/m^3$ total VOCs) posed two inter-related field and laboratory issues – potential saturation of the sorbent material and potential breakthrough of vapors due to saturation and/or an excessively fast sample draw rate. Methods to address these potential concerns were developed and incorporated into field sample collection and laboratory analysis procedures. As discussed in the summary section of this report, the procedures implemented in general worked well to minimize field laboratory error and provide TO-17 data that were reasonably comparable to concurrent Summa canister data for the same vapor point.

TO-17 Soil Gas Sample Volume

The maximum volume of soil gas that could be drawn through the sorbent tubes without saturating the sorbent material was a critical issue for the study. Saturation of the sorbent material and preferential breakthrough of light or heavy compounds could introduce error into estimates of carbon range and individual compound ratios in the vapors. Sorbent materials and packing arrangements typically used for low-concentration, air samples where one-liter or larger

samples are typically drawn would be quickly overwhelmed and become saturated if a similar volume of soil gas with high-concentrations of VOCs were drawn through the tubes.

The laboratory initially suggested a maximum sample draw volume of only five to ten milliliters based on the anticipated, very high concentrations of TPH and other VOCs in the soil gas. While ideal from a laboratory perspective, this was considered to be too small to be representative of field conditions (although the same argument might be made for one- and even six-liter samples and the topic of a potential followup study). Perhaps more importantly, such a small volume is highly prone to field error if the vapor point tubing is not adequately purged of ambient air. The ¼ inch tubing used to collect the samples contained approximately 15 milliliters of air volume per meter length. The depth of sample collection points ranged from one to two meters at the Hickam AFB SP43 site and the Honolulu Harbor Fishing Village and OU1C sites, five to ten meters at the Hickam AFB VP26 site and over one-hundred meters at the Hickam AFB ST03 site. A small residual vacuum at a well point after collection of the Summa sample could potentially draw in an amount of ambient air that exceeded the subsequent draw volume of the sorbent tube sample and result in what in essence was simply a sample of ambient air rather than subsurface vapors.

After a further review of optimal sorbent packing materials and arrangements, the laboratory was able to prepare TO-17 sorbent tubes that could be used to collect high-concentration vapor samples with no anticipated breakthrough provided that no more than 50 milliliters of soil gas were drawn through the tubes. While still not ideal with respect to sample volume and representativeness, the concurrent collection of a Summa canister sample at each point would provide a means to check sorbent tube sample data for potential field error. As mentioned above and described in more detail below, field sample collection procedures were also designed to minimize the potential for ambient air to be drawn into sample tubing prior to collection of a sorbent tube sample.

TO-17 Soil Gas Sample Draw Rate

Although the sorbent material and sample draw rate were believed to have been optimized, concern was still expressed by some consultants in regards to potential breakthrough of VOCs due to an excessively fast sample draw rate. Discussions with labs suggested that breakthrough associated with the speed at which the soil gas was drawn through the sorbent tube draw rate was unlikely if the draw rate was kept below 200 ml/minute. As discussed below, a draw rate of approximately 100 ml/minute was adhered to in the field through the gradual collection of a 50ml sample over a period of thirty seconds. As also discussed below, potential breakthrough was directly evaluated by adding a second, downstream sorbent tube to the sampling train (Tube B). This tube was analyzed for the same list of target compounds separately from the upstream tube to confirm that significant breakthrough (e.g., >10% total TPH mass) had not occurred.

Sample Collection

Sorbent tubes soil gas samples were collected using a 60ml syringe with a three-way valve (supplied by Air Toxics). The sampling train is shown in Figure 15. Two sorbent tubes, rather than the traditional single tube, were used and connected using a union joint. The first tube (Tube A, closest to well point) was intended to fully capture petroleum vapors in the sample drawn from a well point. The second tube (Tube B) was added to the sampling train and tested in order to verify that breakthrough did not occur, since this would result in an underestimation of vapor concentrations using just the first tube and potentially distorting the ratios of carbon ranges and individual compounds in the vapor. The downstream tube is connected to the well point with a short length of flexible tubing in the same manner as done for the Summa canister sampling train.

A simple leak detection test of the sorbent tube sampling train was carried out by closing the well point valve or pinching the flexible connector tubing shut. The handle of the syringe was then gently pulled back and held ten to fifteen seconds to see if air was pulled into the syringe (making sure the three-way valve was set to allow flow from the vapor point). If not, then the syringe connection to the sorbent tubes and the sorbent tube connection to the well point were assumed to be tight. The well point itself was not tested for leaks, since this had already been done during collection of the Summa canister sample. This could have been carried out using the Tupperware shroud noted above if a Summa sample had not been initially collected, however. (Note that there would be some concern about the sample representativeness given the small sorbent tube draw volume). Obtaining a tight connection of the sorbent sample sampling train to the vapor point was relatively easy and no leaks were detected in the field using this approach. As was the case for the Summa canister sampling train, this approach has an advantage over a large shroud in its simplicity and the immediate identification of a significant leak.

6.5.4 SAMPLE ANALYSIS

Samples were shipped to Air Toxics for analysis. The following analyses were carried out on each sample (primary analytes noted):

Summa Canister Samples:

- TO-15 Massachusetts APH (GC/MS; targeted carbon ranges, BTEX and naphthalene or "BTEXN," TPHg);
- ASTM 1945M (C2-4 hydrocarbons, helium, CO2, methane);
- TO-15 (GC/MS; TPHg);
- TO-3 (GC/FID);

Sorbent Tube Samples:

- TO-17 Massachusetts APH (GC/MS; targeted carbon ranges, BTEX and naphthalene, 1&2-methylnaphthalenes, TPHg, TPHd).

The concentration of TPHg (based on a gasoline standard) reported for Summa canister samples is based on the full range of C5-C24, vapor-phase compounds for Methods TO-3, TO-15 and TO-17. The concentration of TPHd reported for sorbent tube samples using Method TO-17 only included C10-C24 compounds, however. The laboratory stated that this is the range generally requested by clients for TPH vapors at diesel and other middle distillate sites. As discussed in Section 8, this proved problematic given the high proportion of C5-C8 aliphatics in soil gas at the middle distillate sites evaluated in this study. Data for C2-4 hydrocarbons, helium, CO2 and methane are again included in Attachment 6 but not summarized in the main tables of the report.

The lab was subsequently requested to report both 1- and 2-methylnaphthalenes for the Phase II sorbent tube samples. Methylnaphthalenes were not identified above method reporting limits in most of the samples and were therefore not carried through in the detailed review of vapor study data (see TO-17 data in Attachment 6).

7 RESULTS AND ANALYSIS

Results of the study are presented in terms of the questions and topics posed in the introduction:

- TPH versus BTEXN Composition of Soil Gas;
- TPH:Benzene Ratios at Other Sites;
- TPH Carbon Range Chemistry and Weighted Inhalation Toxicity;
- Results of Leak Tests; and
- Evaluation of Sorbent Tube Breakthrough.

A discussion of the relative vapor intrusion risk posed by TPH versus benzene and other individual compounds at the study sites is presented in Section 7.

Sample data are summarized in Tables 9-21. A comparison of the TPH versus BTEXN makeup of the vapor samples and initial implications for vapor intrusion risk drivers is provided in the next section. This is followed by a summary and discussion of the carbon range composition of the TPH and a more detailed assessment of TPH versus benzene or naphthalene as the risk driver at the study sites. Chromatograms for samples from key sites were obtained as part of the study and are presented in Attachment 5. Laboratory reports for the samples collected during the study are provided in Attachment 6.

7.1 TPH VERSUS BTEXN COMPOSITION OF SOIL GAS

A summary of TPH and BTEXN Summa canister data for vapors collected over fresh fuels and soil gas samples collected at targeted study sites is provided in Tables 9, 10 and 11. These data help to answer two of the key questions posed at the beginning of the study:

- What is the typical proportion of TPH in petroleum vapors in comparison to targeted, individual volatile organic compounds (VOCs) such as benzene and naphthalene?

And, at least at a initial screening level,

- Is the proportion of TPH sufficiently large in some cases for TPH to drive vapor intrusion over benzene, naphthalene and other targeted, individual VOCs?

Detailed carbon range data are required to full answer the second question. As discussed in Section 3, however, an initial review of the ratio of TPH to individual, targeted compounds such as benzene and naphthalene can shed some light on the potential for the TPH component of soil vapors to drive vapor intrusion risk.

Data from Summa canister samples are used to initially address these two questions. Concurrent sorbent tube data for co-located samples are discussed below in the summary of TPH carbon range data. As discussed in Section 5, reliance on Summa data risks under reporting the true concentration of TPH in the samples, since aromatic compounds >C10 and aliphatic compounds

>C12 cannot be adequately extracted from the canisters. The degree that this affected the Summa canister samples is also discussed in the below summary carbon range data.

Table 9 presents a summary of TPH versus BTEXN vapor data for the Phase I and Phase II samples. Tables 10 and 11 present the relative proportion of TPH versus BTEXN in individual samples and for each study site as a whole. It is clear from the data that non-specific, TPH compounds dominate the vapors. Vapors collected over containers of fresh fuels were characterized by 86-96% TPH and only 4-14% total BTEXN (dominated by TEX). The BTEXN percentages presented in Table 11 reflect the average of all samples collected at the site during the two phases of the study. Note that use of one-half the MRL to estimated total BTEXN does not significantly affect the observation that total BTEXN in soil vapors on average makes up a very small percentage of the total petroleum vapors present.

Soil gas samples collected from study sites show an even greater dominance of TPH, with less than 1% of the total vapors generally attributable to BTEXN. Although the data are limited, the reduction of aromatic BTEXN compounds in subsurface vapors at the study sites could reflect a preferential biodegradation of aromatic compounds in comparison to aliphatic compounds that dominate the TPH fraction of the vapors. This assumes that the BTEXN component of the fuels released at the site were similar to the fresh fuels included in this study. This is of course not known, and an apparent reduction of total BTEXN in vapors over time is of course very speculative. Note that vapor-phase, aliphatic compounds are also highly biodegradable in the subsurface, as illustrated by the rapid attenuation of TPH in general away from source areas at petroleum-contaminated sites. Aromatics appear to be even more efficiently removed from soil vapors, however. Additional evaluation of this issue is warranted in future studies.

Total BTEXN in the range of 1-4% for samples collecte4d from Hickam AFB Site ST03 in October 2011 (Site D) could indicate an undocumented release of fresher fuel, although samples collected in July 2011 were 1% or less BTEXN (see Tables 10 and 11). Bioventing pilot tests had been carried out at the at the site several months previous to the collection of samples for this study but a sufficient amount of time was allowed for re-equilibration of subsurface vapors, based on discussions with the Hickam AFB consultant who was also collecting samples at the site when the HEER office samples were collected. It is possible that this was stripping fresh, BTEX-enriched vapors from free product. Alternatively, this could reflect differences in weathering and biodegradation in different areas of the plume. This issue was not evaluated in detail, but the data highlight the likely spatial and temporal heterogeneity of petroleum vapors in the subsurface and potential problems associated with one-time sampling events.

A comparison of TPH versus benzene and naphthalene data for key sites based on Summa canister samples is presented in Table 12. A summary of average vapor ratios for fresh fuels and soil gas samples collected at the study sites is provided in Tables 13a and 13b. Naphthalene was not detected above laboratory reporting limits in the majority of the samples outside of samples over containers of fresh JP-8 and diesel. This suggests that naphthalene has limited use as a tool

to screen for potential vapor intrusion hazards at petroleum-contaminated sites. For the sites included in this study, TPH and Benzene data are far more useful. Note that analytical detection limits for naphthalene were typically higher than detection limits for other individual VOCs by a factor of two to ten. This does not affect the overall conclusions of the study.

A significant variability between samples collected from different sites and even between samples collected from the same sites is apparent in the date (see Table 12 and 13). The ratio of TPH to benzene for vapors collected over fresh fuels is relatively low, ranging between approximately 50:1 and 300:1 and not that significantly different between gasoline, JP-8 and diesel fuel. This reflects a relatively high proportion of benzene in the vapors. Based on comparison to the TPH:Benzene critical ratios in Table 6a, this initially suggests that either TPH or benzene could drive vapor intrusion risks for vapors from the fresh fuels sampled. Whether TPH or benzene ultimately drives risk depend on the carbon range-weighted toxicity of the TPH and the target risk applied to benzene. This is discussed below and reviewed in more detail in Section 7.

Note the even lower ratio of TPH to benzene in both the gasoline and diesel exhaust samples (see Tables 10 and 12, 4:4 to 7:1). This seems to reflect a much more significantly more efficient combustion of aliphatic compounds in comparison to aromatic compounds, as further discussed in the section of this report that discusses carbon range data. Although data are obviously limited, comparison to the TPH:Benzene ratios in Table 6a suggests that benzene will almost certainly drive inhalation risk for fresh auto exhaust vapors. Naphthalene was again not detected.

Soil gas samples collected from the Hickam AFB VP26 AVGAS site (Site A) are the most gasoline-like within the study group, in comparison with vapors collected over fresh samples of gasoline. The TPH:Benzene ratio at two of the well points was consistently below 1,000:1, indicating moderately high proportion of benzene (although not as high as observed for fresh fuels). Reported levels of TPH approached 100,000,000 $\mu g/m^3$ in some samples (see Table 9). The ratio of TPH:Benzene in the other two well points was consistently over 1,000:1 and up to 5,000:1, indicating a reduced proportion of benzene. This may reflect differences in degradation and/or the presence of JP-4 and middle distillate fuel in these areas. (JP-4 is a mix of a gasoline and kerosene mixture.) Based on comparison to Table 6a, this suggests that either TPH or benzene could drive vapor intrusion risks given the average TPH:Benzene ratio of approximately 1,500:1 (see Table 13a). In areas where the TPH:Benzene ration exceeds the critical ratio of 2,032:1, however, TPH will *always* drive vapor intrusion risk over benzene due to its overwhelming proportion in the vapors.

The average ratio of TPH to benzene was significantly higher in soil gas samples collected from the four other study sites (Honolulu Harbor Site OU1C/Site B; Hickam AFB Site SP43/Site C; Hickam AFB Site ST03/Site D, Honolulu Harbor Fishing Village/Site E; see Tables 9 and 13a). This suggests a reduced proportion of benzene in the original fuels released and/or a preferential

reduction of benzene in vapors as the release aged. (Note that from a vapor intrusion standpoint, the exact cause of the low benzene component of the vapors, e.g., original fuel composition and/or biodegradation, is not relevant.) The ratio of TPH to benzene in samples collected at the Honolulu Harbor OU1C site (Site B) was between 3,000:1 and 5,000:1 when benzene was detectable within the overwhelming mass of TPH compounds, with an average of approximately 4,000:1. As discussed below, the TPH carbon range signature for the samples suggests a dominance of gasoline-related fuels (i.e., TPH dominated by C5-C8 aliphatics). Benzene was only detected in two of the five soil gas samples collected at Hickam AFB Site SP43 (Site C), with TPH:Benzene ratios in both cases well over 10,000:1 and reported concentrations of TPH approaching 40,000,000 $\mu g/m^3$. The ratio of TPH to benzene exceeds 18,000:1 in samples collected from Hickam AFB Site SP43 (Site C) and the Fishing Village site at Honolulu Harbor (Site D). Both of these sites are suspected to include a large component of middle distillate fuels, including JP-8 and/or diesel fuel. The ratio of TPH:Benzene in the samples collected from all four of these sites imply that TPH would drive vapor intrusion risk over benzene even if a conservative, 10^{-6} cancer risk is applied to benzene (see Table 13a).

Moderate levels of naphthalene in vapors collected over fresh fuels suggest that either TPH or naphthalene could drive inhalation risk, depending on the carbon range chemistry and toxicity of the TPH component of the vapors (see Table 9). Naphthalene was not reported in soil gas samples collected at Hickam AFB Site VP26 (Site A; JP4 /AVGAS release), Honolulu Harbor OU1C (Site B; mixed fuels) or Hickam AFB Site ST03 (Site D; JP4/AVGAS). Naphthalene was detected in two of the five soil gas samples collected at Hickam Site SP43 (Site C; JP-8 +/- SP-4), with an average TPH:Naphthalene ratio of approximately 6,300:1. Although this suggests that either TPH or naphthalene could hypothetically drive vapor intrusion risk, the ratio is approach the critical point of 8,800:1 where TPH will drive risks over naphthalene even if a target risk of 10^{-6} is used for the latter (see also Table 13b). Overall, the lack of detections or analytical data for naphthalene appears to limit its usefulness in vapor intrusion studies.

7.2 TPH:Benzene Ratios at Other Sites

Ratios of TPH to benzene from soil gas samples collected by consultants at other sites in Hawai‘i are noted in Table 14. (Again, the data are presented for example purposes only and are not intended to be representative of overall site conditions of the potential for actual vapor intrusion threats.) The ratios are similar to those calculated as part of this study. Releases primarily associated with gasolines are characterized by TPH:Benzene ratios between 100:1 and 1,000:1 (e.g., samples collected from Hickam AFB Site SS156-E). Based on the data obtained in this study, benzene would be an adequate indicator of vapor intrusion risk provided that a target risk of 10^{-6} was adhered to. Data are highly variable, however. This is also highlighted by data from other sites reviewed during this study (see Table 14). Previous soil gas data from the Aloha Petroleum gas station site (assumed gasoline-only release) included in this study indicated TPH:Benzene ratios in soil gas that ranged from approximately 200:1 to 13,000:1 (see reference in Table 7a). In the latter case TPH would clearly drive vapor intrusion risk over benzene.

TPH:Benzene ratios for soil gas samples collected at the ConocoPhillips fuel terminal site are also highly variable, ranging from a low of 42:1 to a high of over 7,000:1. This site was known to be heavily contaminated with gasoline. In some areas of the site benzene almost certainly drives vapor intrusion risk; in other areas vapor intrusion risk is clearly driven by TPH. This could indicate an unidentified mixture of gasoline and diesel releases at the sites. Both benzene and TPH soil gas data clearly identified vapor intrusion risks, however.

TPH clearly drives vapor intrusion risk at most sites dominated by middle distillates release, with average TPH:Benzene ratios well over 10,000 (see Table 14; e.g., Hickam AFB Sites SS156-J and CG110). This includes a soil gas sample from a localized area of stoddard solvent contamination at a dry cleaner (Hakuyosha dry cleaner).

Apparent exceptions include the Challenger Loop diesel/JP-8 site. In this case TPH in soil gas is well below the Fall 2011 HDOH residential vapor intrusion action level of 130,000 µg/m3 but naphthalene is marginally above the vapor intrusion action level of 72 $\mu g/m^3$ at some well points. This assumes, however, that the TPH soil gas data are accurate. As discussed in the next section, laboratories typically report only C10 and higher compounds for TPH in soil gas samples collected at diesel sites, even though data collected during this study suggest that C5-C8 aliphatics could make up a substantial component of the total TPH vapors. Naphthalene also appears to play a role in vapor intrusion risk along with benzene at the Hickam AFB SS156-E gasoline site, where both compounds marginally exceed vapor intrusion action levels but the reported level of TPH is very low. Again, however, historical under reporting of TPH in soil gas samples by the laboratory at middle distillate-release sites is likely.

Each of these examples highlights the importance of considering TPH, benzene and in some cases even naphthalene in soil gas for an accurate evaluation of vapor intrusion hazards at sites with petroleum-contaminated soil and groundwater. Selecting the appropriate lab method for TPH is also important, as discussed in Section 8.

7.3 TPH Carbon Range Chemistry and Weighted Inhalation Toxicity

An evaluation of the TPH versus BTEXN component of petroleum vapors for fresh fuels and aged release sites demonstrated the dominance of TPH in comparison to targeted, individual compounds. A better understanding of the carbon range chemistry and toxicity of the TPH is required to determine if TPH indeed drives vapor intrusion risk over benzene and other traditionally targeted, individual compounds. This was evaluated under the second set of questions posed at the beginning of the study:

- What is the aliphatic and aromatic, carbon range makeup of the TPH?
- Does the carbon range makeup vary with different fuel types or with respect to fresh versus weathered fuels?

- Is the proportion of volatile compounds greater than C10 (aromatics) or C12 (aliphatics) significant enough to warrant the use of sorbent tube (vs Summa canister) methods for the collection and analysis of soil gas samples?
- What is the weighted toxicity of TPH based on the carbon range makeup, after subtracting separately targeted compounds such as benzene and naphthalene?
- Is an update to the current HDOH soil gas action levels for TPH warranted?

TPH carbon range data were obtained for all vapor samples in order to help answer these questions, based on both Summa canister and sorbent tube sample collection techniques.

A summary of the reported concentrations of carbon ranges in samples collected in Summa canisters is presented in Table 15. The relative carbon range percentage in samples is noted in Table 16. A summary of the average carbon range makeup of TPH in the samples is presented in Table 17a. The relative contribution of individual carbon ranges to the total TPH noncancer hazard is summarized in Table 17b. The relative contribution to noncancer hazard for each carbon range was calculated as (Summa data and target carbon ranges):

$$= \frac{\frac{(Fraction\ Carbon\ Range)}{Carbon\ Range\ RfC}}{\left[\frac{(Fraction\ C5\ to\ C8\ Aliphatics)}{C5\ to\ C8\ Aliphatics\ RfC} + \frac{(Fraction\ C9\ to\ C18\ Aliphatics)}{C9\ to\ C18\ Aliphatics\ RfC} + \frac{(Fraction\ C9\ to\ C16\ Aromatics)}{C9\ to\ C16\ Aromatics\ RfC}\right]}$$

Tables 18 through 20 present similar carbon range data for sorbent tube samples collected immediately after the Summa canister samples during Phase II of the study. Example gas chromatograms for samples collected from each site and pie charts that depict the average TPH carbon range makeup of soil gas are included in Figures 16 through 31. A full set of chromatograms for Summa canister samples and sorbent tube samples is included in Attachment 5. Laboratory reports for carbon range data are provided in Attachment 6.

In general there is good agreement between Summa canister and sorbent tube carbon range data. Reference Concentrations (RfCs) for inhalation toxicity were calculated for each sample and the study sites as a whole, based on the weighted, carbon range makeup of the TPH vapors (see Section 3). The weighted RfCs do not consider the BTEXN component of vapors, which are evaluated separately for potential vapor intrusion risks. Estimations of weighted TPH RfCs and related decisions regarding potential vapor intrusion hazards at a site would not be significantly different using either set of data. Most interesting, and perhaps surprising given limited data to suggest the contrary, was the general lack of aromatic compounds >C10 and in particular the lack of >C12 aliphatic compounds both in vapors over fresh fuels and soil gas from aged, middle distillate release sites (see Tables 17a and 20a). This is clearly evident in gas chromatographs for sorbent tube samples (see also Attachment 5).

TPH vapors in all of the samples are dominated by aliphatic compounds (see Tables 15 and 18). Vapors collected over containers of fresh gasoline contained only traces of C9-C12+ aliphatics

and C9-C10+ aromatics (98-99% C5-C8 aliphatics). Vapors collected over fresh diesel were also dominated by C5-C8 aliphatics in two of three samples, with moderate proportions of C9-C12+ aliphatics (14 and 21% for Summa canister samples and 35% for a single sorbent tube sample). C10-C11+ aromatics were present in only trace amounts in the gasoline samples (<1% in the Summa canister samples and 2% in the sorbent tube samples). C10-C11+ aromatics were slightly higher in vapors collected over fresh JP-8 and diesel (2-5%). Weighted inhalation TPH RfCs follow a similar trend, with RfCs and associated action levels for gasoline vapors similar to the RfC for C5-C8 aliphatics (e.g., 600 µg/m^3). Inhalation toxicity RfCs for middle distillate vapors are closer to the RfC for C9-C12 aliphatics of 100 µg/m^3 and therefore more "toxic" than TPH vapors emitted from gasolines. This is an important observation. Disregarding the BTEXN component, TPH vapors associate with diesel and other middle distillate fuels will necessarily exhibit a higher toxicity than vapors from gasoline due to a higher proportion of C9-C12 aliphatics. With respect to actual vapor intrusion hazards, however, this will be partially offset by a comparative reduction in the overall mass and concentration of vapor emitted due to the lower volatility of middle distillate fuels.

A diesel vapor sample (Diesel #2) collected in a Summa canister was reported to contain 9.7% C9-C11 aromatics. Unlike the other two diesel vapor samples, this sample was also dominated by C9-C12 aliphatics (57%). This was significantly higher than the other two diesel vapor samples (maximum 35% C9-12+ aliphatics). The reason for this discrepancy is unknown but could reflect a different source of the fuel or even a difference in the temperature of the fuels when the samples were collected (not recorded but estimated to range between 70 and 85 degrees Fahrenheit).

The carbon range data demonstrates a progressive transition between the study sites from vapors dominated by C5-C8 aliphatics (e.g., Hickam AFB Site VP26/Site A, associated with gasoline) to vapors dominated by C9-C12+ aliphatics (e.g., Honolulu Harbor Fishing Village/Site E; associated with middle distillates). This is identifiable in the gas chromatograms by a progressive shift of the detected mass of petroleum compounds to the right (i.e., towards longer elution times; see figures for each site and chromatograms in Attachment 5). Soil gas samples collected from the Hickam AFB VP26 site (Site A) are dominated by C5-C8 aliphatics (96-98%) with only minor amounts of C9+ aliphatics and C10+ aromatics. This agrees with the known release of AVGAS gasoline fuels at the site. Samples from the Honolulu Harbor OU1C site (Site B) were also dominated by C5-C8 aliphatics (approximately 90%) but show a small but distinct signature of C9-C12 aliphatic compounds in soil gas for both Summa and sorbent tube samples (7-9%). This is presumed to be related to co-located releases of gasolines and middle distillate fuels at the site. Weighted TPH RfCs for these two sites are in the range of 400 to 500 µg/m^3, however, and reflective of the less toxic makeup of gasoline-range aliphatics in comparison to middle distillate vapors. Indoor air and ultimately soil gas TPH action levels calculated for these sites would also approach action levels for C5-C8 aliphatics (see Table 4).

Soil gas samples collected at the Hickam AFB SP43 site (Site C) exhibit a distinct, TPH signature for the presence of middle distillate fuels. As noted in Tables 17b and 20b, moderate levels of C9-C12 aliphatic in the samples contributed to a relatively low, weighted TPH RfC and associated indoor air and soil gas action levels (e.g., average, weighted TPH RfC 251 µg/m^3 based on Summa canister data). An even lower TPH RfC was calculated for soil gas samples from Hickam AFB Site ST03 (Site C) due to an average TPH composition of over 30% C9-C12 aliphatic compounds (average, weighted TPH RfC 211 µg/m^3). This seems to confirm the suspected release of JP-4 jet fuel due to a pipeline break in the mid 1970s.

The Fishing Village site (Site D) is located in the same general vicinity of the Honolulu Harbor as site OU1C. The TPH in samples collected from this site was distinctly dominated by heavier, C9 to C12 aliphatics related to a separate release of diesel fuel and possible JP-8 jet fuel (see Tables 15 and 18). A weighted RfC of 127 µg/m3 was calculated for the site based on the average carbon range makeup of TPH vapors measured in Summa canister samples (see Table 17a). A corresponding, weighted TPH RfC of 161 µg/m^3 was calculated based on sorbent tube sample data collected at the same time as the second round of Summa canister samples. These were the lowest (i.e., most stringent) TPH RfCs calculated for the samples collected during the study.

7.4 Results of Leak Tests

A significant leak was positively identified for only one sample, HAFB ST03 B58 (422), collected during the first phase of the study and was identified in the field. The leak test for this sample was carried out using a helium-filled garbage bag that covered the entire sampling train. The tubing to the vapor monitoring point was inadvertently pulled apart during a check of the Summa canister as the sample was being collected. A concentration of 19% helium was reported for the sample by the laboratory, similar to the target concentration for the shroud based on a field helium meter. Petroleum vapor concentrations in the sample were, however, high enough to permit calculation of the relative proportions of targeted aliphatic and aromatic carbon range fractions and ratios of TPH to benzene and other individual aromatic compounds (e.g., sum of carbon range fractions = 80,200 µg/m^3).

Sorbent tube samples were collected immediately after Summa canister samples at each well point during Phase II of the study. A simple leak test was carried out for sorbent tube sampling trains prior to sample collection by connecting the sampling train to the well point, pinching the well point tubing closed or closing the well point valve and attempting to draw a sample into the syringe by pulling on the handle (see Section 5 and Figure 15). All sampling trains appeared to be tight in the field.

The sorbent tube data agreed reasonably well with data for Summa canister samples that were collected immediately prior to the sorbent tube samples. Nonetheless, the dramatic difference between Summa TPH data and sorbent tube TPH data for sample HAFB-SP43-VMP17 suggests that ambient air was drawn into the well point prior to collection of the latter sample. In this

sample, TPH calculated as the sum of the carbon ranges was 6,530,000 µg/m^3 for Summa canister sample but only 12,210 µg/m^3 for the sorbent tube data. This suggests that ambient air was drawn into the sorbent tube sampling train before or during sample collection. Even so, and as discussed below, the relative percentage of carbon range fractions reported for the sample agreed very well with the relative proportions of fraction calculated for the Summa canister sample.

7.5 Evaluation of Sorbent Tube Breakthrough

A summary of data for paired sorbent tubes connected in series to evaluate potential breakthrough is presented in Table 21 (see also Figure 15). Tube A represents the tube closest to the vapor sampling point. Tube B represents the tube placed between Tube A and the sampling syringe in order to check for breakthrough from the first tube. The percent breakthrough noted in the table represents the concentration of TPH reported in Tube B divided by the sum of the TPH reported for both Tubes A and B. The summary assumes that all TPH reported in Tube B resulted from breakthrough in Tube A, rather than contamination of the original packing material or to exposure to TPH in ambient air during preparation of the TO-17 sampling train.

No breakthrough was identified in nineteen of the twenty-four sorbent tube samples collected (see Table 21; i.e., TPH compounds not detected in the downstream Tube B). Insignificant breakthrough, defined as <10% of the total TPH in Tube B for the purpose of this study (also referenced in HEER office guidance; HDOH 2011), was indentified for three of the high-concentration samples (JP-8 vapor sample and soil gas samples HAFB-VP26-B05(18)-HDOH, HH-OU1C-MW22R and HAFB-ST03-B58 (347)). The only significant, apparent breakthrough occurred in a single, relatively low-concentration soil gas sample (and FV-GP-01-HDOH#2; 41% of total TPH in Tube B). This is perplexing, given the low concentration of TPH at these monitoring points in comparison to other samples (low TPH concentration confirmed by concurrent Summa canister data). Concentrations of toluene, xylenes and naphthalene reported in Tube B were also similar to concentrations reported in Tube A. This suggests that the tubes may not have been lined up correctly during sample collection (arrow on tube must point to sample collection device) or that the tubes were not packed properly at the laboratory. With this one exception, breakthrough was not a significant problem for even very high-concentration soil gas samples.

8 TPH VERSUS INDIVIDUAL VOCS AS VAPOR INTRUSION RISK DRIVERS

The carbon range makeup and toxicity of TPH in vapors over fresh fuels and in soil gas samples collected at the study sites allows for a more detailed evaluation of TPH as a potential risk driver over benzene and individual, targeted compounds and sheds light on the final and ultimate question posed in the study:

- "Do the results of the study indicate that there are conditions where risk-based decision making for potential vapor intrusion concerns would be based on or driven by the noncancer TPH hazard rather than the cancer risk and/or noncancer hazard ("risk") posed by individual compounds?"

Soil gas data collected during the study highlighted benzene over naphthalene (rarely detected) as the most important challenger to TPH as a risk driver. The above question can be restated as:

- "Will the noncancer, vapor intrusion risk posed by the TPH component of soil gas still exceed a target Hazard Quotient of 1.0 when the benzene meets a target cancer risk level?"

Based on the results of this study the answer to both questions can undoubtedly be "Yes" under common site conditions. The noncancer risk or "Hazard Quotient" posed by TPH vapors when the concentration of benzene in indoor air or soil gas meets a specified, target cancer risk can be calculated as follows:

$$TPH\ noncancer\ HQ = \frac{\mathrm{TPH}(_{\text{equivalent concentration}})}{\text{TPH Action Level}}$$

where the term "$\mathrm{TPH}(_{\text{equivalent concentration}})$" is the equivalent, vapor-phase concentration of TPH at a specified concentration of benzene (either indoor air or soil gas). This is calculated based on the site-specific (or sample-specific) ratio of TPH to Benzene multiplied by the target benzene action level for the same media:

$$\mathrm{TPH}(_{\text{equivalent conentration}}) = \text{Site Specific TPH: Benzene Ratio} \times \text{Target Benzene Concentration.}$$

A noncancer Hazard Quotient greater than 1.0 suggests that TPH will drive vapor intrusion risk over benzene. This type of evaluation was carried out for each of the study sites.

Tables 22 and 23 illustrate the noncancer risk (Hazard Quotient) posed by TPH in vapors from fresh fuels and soil gas samples collected from at study sites in comparison to benzene at different target cancer risks. Table 22 reflects the carbon range chemistry and associated TPH toxicity based on Summa canister samples. Table 23 reflects carbon range data and TPH toxicity

based on the sorbent tube samples. **As stated earlier, the soil gas data obtained during the study are not intended or assumed to be representative of overall conditions at the sites where the samples were collected.** The samples were intentionally collected the most heavily impacted areas of the sites and in areas where releases of middle distillate fuels were suspected. Actual vapor intrusion impacts to buildings have not been identified at any of the sites included in the study.

As can be in the tables, the Summa canister and sorbent tube data are in relatively good agreement. Boxes highlighted in green indicate conditions where benzene will drive vapor intrusion risk over TPH. Boxes highlighted in red indicate conditions where TPH will drive vapor intrusion risk over benzene. For example, benzene drives vapor intrusion risk for all fresh fuel samples and for samples collected from Hickam AFB Site VP26 (Site A) if a target cancer risk of 10^{-6} is applied. TPH takes precedence over benzene for fresh gasoline vapors if a less conservative, target risk of 10^{-4} is applied to the latter (i.e., Hazard Quotient >1.0). TPH will drive vapor intrusion risks over benzene for vapors from the fresh JP-8 and diesel fuel samples and for samples collected from Hickam AFB Site VP26 if a target risk of 10^{-5} is applied to benzene (i.e., TPH could still pose a vapor intrusion risk even if benzene in soil gas meets a target risk of 10^{-5}).

Especially telling is the observation that TPH will still pose a vapor intrusion risk at the latter four study sites *even if benzene in soil gas meets a target cancer risk of 10^{-6}*. This reflects the small amount of benzene present in the soil gas in comparison to TPH (i.e., high TPH:Benzene ratio) as well as the increased toxicity of the TPH vapors due to the presence of vapor-phase, C9-C12+ aliphatic compounds.

The relationship between TPH and benzene as vapor intrusion risk drivers can also be depicted graphically. Figures 32-39 depict the average, relative vapor intrusion risk posed by TPH in vapors at a target risk for benzene of 10^{-6} (typically the most conservative target risk used) for each group of samples collected. A TPH Hazard Quotient of 1.0 (left side of graphs) is set equal to a benzene target risk of 10^{-6} (right side of graphs). A TPH Hazard Quotient below 1.0 when the concentration of benzene equals a 10^{-6} risk indicates that benzene drives vapor intrusion concerns if this target risk is applied. This is the case for all of the fresh fuel vapors and for samples collected from the Hickam AFB VP26 site. A TPH Hazard Quotient above 1.0 when the concentration of benzene equals a 10^{-6} risk indicates that TPH drives vapor intrusion hazards even when the benzene target risk is conservatively set to 10^{-6}. This is the case for the four remaining study sites.

The tables and figures were generated based on the equations noted above. For example, an average TPH:Benzene ratio of 170:1 was calculated for vapor samples collected over fresh gasoline based on Summa canister data (see Table 22). Assume for a given site that benzene is present in soil gas at a concentration that met a 10^{-6} risk for vapor intrusion, or 310 $\mu g/m^3$ (see Table 5a). At the noted ratio, the corresponding concentration of TPH would be 170-times this

concentration or 52,700 µg/m^3. This is well below the soil gas action level of 590,000 µg/m^3 calculated for vapors over fresh gasoline based on the carbon range makeup of the TPH (see Table 17a) and reflects a noncancer Hazard Quotient of less than 0.1, well below the target of 1.0 (see Table 22). This means that a site that meets a benzene soil gas action level of 310 µg/m^3 will also meet a TPH noncancer hazard quotient of 1.0. In the case of a remedial action at a site with these TPH and benzene characteristics, reducing benzene in soil gas to a target cleanup of 310 µg/m^3 would adequately address potential vapor intrusion hazards posed by TPH in petroleum vapors at the site. This is depicted graphically for the vapor samples from fresh gasoline in Figure 32.

TPH would also be adequately addressed if benzene in soil gas met an action level of 3,100 µg/m^3, based on target risk of 10^{-5}, since the corresponding concentration of TPH in soil gas of 527,000 µg/m^3 (i.e., 3,100 µg/m^3 times 170) would still be below the vapor intrusion action level of 590,000 µg/m^3 (HQ=0.9 based on the sample data). Reducing benzene in soil gas to a target cleanup of 3,100 µg/m^3 would adequately address potential vapor intrusion hazards posed by TPH in petroleum vapors at the site. In this example of vapors associated with fresh gasoline, it therefore can be stated that benzene "drives" potential vapor intrusion hazards over TPH down to a target risk of 10^{-5}. There is no need to consider TPH provided that benzene in soil gas meets this target risk, since the associated noncancer Hazard Quotient would be less than 1.0.

This does not hold true if action levels that reflect a target risk of only 10^{-4} are used to screen benzene in soil gas at a site with these TPH and benzene characteristics, however. The corresponding soil gas action level under HDOH guidance would be 31,000 µg/m^3. At a TPH:Benzene ratio of 170:1, the corresponding concentration of TPH in soil gas would be 5,270,000 µg/m^3, well above the action level of 590,000 µg/m^3. As noted in Table 22, the corresponding vapor intrusion Hazard Quotient for TPH under this scenario would be 8.9, well above the target of 1.0. Reducing benzene in soil gas to a target cleanup of 31,000 µg/m^3 would *not* adequately address potential vapor intrusion hazards posed by TPH in petroleum vapors at the site. TPH will drive potential vapor intrusion hazards over benzene if a cancer risk of only 10^{-4} is used for the latter.

This highlights the need to apply a relatively conservative target risk to screen benzene in soil vapors at gasoline-contaminated sites for potential vapor intrusion concerns. For study sites where diesel or other middle distillate fuels were present, TPH will drive vapor intrusion risk over benzene even if a conservative target cancer risk is applied.

Ethylbenzene and naphthalene, like benzene, are also considered to be carcinogens and have similarly low indoor air and soil gas action levels. As previously discussed, naphthalene was not detected above laboratory reporting limits in most of the samples and could not be used as an indicator of vapor intrusion risk (see Table 9). Ethylbenzene was detected in a larger number of samples. The indoor air action level for ethylbenzene at a 10^{-6} excess cancer risk is 0.97 µg/m^3 (residential soil gas action level 970 µg/m^3), approximately three times higher than the benzene

indoor air action level of 0.31 µg/m^3 (soil gas action level 310 µg/$m^{3;}$ HDOH 2011). This means that ethylbenzene would need to be present at more than three times the concentration of benzene in order to drive vapor intrusion risk over the latter. This was not the case for gasoline fuel vapor samples and for samples collected from gasoline dominated sites such as Hickam AFB Site VP26 (Site A) and Honolulu Harbor Site OU1C (Site B). Benzene dominated ethylbenzene at these sites.

Ethylbenzene was present on one of three vapor samples collected over fresh diesel fuel, however (DIESEL#3, see Table 9). Ethylbenzene was also present at more than three times the concentration of benzene in samples collected from Hickam AFB Sites SP43 (Site C) and ST03 (Site D), where mixes of gasolines and middle distillates were released. In each of these cases, the vapor intrusion risk posed by ethylbenzene will outweigh the risk posed by benzene. Based on a comparison of the C5-C8 aliphatic soil gas action level of 630,000 µg/m^3 (least stringent TPH action level) to the most stringent ethylbenzene soil gas action level of 970 µg/m^3 (based on a 10^{-6} excess cancer risk), TPH will, however, drive vapor intrusion risk over ethylbenzene whenever the TPH:Ethylbenzene ratio is greater than 650:1 (630,000 µg/970 µg/m^3 m^3/). As summarized in Table 24, this was the case for the average of all but the vapor samples collected over fresh gasoline and diesel fuel. TPH would drive potential vapor intrusion threats for all of the samples collected even when ethylbenzene concentrations in soil gas (or indoor air) met a 10^{-6} cancer risk. This supports the need to evaluate TPH data at these sites in additional to individual chemicals. Although not presented in detail, this is also the case for xylenes (critical TPH:Xylenes ratio of 30:1) and toluene (critical TPH:Toluene ratio of 0.6) due to their much lower toxicity and significantly higher soil gas action levels (e.g., 21,000 µg/m^3 and 1,000,000 µg/m^3 for residential scenarios, respectively; HDOH 2011).

Based on the samples collected, TPH and/or benzene will therefore be the primary risk drivers at sites with petroleum-contaminated soil or groundwater, as summarized in Table 25. The primary driver for potential vapor intrusion threats is TPH, rather than benzene, for soil gas samples collected from sites collected with diesel fuel or other middle distillate fuels.

9 MEASUREMENT OF TPH IN SOIL GAS

The results of the study support the need to include an evaluation of the TPH component of soil gas as part of vapor intrusion investigations at petroleum-contaminated sites. This can be done by requesting specific aliphatic and aromatic carbon range data from the laboratory and treating each fraction as a separate entity, as done for individual compounds such as benzene (e.g., see Table 4). Very few labs are currently set up to report carbon range fractions in soil gas, however, and a standard lab method has not been fully established. Reporting of individual carbon range fractions in soil gas is also more expensive than traditional TPH (approximately $300 per sample in this study, including BTEX and naphthalene).

As an alternative, TPH (excluding BTEXN and any other targeted, individual compounds) can be reported and compared to risk-based screening levels for vapor intrusion hazards based on an assumed, carbon range makeup of the TPH vapors. For example, HDOH guidance presents a TPH soil gas action level of 130,000 µg/m^3 for sites where unrestricted (e.g., residential) current or future use is desired and 370,000 µg/m^3 for commercial/industrial sites (HDOH 2011; see discussion of HDOH TPH soil gas screening levels in Attachment 1). These action levels conservatively assume a high component of C9-C12 aliphatics in TPH vapors, with the default TPH RfC based on soil gas data Summa from the Honolulu Harbor Fishing Village diesel site (RfC 127 µg/m^3).

As presented in this report, a more detailed evaluation of the carbon range makeup of TPH vapors can be carried out as needed based on an initial comparison of TPH soil gas data to published action levels. Site-specific action levels could be up to five-times higher than the default, HDOH action levels if the TPH component of petroleum vapors is in fact dominated by less toxic, C5-C8 aliphatics. This is likely to be the case at sites where only gasoline-related fuels have been released.

The concentration of TPH in soil gas can be estimated through a number of different laboratory methods. A limited comparison of different methods was included as part of this study. Five different methods for calculation of TPH concentrations in soil gas were evaluated during the second phase of the investigation, using two different sample collection methods:

Summa canister samples:

- TO-3 (GC/FID);
- TO-15 (GC/MS);
- Sum of individual, MA-APH carbon ranges (GC/MS);

Sorbent tube samples:

- TO-17 (GC/MS);
- Sum of individual, MA-APH carbon ranges (GC/MS).

A comparison of estimated gasoline-range (e.g., C5-C12) TPH concentrations using different lab methods for samples collected during the second phase of the study is presented in Table 26a and 26b. Reported concentrations of TPHg are summarized in Table 26a. Data for TPHd are presented for comparison. In Table 26b, the concentration of TPHg reported under a specific lab method is divided by the highest concentration of TPHg reported for that sample overall in order to generate relative TPHg concentrations.

As noted in Table 26b and Figure 40, concentrations of TPHg reported under Method TO-15 for Summa canisters were consistently higher than concentrations of TPHg reported under other test methods. Agreement between TPHg reported as the sum of individual carbon ranges using Methods TO-15 and TO-17 was better in most cases and on average less than 40% of the highest TPH concentration reported for a given sample.

Discussions with the laboratory (Air Toxic) suggested that the TO-15 analysis may not have been adequately calibrated to the other methods. The sum of the individual carbon range fractions is assumed to be the most accurate. This issue warrants further evaluation, however.

On an individual sample basis, the different TPH methods consistently flagged samples that failed HDOH soil gas action levels for vapor intrusion concerns (e.g., 130,000 $\mu g/m^3$ for unrestricted land use). Exceptions were HAFB-VMP17, where ambient air was apparently introduced into the well point before the sorbent tube sample was collected or the sample train was otherwise leaking. The vapor sample collected over the container of fresh diesel (Diesel#3) is more problematic. The concentration of TPH calculated as the sum of the Summa canister carbon range fractions is far lower than the concentration reported for the correlative sorbent tube sample using Method TO-17 as well as concentration of TPH reported for the Summa canister sample using Method TO-3. The difference is not significantly attributable to the presence of C13 and higher aliphatics in the sample that were not included in the concentration of TPH reported for the Summa canister sample (only reports C5-C12). If this were soil gas data from a commercial/industrial site then the Summa carbon range data would have suggested an absence of vapor intrusion problems while TPH as calculated by other methods would have identified a problem. This supports the need for multiple soil gas samples to characterize a site, as well as the concurrent collection of Summa canister samples if low-volume (e.g., less than one liter) sorbent tube samples are to be collected. The data also support the need to report the full range of C5-C24 compounds for TPH at diesel and other middle distillate sites.

The concentration of vapor-phase TPH based on TO-3 (GC/FID) analysis of Summa canister samples agreed reasonably well with the TO-17 data (GC/MS), including the sum of individual carbon ranges and estimated TPH. Several consultants and laboratory personnel expressed concern about the limitations of TO-3 for other than general screening, however, due to the lowered sensitivity of the method.

The results of this study highlight the need to include the full range of C5-C24 compounds in vapors for TPH reported as both gasoline and diesel. This is routinely done for TPHg or equivalent tests for gasoline-related vapors. Laboratories might only report TPHd as the sum of C10-C24 compounds, however. During this study, relatively high proportions of C5-C8 aliphatic compounds were indentified both in vapors collected over fresh diesel fuel and JP-8 jet fuel as well as at sites where releases of middle distillate fuels were known to have occurred. Reporting TPH as only the sum of C10 to C24 compounds would have significantly under estimated the total concentration of TPH in the vapors, and subsequently underestimated the potential vapor intrusion risk.

Use of sorbent tubes to estimate the concentration of TPH and individual compounds in soil gas at heavily contaminated sites can be problematic. The sorbent material used in the tubes is susceptible to saturation and breakthrough or other interferences with sample analysis. Discussions with the laboratory prior to collection of high-concentration, vapor samples during this study allow the laboratory to optimize the sorbent materials used in the tubes. A maximum sample draw volume of 50ml was also set. As a result, significant breakthrough was only reported for one sample. The mass of petroleum vapors collected in the upstream sorbent tube (Tube A) for a soil gas sample collected at Hickam AFB Site VP26 [HAFB-VP26-B05(24)-HDOH] overwhelmed the ability of the laboratory to quantity TPHg in the sample. A maximum reporting level of 37,000,000 $\mu g/m^3$ was instead provided by the laboratory (see Table 26). No breakthrough was reported for this sample (see Table 21). Concentrations of individual carbon range fractions were also reported (see Table 18).

Note that variability based on the laboratory method selected is not restricted to TPH. As summarized in Table 27, reported concentrations of benzene in the Phase I samples was also moderately to highly variable based on the method used. Concentrations reported using method TO-3 were consistently significantly higher than those reported using TO-15 or TO-17. This is in part due to the high concentration of petroleum vapors in the samples, with most of the TO-3 data flagged “Reported value may be biased due to apparent matrix interferences” by the laboratory. Lab methods for VOCs are being further evaluated by the HEER office.

10 SUMMARY

The study was designed to address the following question: "Is the proportion of TPH in vapors sufficiently large in some cases for TPH to drive vapor intrusion over benzene, naphthalene and other targeted, individual VOCs?" Based on the data collected the answer to this question is clearly "Yes" for the samples collected in this study, and especially for samples collected from sites contaminated with diesel and other middle distillate fuels (see Table 25).

The results of the study highlight the need to consider the TPH component of vapors at petroleum-contaminated sites in addition to BTEX and naphthalene in order to accurately quantify and evaluate potential vapor intrusion risks posed by contaminated soil and groundwater. TPH aliphatic compounds dominate vapors associated with both gasolines and middle distillates fuels (e.g., diesel), with BTEXN making up less than one-percent of the total vapors for most of the samples collected. The vapor intrusion risk posed by the TPH component of subsurface vapors equaled (samples from one site) or exceeded (samples from four sites) the risk posed by benzene and other individual, targeted compounds, including naphthalene at each of the five sites included in the study. This was due to both a relatively low proportion of benzene and other aromatic compounds in vapors in comparison to TPH in the samples collected as well as an increasing proportion of more toxic, C9-C18 aliphatic compounds in vapors associated with middle distillate fuels. A reduced proportion of BTEXN compounds in soil gas samples in comparison to vapor samples collected over fresh fuels could be related to a preferential partitioning of aromatic compounds into soil moisture, as predicted by partitioning models, and/or to preferential biodegradation of these compounds in the vadose zone (also focused in soil moisture). Note that vapor-phase, aliphatic compounds are also highly biodegradable in the subsurface, as illustrated by the rapid attenuation of TPH in general away from source areas at petroleum-contaminated sites. Aromatics appear to be even more efficiently removed from soil vapors, however.

The study suggests that reliance on benzene in soil gas to screen gasoline-contaminated sites for potential vapor intrusion concerns may be adequate provided that a typical and reasonably conservative, target cancer risk is applied (e.g., 10^{-5} to 10^{-6} cancer risk). This applied to samples collected from only one of the five study sites investigated - Hickam AFB VP26 (Site A) Remediation of a hypothetical site with a similar petroleum vapor signature to reduce benzene-related vapor intrusion risk to a 10^{-6} cancer risk would adequately address noncancer risks posed by the TPH component of soil vapors. Remediation of the site based on a less conservative, target risk for benzene would leave levels of TPH in soil vapors that still posed a vapor intrusion concern, even through benzene had been adequately addressed. It is interesting to note, however, the a reduction of TPH levels in soil gas to meet a target, noncancer Hazard Quotient of 1.0 would be sufficient to address vapor intrusion concerns even if benzene data were not collected.

Soil gas data indicated that the TPH component of samples collected at the four, remaining study sites could pose significant vapor intrusion risks even if the level of benzene in vapors were

reduced to meet a target, 10^{-6} cancer risk. This is due to a significantly lower proportion of benzene in soil vapors combined with an increase in the toxicity of TPH vapors related to the presence of heavier, vapor-phase aliphatics (C9-C12+) associated with the presence of diesel and other middle distillate fuels (see Table13a and Tables 15-17). A consideration of TPH in soil gas as part of vapor intrusion investigations at middle distillate release sites is therefore critical.

TPH soil gas data and conservative, risk-based action levels for soil gas provide an important and easy-to-use tool to screen petroleum-contaminated sites for potential vapor intrusion concerns. Detailed carbon range data can be collected as needed to establish site-specific and most likely less conservative action levels for remedial purposes if needed. In this study, TO-15 analysis of Summa canister samples consistently yielded the highest and most conservative estimate of TPH concentrations, on average twice as high as Method TO-3 and the sum of individual TPH carbon ranges for the same samples and for concurrently collected sorbent tube samples. Several consultants expressed concern over the reliance on TO-3 to report TPH in soil gas due to its decreased sensitivity in comparison to TO-15. Heavily contaminated sites were intentionally selected for the study and significant vapor intrusion concerns would have been identified for all samples collected from the key study sites based on TPH data regardless of the laboratory method used.

The relative proportion of carbon range fractions and estimates of weighted, vapor-phase TPH toxicity were reasonably similar between Summa samples and sorbent tube samples. Sorbent tube methods did not indicate a significant proportion of >C12 aliphatics or >C10 aromatics in any of the samples (maximum 10% and 1%, respectively, in vapors collected over fresh diesel). This suggests that TPH data for Summa canister samples would have been adequate to evaluate potential vapor intrusion concerns at each of the study sites.

Limitations of sorbent tubes include the need to use very small sample draw volumes at heavily contaminated sites in order to avoid saturation of the sorbent material. Sample draws were limited to 50ml based on the anticipated concentration of vapors at the sites included in this study and discussions with the laboratory. The potential for ambient air to be drawn into the vapor monitoring point after purging poses a risk that the resulting sorbent tube data may not be representative of site conditions. This was addressed in the field by collecting a concurrent Summa canister sample from each well point and by closing the well point prior to disconnection of the Summa canister sampling train. Additional carbon range data for middle distillate sites are needed before the use of sorbent tubes at diesel and other middle distillate sites can be completely negated. This study also highlighted the need to include the full range of C5-C24 compounds in analysis of sorbent tube samples for diesel-range compounds, rather than limiting reporting of vapor-phase TPH to the sum of C10-C24 compounds and commonly requested by consultants and carried out by laboratories at this time.

Naphthalene was rarely reported in soil gas samples (even at diesel sites) and was not a reliable indicator of potential vapor intrusion hazards. Naphthalene was marginally above soil gas action

levels for vapor intrusion in samples collected at one site when TPH was below action levels, suggesting that it should still be included as a target analyte in soil gas investigations. Ethylbenzene was present in significant enough concentrations in samples collected from several sites with mixed, gasoline and middle distillate fuels to contribute to potential vapor intrusion risk. Ethylbenzene was also present in significantly higher concentrations than benzene in one of three vapor samples collected over fresh diesel fuel. Xylenes and toluene were not significant risk drivers in samples collected at any of the sites included in the study in comparison to TPH and benzene. This suggests that TPH and/or benzene will in most cases be the primary risk drivers for vapor intrusion at sites with petroleum-contaminated soil and groundwater. The study suggests that naphthalene and ethylbenzene can still contribute to vapor intrusion risks, however, and should continue to be included as contaminants of potential concern in vapor intrusion investigations.

The results of this study will be used to update the section of the HEER Technical Guidance Manual that discusses the collection and analysis of soil gas at petroleum-contaminated sites. An update of this section is anticipated to be completed in 2012. The conclusions of this study are based on the selection of inhalation toxicity factors for individual, TPH carbon ranges. The use of alternative, published toxicity factors may indicate either an increased vapor intrusion risk posed by the TPH component of soil vapors (e.g., MADEP 2003) or a decreased risk (e.g., TPHCWG 1998, WADOE 2006).

It is important to note that the soil gas data collected during this study reflect in part the composition of the petroleum fuels produced or otherwise used in Hawai‘i. The vapor signatures reported in this study for TPH carbon range fractions (i.e., proportions of non-specific, TPH aliphatics to aromatics) are likely to be similar to sites outside of the State. The proportions and identified ratios of TPH to individual compounds such as benzene and naphthalene could vary dramatically, however, depending on the blending processes used by different refineries. Fuel blends in Hawai‘i can also differ dramatically between the two refineries that operate here. Weathering of fuel over time can also significantly affect the both the TPH and individual VOC signatures in soil vapors. Temperatures of subsurface soil and groundwater could affect both vapor concentrations and composition (e.g., average Hawai‘i versus Alaska). Other factors, including the average temperature of vadose zone soils and groundwater, could also affect the nature of vapors emitted from subsurface sources (e.g., see Chin 2012).

This study does not address biodegradation of petroleum vapors as the vapors migrate away from the source area. The fate and transport of vapors in the vadose zone represents the next, important step in evaluation of the vapor intrusion threat posed by petroleum-contaminated soil and groundwater. This issue will be discussed in more detail in updates to Section 7 of the HEER office *Technical Guidance Manual* (Soil Vapor and Indoor Air Sampling Guidance, anticipated September 2012).

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Table 1. Previous HDOH toxicity factors and indoor air and soil gas action levels for TPH (HDOH 2008).

[1]Fuel Type	RfC (µg/m^3)	[2]Indoor Air (µg/m^3)		[2.3]Subslab Soil Gas (µg/m^3)	
		Residential	Commercial/ Industrial	Residential	Commercial/ Industrial
TPH(gasolines)	50	26	37	26,000	73,000
TPH(middle distillates)	110	57	80	57,000	160,000

1. Middle distillates include diesel fuel, Stoddard solvent, JP-8 jet fuel, etc.
2. Based on exposure assumptions in HDOH EHE guidance and a target Hazard Quotient of 0.5 (see HDOH 2008 & 2011).
3. Based on a residential indoor air:subslab soil gas attenuation factor of 1/1,000 and a commercial/industrial attenuation factor of 1/2,000 (see HDOH 2008 & 2011).

Table 2a. Default physiochemical constants for carbon range fractions (after MADEP 2002).

*Chemical/ Carbon Range	Molecular Weight	Vapor Pressure (atms)	Solubility in Water (mg/L)	Henry's Constant, H (dimensionless)	Partition Coeff, Koc (cm^3/g)	Diffusion Coefficient (cm2/s)	
						air	water
Benzene	78	0.1	1,790	0.23	146	0.09	1×10^{-5}
Ethylbenzene	106	0.01	169	0.32	446	0.068	8.5×10^{-6}
Toluene	92	0.04	526	0.27	234	0.078	9.2×10^{-6}
Xylenes	106	0.01	161	0.29	375	0.068	8.4×10^{-6}
Naphthalene	128	1.0×10^{-4}	30	0.018	1,540	0.06	8.4×10^{-6}
C5-C8 Aliphatics	93	0.1	11,000	54	2,265	0.08	1×10^{-5}
C9-C12 Aliphatics	149	8.7×10^{-4}	70	65	150,000	0.07	1×10^{-5}
C9-C18 Aliphatics	170	1.4×10^{-4}	10	69	680,000	0.07	5.0×10^{-6}
C19-C36 Aliphatics	280	1.1×10^{-6}	0.0000015	110	4.0×10^{-8}	-	-
C9-C10 Aromatics	120	2.9×10^{-3}	51,000	0.33	1,778	0.07	1×10^{-5}
C11-C22 Aromatics	150	3.2×10^{-5}	5,800	0.03	5,000	0.06	1×10^{-5}

*Constants for BTEXN from USEPA RSL guidance (USEPA 2011, see Appendix 1 of the HDOH EHE guidance, HDOH 2011); vapor pressures from TOXNET (NLM 2012). Carbon range values from Massachusetts DEP (MADEP 2002) except C19-C36 Aliphatics (TPHCWG 1997, based on EC>16-35 aliphatics).

Table 2b. Theoretical partitioning of targeted VOCs and carbon range fractions in vadose-zone soils.

Chemical/ Carbon Range	[1]Clean Sand			[2]Silty Sand		
	Sorbed To Soil Particles	**Dissolved In Pore Water**	**Vapor In Soil Pore Space**	**Sorbed To Soil Particles**	**Dissolved In Pore Water**	**Vapor In Soil Pore Space**
Benzene	4.0%	67.1%	29.0%	29.2%	49.5%	21.3%
Ethylbenzene	18.4%	50.6%	31.0%	69.3%	19.1%	11.7%
Toluene	10.7%	58.9%	30.4%	54.6%	30.0%	15.5%
Xylenes	20.6%	50.6%	28.8%	72.2%	17.7%	10.1%
Naphthalene	53.4%	44.9%	1.7%	92.0%	7.7%	0.3%
C5-C8 Aliphatics	2.1%	0.9%	96.9%	18.0%	0.8%	81.2%
C9-C12 Aliphatics	54.7%	0.4%	44.9%	92.4%	0.1%	7.6%
C9-C18 Aliphatics	83.8%	0.1%	16.1%	98.1%	0.0%	1.9%
C19-C36 Aliphatics	99.9%	0.0%	0.1%	100.0%	0.0%	0.0%
C9-C10 Aromatics	52.3%	29.4%	18.4%	91.6%	5.2%	3.2%
C11-C22 Aromatics	82.6%	16.5%	0.9%	97.9%	2.0%	0.1%

1. Clean Sand: TOC=0.0001, Air-Filled Porosity=28%, Water-Fill Porosity=15%.
2. Silty Sand: TOC=0.001, Air-Filled Porosity=28%, Water-Fill Porosity=15%.

Table 3. Published inhalation toxicity factors for petroleum aliphatic and aromatic carbon ranges.

Reference		RfC (mg/m3)	RfC µg/m3
TPH Working Group (1998)			
(C5-C8) Aliphatics		18.4	18,400
(C9-C18) Aliphatics		1.0	1,000
(C9-C16) Aromatics		0.2	200
Massachusetts DEP (2003)			
(C5-C8) Aliphatics		0.2	200
(C9-C18) Aliphatics		0.2	200
(C9-C18) Aromatics		0.05	50
	[1]RfDinh		
[1]Washington DOE (2006)	**(mg/kg-day)**		
(C5-C8) Aliphatics	1.7	6.0	5,950
(C9-C16) Aliphatics	0.085	0.3	298
(C9-C10) Aromatics	0.114	0.399	399
(C11-C12) Aromatics (naphthalene)	0.00086	0.003	3.0
(C13-C16) Aromatics	0.05	0.2	175
[2]CalEPA-DTSC (2009)			
(C5-C8) Aliphatics		0.7	700
(C9-C18) Aliphatics		0.3	300
(C9-16) Aromatics		0.05	50
[3]USEPA/NCEA (2009)			
(C5-C8) Aliphatics (noncancer)		0.6	600
(C9-C18) Aliphatics		0.1	100
(C9-C16) Aromatics		0.1	100

1. Inhalation Reference Dose published by Washington DOE converted to a Reference Concentration: RfC (mg/m^3) = RfD (mg/kg-day) x70kg x (1/20m3-day).
2. California EPA toxicity factors withdrawn in 2010 pending review of USEPA document and potential revision.
3. USEPA NCEA toxicity factors selected for calculation of HDOH risk-based indoor air and soil gas action levels.

Table 4. Indoor air and soil gas action levels for vapor-phase carbon ranges based on USEPA-NCEA inhalation Reference Concentrations (see Table 2).

Carbon Range	RfC (µg/m^3)	[1]Indoor Air (µg/m^3)		[2]Subslab Soil Gas (µg/m^3)	
		Residential	Commercial/ Industrial	Residential	Commercial/ Industrial
C5-C8 Aliphatics	600	630	880	630,000	176,000
C9-C18 Aliphatics	100	100	150	100,000	300,000
C9-C16 Aromatics	100	100	150	100,000	300,000

1. Based on exposure assumptions in HDOH EHE guidance and a target Hazard Quotient of 1.0 (see HDOH 2011).

2. Based on a residential indoor air:subslab soil gas attenuation factor of 1/1,000 and a commercial/industrial attenuation factor of 1/2,000 (see HDOH 2011).

Table 5a. Benzene and naphthalene indoor air and soil gas action levels based on cancer health risk.

Chemical	IUR ($\mu g/m^3$)-[1]	Target Cancer Risk	[1]Indoor Air ($\mu g/m^3$)		[1,2]Subslab Soil Gas ($\mu g/m^3$)	
			Residential	Commercial/ Industrial	Residential	Commercial/ Industrial
Benzene	7.8E-06	10^{-6}	0.31	0.52	310	1,040
		10^{-5}	3.1	5.2	3,100	10,400
		10^{-4}	31	52	31,000	100,400
Naphthalene	3.48E-05	10^{-6}	0.072	0.12	72	240
		10^{-5}	0.72	1.2	720	2,400
		10^{-4}	7.2	12	7,200	24,000

1. Based on exposure assumptions in HDOH EHE guidance (see HDOH 2011).
2. Based on a residential indoor air:subslab soil gas attenuation factor of 1/1,000 and a commercial/industrial attenuation factor of 1/2,000 (see HDOH 2011).

Table 5b. Benzene and naphthalene indoor air and soil gas action levels based on noncancer health risk.

Chemical	RfC ($\mu g/m^3$)	Target HQ	[1]Indoor Air ($\mu g/m^3$)		[1,2]Subslab Soil Gas ($\mu g/m^3$)	
			Residential	Commercial/ Industrial	Residential	Commercial/ Industrial
Benzene	30	1.0	31	44	31,000	88,000
Naphthalene	3.0	1.0	3.1	4.4	3,100	8,800

1. Based on exposure assumptions in HDOH EHE guidance (see HDOH 2011).
2. Based on a residential indoor air:subslab soil gas attenuation factor of 1/1,000 and a commercial/industrial attenuation factor of 1/2,000 (see HDOH 2011).

Table 6a. TPH versus benzene as the primary vapor intrusion risk driver.

TPH:Benzene Soil Gas Ratio	**Risk Driver**
>2,000:1	TPH will always drives vapor intrusion hazards over benzene (TPH HQ will exceed 1.0 when benzene ECR risk is 10^{-6}).
16:1 to 2,000:1	TPH Carbon Range data recommended. TPH could drive vapor intrusion hazards depending on carbon range makeup and benzene target risk (TPH HQ could exceed 1.0 even though benzene ECR risk is note exceeded).
<16:1	Benzene will always drive vapor intrusion risk over TPH (Benzene ECR will exceed 10^{-4} and HQ will exceed 1.0 when TPH HQ is 1.0)

Table 6b. TPH versus naphthalene as the primary vapor intrusion risk driver.

TPH:Naphthalene Soil Gas Ratio	**Risk Driver**
>8,800:1	TPH will always drives vapor intrusion hazards over naphthalene (TPH HQ will exceed 1.0 when naphthalene ECR risk is 10^{-6}).
32:1 to 8,800:1	TPH could drive vapor intrusion hazards depending on carbon range makeup and naphthalene target risk (TPH HQ could exceed 1.0 even though naphthalene ECR risk is note exceeded).
<32:1	Naphthalene will always drive vapor intrusion risk over TPH (Naphthalene noncancer HQ will exceed 1.0 when TPH HQ is 1.0)

Table 6c. Summary of critical ratio where TPH will always drive vapor intrusion risk over versus noted, individual compound.

VOC	[1]Indoor Air Action Level ($\mu g/m^3$)	[2]Critical TPH:VOC Ratio
Naphthalene	0.072	8,800:1
1-Methylnaphthalene	0.29	2,200:1
Benzene	0.31	2,000:1
Ethylbenzene	0.97	650:1
Xylenes	21	30:1
Toluene	1,000	0.6:1

1. Based on 10^{-6} cancer risk for naphthalene, benzene, 1-methylnaphthalene and ethylbenzene and noncancer Hazard Quotient of 1.0 for toluene and xylenes. VOCs listed in order or relative toxicity.

2. Risk posed by TPH aliphatics and aromatics sufficient to overwhelm risk posed individual compound due to overwhelming proportion of TPH in vapor.

Table 7a. Sites selected for collection of soil gas samples.

Site Name (sampling phase)	[1]Location	Suspected Fuel Type Released	Notes	Site Overview Reports
[2]Aloha Petroleum (Phase I)	School Street, Honolulu	Gasoline	Operating service station	Soil Gas Investigation, Aloha Petroleum, Ltd., 1841 Palolo Avenue, Honolulu, Hawai'i, 2008.
[3]GASCO (Phase I)	616 Iwilei Road, Honolulu	Benzene, naphthalene, diesel fuel	Former manufactured gas plant	Remedial Investigation Report, Former GASCO Facility, 616 Iwilei Road, Honolulu, April 1, 2009.
[3]HAFB IRP Site VP26 (Phase I & II)	Aiea	JP-4/AVGAS	Fuel pipeline release	Draft Work Plan Addendum for Treatability Study at IRP Site ST02/Valve Pit 26, Hickam POL Pipeline, Oahu, Hawaii, April 7, 2011.
[3]OU1C (Phase I & II)	Honolulu Harbor Pier 24 area	Mixture gasolines and middle distillates	Fuel pipeline release	Operable Units OU1C LNAPL and Soil Gas Investigation, Supplemental Remedial Investigation Report, Honolulu, Hawai'i, June 2008.
[3]HAFB IRP Site SP43 (Phase II)	Hickam Air Force Base, Honolulu	JP-8	Fuel pipeline release	Investigation/Remediation of Air Mobility Command Stripper Pit Site No. 43, Hickam Air Force Base Oahu, Hawai'i, September 30, 2010
[3]HAFB IRP Site ST03 (Phase I & II)	Mililani,	MOGAS, AVGAS, JP-4	Fuel pipeline release (mid 1970s)	Work Plan for Phase 2 Remedial Investigation and Treatability Study at IRP Site ST03, Hickam AFB, Honolulu, Hawai'i, July 2009.
[3]Fishing Village (Phase I & II)	Honolulu Harbor Piers36-38 area	Diesel	UST and/or pipeline releases	Soil Gas Monitoring Report, Domestic Commercial Fishing Village Site, Honolulu, May 2010.

Table 7a (cont.). Sites selected for collection of soil gas samples.

Site Name (sampling phase)	[1]Location	Suspected Fuel Type Released	Notes	Site Overview Reports
Other				
Fresh Gasoline Vapors (Phase I & II)	-	Gasoline	Vapors over fresh fuel	-
Fresh Diesel Vapors (Phase I & II)	-	Diesel #2	Vapors over fresh fuel	-
Fresh JP-8 Vapors (Phase II)	-	Jet Fuel #8	Vapors over fresh fuel	-
Gasoline Auto Exhaust (Phase II)	-	Gasoline	Vapors from exhaust	-
Diesel Auto Exhaust (Phase II)	-	Diesel #2Exhaust	Vapors from exhaust	-

1. All sites located on the island of Oʻahu, Hawaiʻi (see Figure 1).
2. UST office lead case.
3. HEER office lead case.

Table 7b. Depth and proximity of soil gas sampling point to source area at final, primary study sites.

Site	Sample ID	[1]Primary Source of Vapors at Sampling Point	Surface Cover at Sampling Point	[2]Soil Vapor Point Depth (feet bgs)	[3]Estimated Distance to Vapor Source (feet)	Depth to Groundwater (feet bgs)
Hickam AFB VP26 (Site A)	HAFB-VP26-B05(18)-HDOH	VZS, GW	Soil	-18’	<15’	-30’
	HAFB-VP26-B05(24)-HDOH	VZS, GW	Soil	-24’	<6’	-30’
	HAFB-VP26-B07(20)-HDOH	VZS, GW	Soil	-20’	<10’	-30’
	HAFB-VP26-B07(25)-HDOH	VZS, GW	Soil	-25’	<5’	-30’
Honolulu Harbor OU1C (Site B)	HH-OU1C-MW10SG	GW	Asphalt	-2.3’	<5’	-6’
	HH-OU1C-MW22R	GW	Asphalt	-2.3’	<5’	-6’
	HH-OU1C-OTNS1	GW	Asphalt	-1.8’	<5’	-6’
Hickam AFB SP43 (Site C)	HAFB-SP43-VMP10	GW	Soil	-2.5’	<5’	-6’
	HAFB-SP43-VMP11	GW	Soil	-2.5’	<5’	-5’
	HAFB-SP43-VMP12	GW	Soil	-2.5’	<5’	-7’
	HAFB-SP43-VMP16	GW	Soil	-2.5’	<5’	-6’
	HAFB-SP43-VMP17	GW	Soil	-2.5’	<5’	-5’
Hickam AFB ST03 (Site D)	HAFB-ST03-B58 (347)	VZS?	Soil	-347’	<50’?	-540’
	HAFB-ST03-B58 (422)	VZS?	Soil	-422’	<50’?	-540
	HAFB-ST03-B58 (492)	VZS?	Soil	-492’	<50’?	-540
	HAFB-ST03-B59 (388)	VZS?, GW	Soil	-388 to -538’	<50’?	-540
Fishing Village (Site E)	FV-GP-01-HDOH	GW	Asphalt	-1 to -5’	<5’	-5’
	FV-GP-08-HDOH	GW	Asphalt	-1 to -5’	<5’	-5’
	FV-GP-16R-HDOH	GW	Asphalt	-1 to -5’	<5’	-5’

1. Assumed primary source of vapors at sampling point based on site investigation reports (VZS=vadose-zone soils, GW=free product and/or dissolved-phase petroleum at water table).
2. Top of six-inch screen noted for discrete sample points.
3. Distance to product in basalt and/or on groundwater uncertain at Site D due to depth and limited number of borings.

Table 8. Elution/retention times for targeted VOCs and chemical markers use to define carbon ranges.

Target Chemical/ Carbon Range	Marker Chemical(s) on Chromatogram	Elution/Retention Time (minutes)	
		TO-15	TO-17
C5 aliphatics	Isopentane	7.445	3.302
C9 aliphatics	Nonane	20.240	11.121
C13 aliphatics	Dodecane	23.134	15.457
C18 aliphatics	Octadecane	NA	21.037
C24 aliphatics	Tetracosane	NA	24.991
C9 aromatics	o-Xylene	20.238	10.844
C11 aromatics	Naphthalene	23.060	14.978
C16 aromatics	Octadecane	NA	21.037
Benzene	“”	14.779	5.565
Ethylbenzene	“”	19.704	10.128
Toluene	“”	17.997	8.022
Xylenes	“”	M/P :19.816 O :20.138	M/P :10.321 O :10.744
Naphthalene	“”	23.160	15.078
1-Methylnaphthalene	“”	NA	16.549
2-Methylnaphthalene	“”	NA	16.370
TPHg (C5-C12)	Isopentane & Nonane	7.445 to 23.134	3.302 to 11.121
TPHg (C5-C24)	Isopentane & Tetracosane	NA	3.302 to 24.991
[1]TPHd (C5-C24)	Isopentane & Tetracosane	NA	3.302 to 24.991
[2]TPHd (C10-C24)	Nonane & Tetracosane	NA	12.671 to 24.991

1. Request lab to report TPHd as C5 to C24 to ensure inclusion of C5-C8 aliphatics.
2. Not recommended, excludes potential C5-C8 aliphatics in diesel and other middle distillate vapors.

Table 9. Summary of TPH and BTEXN vapor data based on Summa canister data.

Site	Sample ID	[1]TPH (µg/m^3)	[2]Benzene (µg/m^3)	[2]Toluene (µg/m^3)	[2]Ethylbenzene (µg/m^3)	[2]Xylenes (µg/m^3)	[2]Naphthalene (µg/m^3)
Fresh Fuels and Auto Exhaust	Gasoline #1	261,985,000	5,100,000	28,000,000	2,100,000	7,300,000	ND (<500,000)
	Gasoline #2	8,342,000	29,000	130,000	11,000	49,000	ND (<26,000)
	Gasoline Exhaust	27,540	4,700	6,400	1,000	5,200	ND (<200)
	JP8#1	6,010,000	20,000	62,000	22,000	115,000	6,100
	Diesel#1	1,195,000	16,000	42,000	9,700	31,800	730
	Diesel#2	974,000	2,900	21,000	6,000	37,000	3,500
	Diesel#3	208,200	1,000	850	4,000	3,800	120
	Diesel Exhaust	62	14	4.6	ND (<3)	ND (<6)	ND (<16)
Site A (May 2011)	HAFB-VP26-B05(18)-HDOH	49,412,000	29,000	ND (<4,800)	14,000	ND (<9,600)	ND (<25,000)
	HAFB-VP26-B05(24)-HDOH	94,275,000	470,000	ND (<240,000)	ND (<240,000)	ND (<240,000)	ND (<300,000)
	HAFB-VP26-B07(20)-HDOH	38,267,500	58,000	ND (<230)	40,000	545	ND (<1,200)
	HAFB-VP26-B07(25)-HDOH	100,396,000	19,000	ND (<4,600)	9,200	ND (<9,200)	ND (<24,000)
Site A (October 2011)	HAFB-VP26-B05(18)-HDOH	49,412,000	40,000	ND (<2,000)	18,000	ND (<2,000)	ND (<11,000)
	HAFB-VP26-B05(24)-HDOH	94,275,000	280,000	ND (<50,000)	ND (<50,000)	ND (<100,000)	ND (<260,000)
	HAFB-VP26-B07(20)-HDOH	38,267,500	84,000	ND (<4,800)	37,000	ND (<9,600)	ND (<15,000)
	HAFB-VP26-B07(25)-HDOH	100,396,000	45,000	ND (<6,300)	20,000	ND (<12,600)	ND (<33,000)
Site B (August 2011)	HH-OU1C-MW10SG	63,835,000	12,000	3,600	ND (<3,100)	ND (<6,200)	ND (<16,000)
	HH-OU1C-MW22R	23,217,000	7,700	ND (<1,900)	ND (<1,900)	ND (<3,800)	ND (<10,000)
	HH-OU1C-OTNS1	902,700	ND (<300)	ND (<500)	ND (<500)	ND (<1,000)	ND (<1,600)
Site B (October 2011)	HH-OU1C-MW10SG	67,017,000	16,000	ND (<6,700)	ND (<6,700)	ND (<13,400)	ND (<35,000)
	HH-OU1C-MW22R	65,304,100	ND (<16,000)	ND (<16,000)	ND (<16,000)	ND (<32,000)	ND (<85,000)
	HH-OU1C-OTNS1	699	ND (<3.1)	ND (<3.1)	ND (<3.1)	ND (<6.2)	ND (<16)

Table 9 (cont.). Summary of TPH vs BTEXN data based on Summa canister data.

Site	Sample ID	[1]TPH (µg/m^3)	[2]Benzene (µg/m3)	[2]Toluene (µg/m^3)	[2]Ethylbenzene (µg/m^3)	[2]Xylenes (µg/m^3)	[2]Naphthalene (µg/m3)
Site C (October 2011)	HAFB-SP43-VMP10	19,520,000	1,600	ND (<490)	7,200	ND (<980)	4,000
	HAFB-SP43-VMP11	19,982,000	ND (<480)	ND (<480)	41,000	ND (<960)	2,600
	HAFB-SP43-VMP12	2,158	ND (<4.8)	ND (<4.8)	ND (<4.8)	ND (<4.8)	ND (<50)
	HAFB-SP43-VMP16	37,830,000	1,500	ND (<500)	1,600	ND (<1,000)	ND (<2,600)
	HAFB-SP43-VMP17	6,530,000	ND (<500)	ND (<490)	6,000	ND (<980)	ND (<2,600)
Site D (July 2011)	HAFB-ST03-B58 (347)	173,340	22	400	140	1,260	ND (<100)
	HAFB-ST03-B58 (422)	80,200	14	210	54	329	ND (<65)
	HAFB-ST03-B58 (492)	530,850	79	680	240	2,120	ND (<340)
	HAFB-ST03-B59 (388)	510,700	32	550	170	1,080	ND (<330)
Site D (October 2011)	HAFB-ST03-B58 (347)	624,000	ND (<32)	110	510	13,400	ND (<160)
	HAFB-ST03-B58 (422)	944,000	ND (<43)	130	620	15,600	ND (<220)
	HAFB-ST03-B58 (492)	898,000	ND (<42)	160	720	19,000	ND (<220)
	HAFB-ST03-B59 (388)	72,000	180	360	120	2,420	140
Site E (May 2011)	FV-GP-01-HDOH	89,600	ND (<28)	ND (<28)	ND (<28)	ND (<28)	ND (<150)
	FV-GP-08-HDOH	3,781,000	50	67	110	638	50
	FV-GP-16R-HDOH	5,923,000	ND (<490)	ND (<490)	ND (<490)	ND (<980)	ND (<2,600)
Site E (Oct 2011)	FV-GP-01-HDOH	28,472	ND (<4.7)	ND (<4.7)	ND (<4.7)	ND (<9.4)	ND (<150)
	FV-GP-08-HDOH	1,609,700	49	51	ND (<48)	ND (<96)	125
	FV-GP-16R-HDOH	6,917,000	ND (<490)	ND (<490)	ND (<490)	ND (<980)	ND (<2,600)

Notes

1. TPH calculated as sum of individual carbon ranges; excludes BTEXN.
2. Benzene and naphthalene concentrations as reported in MA-APH test data.

Table 10. Summary of relative proportion of TPH versus total BTEXN vapor data based on Summa canister data.

Site	Sample ID	[1]TPH (µg/m^3)	[2]Sum of BTEXN (µg/m3)	Percent TPH	Percent BTEXN	Comments
Fresh Fuels and Auto Exhaust	Gasoline #1	261,985,000	42,750,000	86.0%	14.0%	Vapors collected over various fuels and directly from auto exhaust
	Gasoline #2	8,342,000	232,000	97.3%	2.7%	
	Gasoline Exhaust	27,540	17,380	61.3%	38.7%	
	JP8#1	6,010,000	225,100	96.4%	3.6%	
	Diesel#1	1,195,000	100,750	92.2%	7.8%	
	Diesel#2	974,000	70,400	93.3%	6.7%	
	Diesel#3	208,200	9,770	95.5%	4.5%	
	Diesel Exhaust	62	30	67.1%	32.9%	
Site A (May 2011)	HAFB-VP26-B05(18)-HDOH	49,412,000	62,700	99.9%	0.1%	JP-4/AVGAS
	HAFB-VP26-B05(24)-HDOH	94,275,000	1,600,000	98.3%	1.7%	
	HAFB-VP26-B07(20)-HDOH	38,267,500	99,260	99.7%	0.3%	
	HAFB-VP26-B07(25)-HDOH	100,396,000	47,100	100.0%	0.0%	
Site A (October 2011)	HAFB-VP26-B05(18)-HDOH	49,412,000	66,500	99.9%	0.1%	
	HAFB-VP26-B05(24)-HDOH	94,275,000	510,000	99.5%	0.5%	
	HAFB-VP26-B07(20)-HDOH	38,267,500	132,850	99.7%	0.3%	
	HAFB-VP26-B07(25)-HDOH	100,396,000	90,950	99.9%	0.1%	
Site B (August 2011)	HH-OU1C-MW10SG	63,835,000	28,250	100.0%	0.0%	Mix diesel, fuel oil & gasoline
	HH-OU1C-MW22R	23,217,000	16,500	99.9%	0.1%	
	HH-OU1C-OTNS1	902,700	2,050	99.8%	0.2%	
Site B (October 2011)	HH-OU1C-MW10SG	67,017,000	46,900	99.9%	0.1%	
	HH-OU1C-MW22R	65,304,100	82,500	99.9%	0.1%	
	HH-OU1C-OTNS1	699	16	97.8%	2.2%	

Table 10 (cont.). Summary of relative proportion of TPH versus total BTEXN vapor data based on Summa canister data.

Site	Sample ID	[1]TPH (µg/m^3)	[2]Sum of BTEXN (µg/m3)	Percent TPH	Percent BTEXN	Comments
Site C (October 2011)	HAFB-SP43-VMP10	19,520,000	13,535	99.9%	0.1%	JP-4 + JP-8
	HAFB-SP43-VMP11	19,982,000	44,560	99.8%	0.2%	
	HAFB-SP43-VMP12	2,158	22	99.0%	1.0%	
	HAFB-SP43-VMP16	37,830,000	5,150	100.0%	0.0%	
	HAFB-SP43-VMP17	6,530,000	8,285	99.9%	0.1%	
Site D (July 2011)	HAFB-ST03-B58 (347)	173,340	1,872	98.9%	1.1%	JP-4/AVGAS, JP-8
	HAFB-ST03-B58 (422)	80,200	640	99.2%	0.8%	
	HAFB-ST03-B58 (492)	530,850	3,289	99.4%	0.6%	
	HAFB-ST03-B59 (388)	510,700	1,997	99.6%	0.4%	
Site D (October 2011)	HAFB-ST03-B58 (347)	624,000	14,116	97.8%	2.2%	
	HAFB-ST03-B58 (422)	944,000	16,592	98.3%	1.7%	
	HAFB-ST03-B58 (492)	898,000	20,011	97.8%	2.2%	
	HAFB-ST03-B59 (388)	72,000	3,220	95.7%	4.3%	
Site E (May 2011)	FV-GP-01-HDOH	89,600	145	99.8%	0.2%	Diesel; May 2011 TPH based on sum of carbon ranges (no TO-15 analysis)
	FV-GP-08-HDOH	3,781,000	865	100.0%	0.0%	
	FV-GP-16R-HDOH	5,923,000	2,525	100.0%	0.0%	
Site E (Oct 2011)	FV-GP-01-HDOH	28,472	21	99.9%	0.1%	
	FV-GP-08-HDOH	1,609,700	297	100.0%	0.0%	
	FV-GP-16R-HDOH	6,917,000	2,280	100.0%	0.0%	
Average for Sites (excluding fuel vapors):				99.4%	0.6%	

Notes

1. TPH calculated as sum of individual carbon ranges; excludes BTEXN.
2. Sum of reported benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN); NDs summed as 1/2 the method reporting level (see Table 9).

Table 11. Average TPH versus BTEXN composition for fuel vapor and soil gas samples from key sites based on Summa canister data.

Site/Fuel Type	Average Soil Gas Composition (TO-15 Data)	
	TPH	**[1]BTEXN**
Gasoline (Fresh Vapors)	91.6%	8.4%
Diesel (Fresh Vapors)	93.7%	6.3%
JP-8 (Fresh Vapors)	96.4%	3.6%
Site A (JP-4/AVGAS)	99.6%	0.4%
Site B (mixed fuels)	99.5%	0.5%
Site C (JP-8 +/- JP-4)	99.7%	0.3%
Site D (JP-4/AVGAS)	98.3%	1.7%
Site E (diesel)	99.9%	0.1%

1. NDs summed as 1/2 the method reporting level for estimation of total BTEXN (see Tables 9 and 10).

Table 12. TPH vs benzene and naphthalene data based on Summa canister data.

Site	Sample ID	[1]TPH ($\mu g/m^3$)	[2]Benzene ($\mu g/m^3$)	[2]Naphthalene ($\mu g/m^3$)	[1]TPH: Benzene Ratio	[1]TPH: Naphthalene Ratio
Fresh Fuels and Auto Exhaust	Gasoline #1	261,985,000	5,100,000	ND (<500,000)	51:1	>524:1
	Gasoline #2	8,342,000	29,000	ND (<26,000)	288:1	>321:1
	Gasoline Exhaust	27,540	4,700	ND (<200)	7.1:1	>138:1
	JP8#1	6,010,000	20,000	6,100	301:1	985:1
	Diesel#1	1,195,000	16,000	730	75:1	1,637:1
	Diesel#2	974,000	2,900	3,500	336:1	278:1
	Diesel#3	208,200	1,000	120	208:1	1,735:1
	Diesel Exhaust	62	14	ND (<16)	4.4:1	>3.8:1
Site A (May 2011)	HAFB-VP26-B05(18)-HDOH	49,412,000	29,000	ND (<25,000)	1,704:1	>1,976:1
	HAFB-VP26-B05(24)-HDOH	94,275,000	470,000	ND (<,300,000)	201:1	>73:1
	HAFB-VP26-B07(20)-HDOH	38,267,500	58,000	ND (<1,200)	660:1	>31,890:1
	HAFB-VP26-B07(25)-HDOH	100,396,000	19,000	ND (<24,000)	5,284:1	>4,183:1
Site A (October 2011)	HAFB-VP26-B05(18)-HDOH	49,412,000	40,000	ND (<11,000)	1,235:1	>4,492:1
	HAFB-VP26-B05(24)-HDOH	94,275,000	280,000	ND (<260,000)	337:1	>363:1
	HAFB-VP26-B07(20)-HDOH	38,267,500	84,000	ND (<15,000)	456:1	>2,551:1
	HAFB-VP26-B07(25)-HDOH	100,396,000	45,000	ND (<33,000)	2,231:1	>3,042:1
Site B (August 2011)	HH-OU1C-MW10SG	63,835,000	12,000	ND (<16,000)	5,320:1	>3,990:1
	HH-OU1C-MW22R	23,217,000	7,700	ND (<10,000)	3,015:1	>2,322:1
	HH-OU1C-OTNS1	902,700	ND (<300)	ND (<1,600)	>3,009:1	>564:1
Site B (October 2011)	HH-OU1C-MW10SG	67,017,000	16,000	ND (<35,000)	4,189:1	>1,915:1
	HH-OU1C-MW22R	65,304,100	ND (<16,000)	ND (<85,000)	>4,082:1	>768:1
	HH-OU1C-OTNS1	699	ND (<3.1)	ND (<16)	>225:1	>44:1

Table 12 (cont.). TPH vs benzene and naphthalene data based on Summa canister data.

Site	Sample ID	[1]TPH (µg/m^3)	[2]Benzene (µg/m^3)	[2]Naphthalene (µg/m^3)	[1]TPH: Benzene Ratio	[1]TPH: Naphthalene Ratio
Site C	HAFB-SP43-VMP10	19,520,000	1,600	4,000	12,200:1	4,880:1
	HAFB-SP43-VMP11	19,982,000	ND (<480)	2,600	>41,629:1	7,685:1
	HAFB-SP43-VMP12	2,158	ND (<4.8)	ND (<50)	>450:1	>43:1
	HAFB-SP43-VMP16	37,830,000	1,500	ND (<2,600)	25,220:1	>14,550:1
	HAFB-SP43-VMP17	6,530,000	ND (<500)	ND (<2,600)	>13,060:1	>2,512:1
Site D (July 2011)	HAFB-ST03-B58 (347)	173,340	22	ND (<100)	7,879:1	>1,733:1
	HAFB-ST03-B58 (422)	80,200	14	ND (<65)	5,729:1	>1,234:1
	HAFB-ST03-B58 (492)	530,850	79	ND (<340)	6,720:1	>1,561:1
	HAFB-ST03-B59 (388)	510,700	32	ND (<330)	16,213:1	>1,548:1
Site D (October 2011)	HAFB-ST03-B58 (347)	624,000	ND (<32)	ND (<160)	>19,500:1	>3,900:1
	HAFB-ST03-B58 (422)	944,000	ND (<43)	ND (<220)	>21,953:1	>4,291:1
	HAFB-ST03-B58 (492)	898,000	ND (<42)	ND (<220)	>21,381:1	>4,082:1
	HAFB-ST03-B59 (388)	72,000	180	140	400:1	514:1
Site E (May 2011)	FV-GP-01-HDOH	89,600	ND (<28)	ND (<150)	>3,200:1	>597:1
	FV-GP-08-HDOH	3,781,000	865	50	75,620:1	6,302:1
	FV-GP-16R-HDOH	5,923,000	ND (<500)	ND (<2,600)	>11,846:1	>2,278:1
Site E (Oct 2011)	FV-GP-01-HDOH	28,472	ND (<4.7)	ND (<150)	>6,058:1	>190:1
	FV-GP-08-HDOH	1,609,700	49	125	32,851:1	12,878:1
	FV-GP-16R-HDOH	6,917,000	ND (<245)	ND (<2,600)	>28,233:1	>2,660:1

Table 12 (cont.). TPH vs benzene and naphthalene data based on Summa canister data.

Site	Sample ID	[1]TPH (µg/m^3)	[2]Benzene (µg/m^3)	[2]Naphthalene (µg/m^3)	[1]TPH: Benzene Ratio	[1]TPH: Naphthalene Ratio
[3]GASCO (former MGP that produced benzene & naphthalene)	G-IPB20-HDOH	ND (2,500)	34,000	430	<0.1:1	<5.8
	G-IPH11-HDOH	ND (<840,000)	9,700,000	ND (<81,000)	<0.1:1	-
	G-IPH19-HDOH	689	480	ND (<26)	1.4:1	>28:1
	G-IP28-HDOH	ND (<1,340,000)	22,000,000	ND (<410,000)	<0.1:1	-
	G-SG12-HDOH	4,220	ND (<13)	ND (<70)	>325:1	>60:1
[3]Aloha Petroleum School Street (gasolines)	A-SV04-HDOH	52	ND (<4.4)	ND (<24)	-	-
	A-SVO13-HDOH	66	10	ND (<24)	6.6	-
	A-AS4-HDOH	62	ND (<4.2)	ND (<24)	-	-

Notes

Red: Not detected, laboratory Reporting Limit noted.

1. TPH calculated as sum of individual carbon ranges; excludes BTEXN.
2. Benzene and naphthalene concentrations as reported in MA-APH test data.
3. GASCO and Aloha Petroleum site data not carried forward for additional evaluation (see Section 5). TPH ratios not calculated for Aloha Petroleum site data due to non-detects for some individual TPH carbon ranges and low to non-detect levels of benzene and naphthalene.

Table 13a. Average TPH and benzene ratios for fuel vapor samples and samples from key sites and potential vapor intrusion risk driver based on Summa canister data.

Site/Fuel Type	[1]TPH:Benzene Ratio	Vapor Intrusion Risk Driver (see Table 6a)
Gasoline (Fresh Vapors)	170:1	TPH *could* drive vapor intrusion hazards depending on carbon range makeup and benzene target risk.
Diesel (Fresh Vapors)	206:1	TPH *could* drive vapor intrusion hazards depending on carbon range makeup and benzene target risk.
JP-8 (Fresh Vapors)	301:1	TPH *could* drive vapor intrusion hazards depending on carbon range makeup and benzene target risk.
Site A (JP-4/AVGAS)	1,513:1	TPH *could* drive vapor intrusion hazards depending on carbon range makeup and benzene target risk.
Site B (mixed fuels)	4,174:1	[2]TPH drives vapor intrusion hazards over benzene.
Site C (JP-8 +/- JP-4)	18,710:1	[2]TPH drives vapor intrusion hazards over benzene.
Site D (JP-4/AVGAS)	9,135:1	[2]TPH drives vapor intrusion hazards over benzene.
Site E (diesel)	54,236:1	[2]TPH drives vapor intrusion hazards over benzene.

1. See Table 9, TPH base on sum of Summa carbon range data. Average ratio for samples where both TPH and benzene were reported; individual samples with ND for benzene not included.
2. TPH noncancer Hazard Quotient for vapor intrusion will exceed 1.0 even though benzene risk is $<10^{-6}$.

Table 13b. Average TPH and naphthalene ratios for fuel vapor samples and samples from key sites and potential vapor intrusion risk driver based on Summa canister data.

Site/Fuel Type	[1]TPH:Naphthalene Ratio	Vapor Intrusion Risk Driver (see Table 6b)
Gasoline (Fresh Vapors)	-	Naphthalene not detected.
Diesel (Fresh Vapors)	1,217:1	TPH *could* drive vapor intrusion hazards depending on carbon range makeup and naphthalene target risk.
JP-8 (Fresh Vapors)	985:1	TPH *could* drive vapor intrusion hazards depending on carbon range makeup and naphthalene target risk.
Site A (JP-4/AVGAS)	-	Naphthalene not detected.
Site B (mixed fuels)	-	Naphthalene not detected.
Site C (JP-8 +/- JP-4)	6,283:1	TPH *could* drive vapor intrusion hazards depending on carbon range makeup and naphthalene target risk.
Site D (JP-4/AVGAS)	-	Naphthalene not detected.
Site E (diesel)	44,249:1	[2]TPH drives vapor intrusion hazards over naphthalene.

1. See Table 9; TPH base on sum of Summa carbon range data. Average ratio for samples where both TPH and naphthalene were reported; individual samples with ND for naphthalene not included.
2. TPH noncancer Hazard Quotient for vapor intrusion will exceed 1.0 even though naphthalene risk is $<10^{-6}$.

Table 14. Example TPH vs benzene and naphthalene data for other petroleum sites in Hawai‘i.

Site (see reference)	Sample ID	[1]TPH (µg/m^3)	[1]Benzene (µg/m^3)	[1]Naphthalene (µg/m^3)	[2]TPH: Benzene Ratio	[2]TPH: Naphthalene Ratio
[1]Hickam AFB SS156-J (mix gasolines & middle distillates)	VMP05	60,000,000	11,000	10,000	5,455:1	6,000:1
	VMP06	82,000,000	5,600	810	14,643:1	101,235:1
	VMP07	68,000,000	860	ND (<45)	79,070:1	>1,511,111:1
	VMP08	43,000,000	260	ND (<89)	165,385:1	>483,146:1
	VMP10	84,000,000	150,000	5,400	560:1	15,556:1
[1]Hickam AFB SS156-E (gasolines)	VMP30	3,000	5.2	34	577:1	88:1
	VMP31	3,500	2.7	44	1,296:1	80:1
	VMP32	3,600	9.7	33	371:1	109:1
	VMP33	3,900	16	27	244:1	144:1
	VMP34	3,000	4.9	40	612:1	75:1
	VMP3	39,000	130	ND (<30)	300:1	>1,300:1
	VMP04	620,000	1,800	51	344:1	12,157:1
	VMP08	6,900	19	28	363:1	246:1
	VMP09	1,000	2.2	48	455:1	21:1
	VMP10	98,000	250	ND (<30)	392:1	>3,267:1
	MP3-SS156E (14' bgs)	390,000,000	2,200,000	ND (< 17,000)	195:1	<22,941:1
[2]Hakuyosha Dry Cleaner (stoddard)	B1-SV	9,000	ND (<34)	-	>265:1	-
	B4-SV	1,300,000	ND (<1,800)	-	>722:1	-
	B8-SV1	1,200	ND (<32)	-	>38:1	-
	B10-SV	1,600	ND (<32)	-	>50:1	-
	B12-SV	8,200	ND (<32)	-	>256:1	-
[3]Challenger Loop, Pearl Harbor NB (middle distillates)	SG-1	4,880	1.3	39	3,754:1	125:1
	SG-2	4,596	1.3	ND (<27)	3,535:1	>170:1
	SG-3	4,534	0.9	ND (<25)	5,152:1	>181:1
	SG-4	4,719	1.7	ND (<26)	2,776:1	>182:1
	SG-5	4,152	ND (<0.7)	ND (<24)	>6,106:1	>173:1

Table 14 (cont.). Example TPH vs benzene and naphthalene data for other petroleum sites in Hawai‘i.

Site (see reference)	Sample ID	[1]TPH (µg/m^3)	[1]Benzene (µg/m^3)	[1]Naphthalene (µg/m^3)	[2]TPH: Benzene Ratio	[2]TPH: Naphthalene Ratio
[4]Aloha Gas Station (gasolines)	S1	17,100,000	1,300	-	13,154:1	-
	S2	6,300,000	17,200	-	366:1	-
	S4	75,600	390	-	194:1	-
	S5	185,000	114	-	1,623:1	-
	S6	144,000	241	-	598:1	-
[5]ConocoPhillps Fuel Terminal (mix gasolines & middle distillates)	EVT-005	15,902,000	63,804	-	249:1	-
	EVT-007	194,356,000	2,010,000	-	97:1	-
	EV-014	106,012,000	382,822	-	277:1	-
	EV-025	14,577,000	350,920	-	42:1	-
	EVT-002	21,202,000	8,933	-	2,373:1	-
	EVT-012	5,742,000	766	-	7,496:1	-
	EV-026	27,828,000	23,607	-	1,179:1	-
	EV-041	3,500,000	650	-	5,385:1	-
[6]Kamehameha Schools Lipoa Place (gasoline-diesel mix?)	SV07	28,000	ND (<17.0)	3.4	>1,647:1	8,235:1
	SV10	74,000	900	20	82:1	3,700:1
	SV11	2,300,000	ND (<360)	ND (<2.2)	>6,389:1	>1,045,455:1
	SV13	140,000	ND (<52)	4	>2,692:1	>36,842:1
	SV14	180,000	670	13	269:1	>13,846:1
[7]Hickam AFB Bldg 1760 (gasoline)	SG002	965,300	5,037	43	192:1	22,449:1
	SG004	20,853	142	2.9	147:1	7,191:1
[8]Hickam AFB Bldg CG110 (middle distillates)	SG05	8,790,000	6	1,000	1,598,182:1	8,790:1
	SG06	18,400,000	12	150	1,600,000:1	122,667:1

a. TPH generally reported as TPHgasoline and includes BTEXN; data usually based on TO-15 Summa canister analysis but varies between sites; TPH noted for Hickam AFB Bldg 1760 calculated as sum of individual carbon ranges.

b. Benzene and naphthalene respectively subtracted from TPH for calculation of ratios.

Table 14 (cont.). TPH vs benzene and naphthalene data for other petroleum sites in Hawai‘i.

Note: For example only; not intended to be representative of overall conditions at subject site.

References

1. Record of Decision and Response Action Memorandum Spill Site 156 Feasibility Study, Proposed Plan, and Record of Decision/Response Action Memorandum, Hickam AFB, Honolulu, Hawai'i, November 2009.
2. Limited Site Investigation, Hakuyosha International Inc., Honolulu, Hawai'i, June 2007.
3. Environmental Hazard Evaluation Report, Challenger Loop Site, Hickam AFB, Honolulu, Hawai'i, April 2007.
4. Soil Gas Investigation, Aloha Petroleum, Ltd., 1841 Palolo Avenue, Honolulu, Hawai'i, 2008.
5. Site Characterization, Former ConocoPhillips Terminal, Honolulu, Honolulu, Hawai'i, September 2007
6. DRAFT Soil Vapor Assessment (May 2011), 98-121 Lipoa Place, Aiea, Oahu, Hawai'i.
7. Additional Site Characterization Report for Building 1760, Hickam AFB, Honolulu, Hawai'i, November 2009.
8. Final Remedial Investigation Report for Site CG110 (March 9, 2007), Hickam AFB, Honolulu, Hawai'i, Appendix H, Complete Processed Data Listings, Table 5.

Table 15. Reported TPH carbon range concentrations in TO-15 Summa canister soil gas samples.

Site	Sample ID	Reported Carbon Range Concentrations (Summa samples)			
		C9-10 Aromatics (µg/m^3)	C5-8 Aliphatics (µg/m^3)	C9-12 Aliphatics (µg/m^3)	Sum Carbon Ranges (µg/m^3)
Fresh Fuels and Auto Exhaust	Gasoline#1	1,700,000	260,000,000	285,000	261,985,000
	Gasoline #2	12,000	8,200,000	130,000	8,342,000
	Gasoline Exhaust	2,200	25,000	340	27,540
	JP8#1	210,000	4,500,000	1,300,000	6,010,000
	Diesel#1	25,000	1,000,000	170,000	1,195,000
	Diesel#2	94,000	320,000	560,000	974,000
	Diesel#3	5,200	160,000	43,000	208,200
	Diesel Exhaust	ND (<18)	45	ND (<18)	54
Site A (JP-4/AVGAS) (May 2011)	HAFB-VP26-B05(18)-HDOH	12,000	18,000,000	330,000	18,342,000
	HAFB-VP26-B05(24)-HDOH	1,200,000	160,000,000	1,400,000	162,600,000
	HAFB-VP26-B07(20)-HDOH	8,000	12,000,000	220,000	12,228,000
	HAFB-VP26-B07(25)-HDOH	11,500	58,000,000	78,000	58,089,500
Site A (JP-4/AVGAS) (October 2011)	HAFB-VP26-B05(18)	12,000	48,000,000	1,400,000	49,412,000
	HAFB-VP26-B05(24)	125,000	94,000,000	150,000	94,275,000
	HAFB-VP26-B07(20)	7,500	38,000,000	260,000	38,267,500
	HAFB-VP26-B07(25)	16,000	100,000,000	380,000	100,396,000
Site B (mixed fuels) (August 2011)	HH-OU1C-MW10SG	35,000	62,000,000	1,800,000	63,835,000
	HH-OU1C-MW22R	17,000	22,000,000	1,200,000	23,217,000
	HH-OU1C-OTNS1	2,700	740,000	160,000	902,700
Site B (mixed fuels) (October 2011)	HH-OU1C-MW10SG	17,000	66,000,000	1,000,000	67,017,000
	HH-OU1C-MW22R	4,100	63,000,000	2,300,000	65,304,100
	HH-OU1C-OTNS1	8.0	620	71	699

Table 15 (cont.). Reported TPH carbon range concentrations in TO-15 Summa canister soil gas samples.

Site	Sample ID	Reported Carbon Range Concentrations (Summa samples)			
		C9-10 Aromatics ($\mu g/m^3$)	C5-8 Aliphatics ($\mu g/m^3$)	C9-12 Aliphatics ($\mu g/m^3$)	Sum Carbon Ranges ($\mu g/m^3$)
Site C (JP-8 +/- JP-4)	HAFB-SP43-VMP10	120,000	13,000,000	6,400,000	19,520,000
	HAFB-SP43-VMP11	82,000	14,000,000	5,900,000	19,982,000
	HAFB-SP43-VMP12	28	1,500	630	2,158
	HAFB-SP43-VMP16	130,000	32,000,000	5,700,000	37,830,000
	HAFB-SP43-VMP17	30,000	4,600,000	1,900,000	6,530,000
Site D (JP-4/AVGAS) (July 2011)	HAFB-ST03-B58 (347)	340	130,000	43,000	173,340
	HAFB-ST03-B58 (422)	200	64,000	16,000	80,200
	HAFB-ST03-B58 (492)	850	420,000	110,000	530,850
	HAFB-ST03-B59 (388)	700	410,000	100,000	510,700
Site D (JP-4/AVGAS) (October 2011)	HAFB-ST03-B58 (347)	44,000	320,000	260,000	624,000
	HAFB-ST03-B58 (422)	44,000	450,000	450,000	944,000
	HAFB-ST03-B58 (492)	58,000	460,000	380,000	898,000
	HAFB-ST03-B59 (388)	10,000	30,000	32,000	72,000
Site E (diesel) (May 2011)	FV-GP-01-HDOH	1,200	9,400	79,000	89,600
	FV-GP-08-HDOH	61,000	520,000	3,200,000	3,781,000
	FV-GP-16R-HDOH	23,000	1,100,000	4,800,000	5,923,000
	FV-GP-17-HDOH	310	7,000	11,000	18,310
Site E (diesel) (Oct 2011)	FV-GP-01-HDOH#2	72	8,400	20,000	28,472
	FV-GP-08-HDOH#2	9,700	680,000	920,000	1,609,700
	FV-GP-16R-HDOH#2	17,000	1,700,000	5,200,000	6,917,000

Red: Laboratory Reporting Limit noted or 1/2 MRL used for summation of carbon range data if other carbon ranges detected.

Table 16. Relative TPH carbon range concentrations in Summa canister soil gas samples and equivalent, weighted inhalation reference Concentration (RfC).

Site	Sample ID	Relative Carbon Range Composition (Summa samples)			[1]Weighted TPH RfC ($\mu g/m^3$)
		C9-10 Aromatics (RfC=100 $\mu g/m^3$)	C5-8 Aliphatics (RfC=600 $\mu g/m^3$)	C9-12 Aliphatics (RfC=100 $\mu g/m^3$)	
Fresh Fuels and Auto Exhaust	Gasoline#1	0.6%	99%	0.1%	578
	Gasoline #2	0.1%	98%	1.6%	553
	Gasoline Exhaust	8%	91%	1%	411
	JP8#1	3.5%	75%	22%	266
	Diesel#1	2.1%	84%	14%	330
	Diesel#2	9.7%	33%	57%	138
	Diesel#3	2.5%	77%	21%	278
	Diesel Exhaust	12%	73%	15%	256
Site A (JP-4/AVGAS) (May 2011)	HAFB-VP26-B05(18)-HDOH	0.1%	98%	1.8%	549
	HAFB-VP26-B05(24)-HDOH	0.7%	98%	0.9%	556
	HAFB-VP26-B07(20)-HDOH	0.1%	98%	1.8%	549
	HAFB-VP26-B07(25)-HDOH	0.0%	100%	0.1%	595
	HAFB-VP26-B08(21)-HDOH	0.1%	88%	12%	373
Site A (JP-4/AVGAS) (October 2011)	HAFB-VP26-B05(18)	0.0%	97%	2.8%	525
	HAFB-VP26-B05(24)	0.1%	100%	0.2%	591
	HAFB-VP26-B07(20)	0.0%	99%	0.7%	580
	HAFB-VP26-B07(25)	0.0%	100%	0.4%	588
Site B (mixed fuels) (August 2011)	HH-OU1C-MW10SG	0.1%	97%	3%	525
	HH-OU1C-MW22R	0.1%	95%	5%	475
	HH-OU1C-OTNS1	0.3%	82%	18%	316
Site B (mixed fuels) (October 2011)	HH-OU1C-MW10SG	0.0%	98%	1.5%	558
	HH-OU1C-MW22R	0.0%	96%	3.5%	510
	HH-OU1C-OTNS1	1.1%	89%	10%	383

Table 16 (cont.). Relative TPH carbon range concentrations in Summa canister soil gas samples and equivalent, weighted inhalation reference Concentration (RfC).

Site	Sample ID	Relative Carbon Range Composition (Summa samples)			[1]Weighted TPH RfC ($\mu g/m^3$)
		C9-10 Aromatics (RfC=100 $\mu g/m^3$)	C5-8 Aliphatics (RfC=600 $\mu g/m^3$)	C9-12 Aliphatics (RfC=100 $\mu g/m^3$)	
Site C (JP-8 +/- JP-4)	HAFB-SP43-VMP10	0.6%	67%	33%	225
	HAFB-SP43-VMP11	0.4%	70%	30%	240
	HAFB-SP43-VMP12	1.3%	70%	29%	238
	HAFB-SP43-VMP16	0.3%	85%	15%	339
	HAFB-SP43-VMP17	0.5%	70%	29%	242
Site D (JP-4/AVGAS) (July 2011)	HAFB-ST03-B58 (347)	0.2%	75%	25%	267
	HAFB-ST03-B58 (422)	0.2%	80%	20%	299
	HAFB-ST03-B58 (492)	0.2%	79%	21%	294
	HAFB-ST03-B59 (388)	0.1%	80%	20%	302
Site D (JP-4/AVGAS) (October 2011)	HAFB-ST03-B58 (347)	7.1%	51%	42%	175
	HAFB-ST03-B58 (422)	4.7%	48%	48%	166
	HAFB-ST03-B58 (492)	6.5%	51%	42%	174
	HAFB-ST03-B59 (388)	14%	42%	44%	153
Site E (diesel) (May 2011)	FV-GP-01-HDOH	1.3%	10%	88%	110
	FV-GP-08-HDOH	1.6%	14%	85%	113
	FV-GP-16R-HDOH	0.4%	19%	81%	118
	FV-GP-17-HDOH	1.7%	38%	60%	147
Site E (diesel) (Oct 2011)	FV-GP-01-HDOH#2	0.3%	30%	70%	133
	FV-GP-08-HDOH#2	0.6%	42%	57%	154
	FV-GP-16R-HDOH#2	0.2%	25%	75%	126

Red: Not detected, relative percentage based on 1/2 MRL.

Table 17a. Summary of average TPH carbon range composition for fuels and samples from key sites based on Summa canister samples.

Site/Fuel Type	Average Carbon Range Composition (Summa Canister Data)			[1]Weighted RfC (µg/m^3)	[2]Indoor Air Action Level Residential (µg/m^3)	[3]Soil gas Action Level Residential (µg/m^3)	[2]Indoor Air Action Level C/I (µg/m^3)	[3]Soil gas Action Level C/I (µg/m^3)
	Aromatics	Aliphatics						
	C9-10	C5-8	C9-12					
Gasoline (Fresh Vapors)	0.4%	99%	0.8%	565	590	590,000	820	1,649,000
Diesel (Fresh Vapors)	4.7%	64%	31%	216	250	250,000	230	631,000
JP-8 (Fresh Vapors)	0.6%	67%	33%	225	230	230,000	330	657,000
Site A (JP-4/AVGAS)	0.2%	96%	3.3%	510	530	530,000	740	1,480,000
Site B (mixed fuels)	0.3%	93%	6.8%	443	460	460,000	650	1,240,000
Site C (JP-8 +/- JP-4)	0.6%	72%	27%	251	260	260,000	370	733,000
Site D (JP-4/AVGAS)	4.1%	63%	33%	211	220	220,000	310	616,000
Site E (diesel)	0.9%	25%	74%	127	130	130,000	190	371,000

1. Based on 2009 USEPA-NCEA Reference Concentrations for individual carbon ranges (C9+ aromatics = 100 µg/m^3, C5-C8 aliphatics = 600 µg/m^3, C9+ aliphatics = 100 µg/m^3).

2. Based on model and exposure parameter assumptions discussed in the HEER office EHE guidance (HDOH 2011).

3. Soil gas action levels based indoor air:subslab soil gas attenuation factor of 0.001 (1/1,000) for residential structures and 0.0005 (1/2,000) for commercial/industrial structures (HDOH 2011).

Table 17b. Relative contribution of target carbon ranges to total TPH noncancer hazard (average of Summa canister data).

Site/Fuel Type	Relative Contribution to Total TPH Noncancer Hazard (TO-15 Data)		
	Aromatics	Aliphatics	
	C9-10	C5-8	C9-12
Gasoline (Fresh Vapors)	2.3%	93%	4.9%
Diesel (Fresh Vapors)	10%	22%	67%
JP-8 (Fresh Vapors)	1.4%	24%	75%
Site A (JP-4/AVGAS)	1.1%	81%	18%
Site B (mixed fuels)	1.2%	69%	31%
Site C (JP-8 +/- JP-4)	1.6%	29%	69%
Site D (JP-4/AVGAS)	8.8%	21%	70%
Site E (diesel)	1.1%	5.1%	95%

Table 18. Reported TPH carbon range concentrations in sorbent tube soil gas samples.

Site	Sample ID	Reported Carbon Range Concentrations (µg/m^3)					
		Aromatics		Aliphatics			Sum Carbon Ranges
		C9-10	C11-C16	C5-8	C9-12	C13-18	
Fresh Fuels and Auto Exhaust	Gasoline #2 (A)	340,000	20,000	16,000,000	7,000	20,000	16,387,000
	Gasoline Exhaust (A)	1,250	5,000	34,000	34,000	5,000	79,250
	JP8#1 (A)	190,000	17,000	1,800,000	1,300,000	150,000	3,457,000
	Diesel#3-HDOH (A)	23,000	5,000	470,000	190,000	78,000	766,000
	Diesel Exhaust (A)	ND (<500)	ND (<2000)	ND (<460)	ND (<700)	ND (<2000)	ND (<5,660)
Site A (JP-4/AVGAS)	HAFB-VP26-B05(18)-HDOH (A)	9,300	4,000	12,000,000	750,000	4,000	12,767,300
	HAFB-VP26-B05(24)-HDOH (A)	17,000	4,000	64,000,000	430,000	4,000	64,455,000
	HAFB-VP26-B07(20)-HDOH (A)	5,400	4,000	13,000,000	180,000	4,000	13,193,400
	HAFB-VP26-B07(25)-HDOH (A)	5,200	4,000	29,000,000	220,000	4,000	29,233,200
Site B (mixed fuels)	HH-OU1C-MW10SG (A)	31,000	4,000	35,000,000	1,900,000	13,000	36,948,000
	HH-OU1C-MW22R (A)	110,000	4,000	20,000,000	2,800,000	120,000	23,034,000
	HH-OU1C-OTNS1 (A)	ND (<500)	ND (<2000)	ND (<460)	ND (<700)	ND (<2000)	ND (<5,660)
Site C (JP-8 +/- JP-4)	HAFB-SP43-VMP10 (A)	180,000	4,000	13,000,000	650,000	66,000	13,900,000
	HAFB-SP43-VMP11 (A)	140,000	4,000	17,000,000	6,200,000	100,000	23,444,000
	HAFB-SP43-VMP12 (A)	ND (<500)	ND (<2000)	ND (<460)	ND (<700)	ND (<2000)	ND (<5,660)
	HAFB-SP43-VMP16 (A)	130,000	1,000	26,000,000	4,600,000	12,000	30,743,000
	HAFB-SP43-VMP17 (A)	210	850	7,500	2,800	850	12,210

Table 18 (cont.). Reported TPH carbon range concentrations in sorbent tube soil gas samples.

Site	Sample ID	Reported Carbon Range Concentrations (µg/m^3)					
		Aromatics		Aliphatics			Sum
		C9-10	C11-C16	C5-8	C9-12	C13-18	Carbon Ranges
Site D (JP-4/AVGAS)	HAFB-ST03-B58 (347) (A)	110,000	1,000	830,000	580,000	4,800	1,525,800
	HAFB-ST03-B58 (422) (A)	92,000	1,000	850,000	590,000	3,600	1,536,600
	HAFB-ST03-B58 (492) (A)	100,000	1,000	870,000	640,000	7,000	1,618,000
	HAFB-ST03-B59 (388) (A)	7,600	1,000	120,000	38,000	2,400	169,000
Site E (diesel)	FV-GP-01-HDOH (A)	210	850	11,000	13,000	850	25,910
	FV-GP-08-HDOH (A)	11,000	1,000	900,000	640,000	6,000	1,558,000
	FV-GP-16R-HDOH (A)	32,000	4,000	3,200,000	5,500,000	130,000	8,866,000

Red: Not detected, laboratory Reporting Limit noted or 1/2 MRL used for summation of carbon range data if other carbon ranges detected.

Table 19. Relative TPH carbon range concentrations in sorbent tube soil gas samples and equivalent, weighted inhalation Reference Concentration (RfC).

Site	Sample ID	Relative Carbon Range Composition					[2]Weighted TPH RfC (µg/m^3)
		Aromatics		Aliphatics			
		C9-10	C11-C16	C5-8	C9-12	C13-18	
Fresh Fuels and Auto Exhaust	Gasoline #2 (A)	2.1%	0.1%	98%	0.0%	0.0%	537
	Gasoline Exhaust (A)	1.6%	6.0%	43%	43%	6.3%	156
	JP8#1 (A)	5.5%	0.5%	52%	38%	4.3%	177
	Diesel#3-HDOH (A)	3.0%	1.0%	61%	25%	10%	205
	Diesel Exhaust (A)	-	-	-	-	-	-
Site A (JP-4/AVGAS)	HAFB-VP26-B05(18)-HDOH (A)	0.1%	0.0%	94.0%	5.9%	0.0%	461
	HAFB-VP26-B05(24)-HDOH (A)	0.0%	0.0%	99.3%	0.7%	0.0%	580
	HAFB-VP26-B07(20)-HDOH (A)	0.0%	0.0%	98.5%	1.4%	0.0%	559
	HAFB-VP26-B07(25)-HDOH (A)	0.0%	0.0%	99.2%	0.8%	0.0%	577
Site B (mixed fuels)	HH-OU1C-MW10SG (A)	0.1%	0.0%	94.7%	5.1%	0.0%	475
	HH-OU1C-MW22R (A)	0.5%	0.0%	86.8%	12.2%	0.5%	362
	HH-OU1C-OTNS1 (A)	-	-	-	-	-	-
Site C (JP-8 +/- JP-4)	HAFB-SP43-VMP10 (A)	1.3%	0.0%	94%	5%	0.5%	453
	HAFB-SP43-VMP11 (A)	0.6%	0.0%	73%	26%	0.4%	253
	HAFB-SP43-VMP12 (A)	-	-	-	-	-	-
	HAFB-SP43-VMP16 (A)	0.4%	0.0%	85%	15%	0.04%	339
	HAFB-SP43-VMP17 (A)	1.7%	7.0%	61%	23%	7.0%	205
Site D (JP-4/AVGAS)	HAFB-ST03-B58 (347) (A)	7.2%	0.1%	54.4%	38.0%	0.3%	183
	HAFB-ST03-B58 (422) (A)	6.0%	0.1%	55.3%	38.4%	0.2%	186
	HAFB-ST03-B58 (492) (A)	6.2%	0.1%	53.8%	39.6%	0.4%	181
	HAFB-ST03-B59 (388) (A)	4.5%	0.6%	71.0%	22.5%	1.4%	245
Site E (diesel)	FV-GP-01-HDOH (A)	0.8%	3.3%	42%	50%	3.3%	155
	FV-GP-08-HDOH (A)	0.7%	0.1%	58%	41%	0.4%	193
	FV-GP-16R-HDOH (A)	0.4%	0.0%	36%	62%	1.5%	143

Red: Not detected, relative percentage based on 1/2 MRL.

Table 20a. Summary of average TPH carbon range composition for fuels and samples from key sites based on sorbent tube samples.

Site/Fuel Type	Average Carbon Range Composition (Sorbent Tube Data)					[1]Weighted RfC (µg/m^3)	[2]Indoor Air Action Level Residential (µg/m^3)	[3]Soil gas Action Level Residential (µg/m^3)	[2]Indoor Air Action Level C/I (µg/m^3)	[3]Soil gas Action Level C/I (µg/m^3)
	Aromatics		Aliphatics							
	C9-10	C11-C16	C5-8	C9-12	C13-18					
Gasoline (Fresh Vapors)	2.1%	0.1%	98%	0.0%	0.1%	537	560	560,000	780	1,568,000
Diesel (Fresh Vapors)	3.0%	0.7%	61.4%	24.8%	10.2%	205	210	210,000	300	599,000
JP-8 (Fresh Vapors)	5.5%	0.5%	52%	38%	4.3%	177	180	180,000	260	517,000
Site A (JP-4/AVGAS)	0.0%	0.0%	98%	2.2%	0.0%	539	560	560,000	790	1,574,000
Site B (mixed fuels)	0.3%	0.0%	91%	8.6%	0.3%	411	430	430,000	600	1,200,000
Site C (JP-8 +/- JP-4)	1.0%	1.8%	78%	17%	2.0%	286	300	300,000	420	835,000
Site D (JP-4/AVGAS)	6.0%	0.2%	59%	35%	0.6%	196	200	200,000	290	572,000
Site E (diesel)	0.6%	1.1%	45%	51%	1.7%	161	170	170,000	240	470,000

1. Based on 2009 USEPA-NCEA Reference Concentrations for individual carbon ranges (C9+ aromatics = 100 µg/m^3, C5-C8 aliphatics = 600 µg/m^3, C9+ aliphatics = 100 µg/m^3).

2. Based on model and exposure parameter assumptions discussed in the HEER office EHE guidance (HDOH 2011).

Table 20b. Relative contribution of target carbon ranges to total TPH noncancer hazard (average of sorbent tube data).

Site/Fuel Type	Relative Contribution to Total TPH Noncancer Hazard (TO-17 Data)				
	Aromatics		Aliphatics		
	C9-10	C11-C16	C5-8	C9-12	C13-18
Gasoline (Fresh Vapors)	12%	0.7%	87%	0.2%	0.7%
Diesel (Fresh Vapors)	6.2%	1.3%	20%	51%	21%
JP-8 (Fresh Vapors)	9.8%	0.9%	15%	67%	7.7%
Site A (JP-4/AVGAS)	0.2%	0.1%	87%	12%	0.1%
Site B (mixed fuels)	1.2%	0.1%	61%	37%	1.2%
Site C (JP-8 +/- JP-4)	2.9%	5.1%	36%	50%	5.7%
Site D (JP-4/AVGAS)	12%	0.4%	18%	68%	1.2%
Site E (diesel)	1.0%	1.8%	12%	84%	2.8%

Table 21. Comparison of series sorbent tube samples for potential breakthrough (Tube A closest to well point).

Site	Sample ID	Highest of TPHg and TPHd ($\mu g/m^3$)		Total TPH (Tube A+Tube B)	[1]Percent Breakthrough
		Upstream (Tube A)	Downstream (Tube B)		
Fresh Fuels and Auto Exhaust	Gasoline #2	20,000,000	ND (100,000)	-	-
	Gasoline Exhaust	310,000	ND (100,000)	-	-
	JP8#1	2,100,000	120,000	2,220,000	5.4%
	Diesel#3-HDOH	2,000,000	ND (100,000)	-	-
	Diesel Exhaust	160,000	ND (100,000)	-	-
Site A (JP-4/AVGAS)	HAFB-VP26-B05(18)-HDOH	19,000,000	33,000	19,033,000	0.2%
	HAFB-VP26-B05(24)-HDOH	>37,000,000	ND (20,000)	-	-
	HAFB-VP26-B07(20)-HDOH	14,000,000	ND (20,000)	-	-
	HAFB-VP26-B07(25)-HDOH	29,000,000	ND (20,000)	-	-
Site B (mixed fuels)	HH-OU1C-MW10SG	30,000,000	ND (20,000)	-	-
	HH-OU1C-MW22R	29,000,000	39,000	29,039,000	0.1%
	HH-OU1C-OTNS1	ND (20,000)	ND (20,000)	-	-
Site C (JP-8 +/- JP-4)	HAFB-SP43-VMP10	18,000,000	ND (20,000)	-	-
	HAFB-SP43-VMP11	4,600,000	ND (20,000)	-	-
	HAFB-SP43-VMP12	ND (20,000)	ND (20,000)	-	-
	HAFB-SP43-VMP16	26,000,000	ND (20,000)	-	-
	HAFB-SP43-VMP17	20,000	ND (17,000)	-	-

Table 21 (cont.). Comparison of series sorbent tube samples for potential breakthrough (Tube A closest to well point).

Site	Sample ID	Sum of Detected TPH Carbon Range Fractions (µg/m^3)		Total TPH (Tube A+Tube B)	[1]Percent Breakthrough
		Upstream (Tube A)	Downstream (Tube B)		
Site D (JP-4/AVGAS) (October 2011)	HAFB-ST03-B58 (347)	1,600,000	26,000	1,626,000	1.6%
	HAFB-ST03-B58 (422)	1,600,000	ND (20,000)	-	-
	HAFB-ST03-B58 (492)	1,600,000	ND (20,000)	-	-
	HAFB-ST03-B59 (388)	180,000	ND (20,000)	-	-
Site E (diesel) (Oct 2011)	FV-GP-01-HDOH#2	27,000	19,000	46,000	41%
	FV-GP-08-HDOH#2	860,000	ND (20,000)	-	-
	FV-GP-16R-HDOH#2	10,000,000	ND (20,000)	-	-

1. Reported TPH in Tube B (downstream tube, closest to sampling syringe) divided by sum of TPH reported in Tube A plus Tube B.

Table 22. Vapor intrusion risk posed by TPH in soil gas at different target risks for benzene based on the average TPH carbon range makeup and TPH:Benzene ratio in vapor samples collected over fresh fuel or soil gas samples from key study sites based on comparison to Summa canister carbon range data.

			[3]TPH Vapor Intrusion Risk (HQ) at noted Benzene Concentration and Risk (Based on MA-APH Summa data)			
Site/Fuel Type	**[1]Average Soil Gas TPH:Benzene Ratio**	**[2]TPH Indoor Air Action Level ($\mu g/m^3$)**	**Benzene= 31 $\mu g/m^3$ (VI Risk=10^{-4})**	**Benzene= 3.1 $\mu g/m^3$ (VI Risk=10^{-5})**	**Benzene= 0.31 $\mu g/m^3$ (VI Risk=10^{-6})**	**[4]Vapor Intrusion Risk Driver**
Gasoline (Fresh Vapors)	170:1	590	8.9	0.9	0.1	TPH begins to drive vapor intrusion risk when benzene in soil gas or indoor exceeds a cancer risk of 10^{-4}.
Diesel (Fresh Vapors)	206:1	230	28	2.8	0.3	TPH begins to drive vapor intrusion risk as benzene in soil gas or indoor approaches a cancer risk of 10^{-5}.
JP-8 (Fresh Vapors)	301:1	230	41	4.1	0.4	
Site A (JP-4/AVGAS)	1,513:1	530	89	8.9	0.9	TPH begins to drive vapor intrusion risk when benzene in soil gas or indoor exceeds a cancer risk of 10^{-6}.
Site B (mixed fuels)	4,174:1	460	281	28	2.8	TPH drives vapor intrusion risk even when benzene in soil gas or indoor air is below a cancer risk of 10^{-6}.
Site C (JP-8 +/- JP-4)	18,710:1	260	2,231	223	22	
Site D (JP-4/AVGAS)	9,135:1	220	1,287	129	13	
Site E (diesel)	18,611:1	130	4,438	444	44	

1. See Tables 12 and 13a; TPH calculated as sum of carbon range data for Summa canister samples (does not consider >C10 aromatics or >C12 aliphatics).
2. See Table 17. Based on weighted TPH toxicity using Summa canister carbon range data and a noncancer Hazard Quotient of 1.0.
3. TPH vapor intrusion noncancer hazard quotient = (Soil Gas TPH:Benzene Ratio x Benzene Concentration)/TPH Indoor Air Action Level. Benzene indoor air action levels presented and discussed in HEER EHE guidance (HDOH 2011).
4. TPH drives vapor intrusion risk when HQ>1.0 at noted target benzene concentration and risk.

Table 23. Vapor intrusion risk posed by TPH in soil gas at different target risks for benzene based on the average TPH carbon range makeup and TPH:Benzene ratio in vapor samples collected over fresh fuel or soil gas samples from key study sites based on comparison to sorbent tube carbon range data.

			[3]TPH Vapor Intrusion Risk (HQ) at noted Benzene Concentration and Risk (Based on MA-APH sorbent tube data)			
Site/Fuel Type	**[1]Average Soil Gas TPH:Benzene Ratio**	**[2]TPH Indoor Air Action Level ($\mu g/m^3$)**	**Benzene= 31 $\mu g/m^3$ (VI Risk=10^{-4})**	**Benzene= 3.1 $\mu g/m^3$ (VI Risk=10^{-5})**	**Benzene= 0.31 $\mu g/m^3$ (VI Risk=10^{-6})**	**[4]Vapor Intrusion Risk Driver**
Gasoline (Fresh Vapors)	152:1	560	8.4	0.8	0.1	TPH begins to drive vapor intrusion risk when benzene in soil gas or indoor exceeds a cancer risk of 10^{-4}.
Diesel (Fresh Vapors)	389:1	210	57	5.7	0.6	TPH begins to drive vapor intrusion risk as benzene in soil gas or indoor approaches a cancer risk of 10^{-5}.
JP-8 (Fresh Vapors)	247:1	180	42	4.2	0.4	
Site A (JP-4/AVGAS)	965:1	560	53	5.3	0.5	
Site B (mixed fuels)	5,514:1	430	398	40	4.0	TPH drives vapor intrusion risk even when benzene in soil gas or indoor air is below a cancer risk of 10^{-6}.
Site C (JP-8 +/- JP-4)	12,772:1	300	1,320	132	13	
Site D (JP-4/AVGAS)	12,915:1	200	2,002	200	20	
Site E (diesel)	20,570:1	170	3,751	375	38	

1. See Tables 9 and 15. Average of benzene data based on Summa canister samples divided by TPH calculated as sum of carbon range data for sorbent tube samples (includes consideration of >C10 aromatics or >C12 aliphatics).
2. See Tables 19 and 20. Based on weighted TPH toxicity using sorbent tube carbon range data and a noncancer Hazard Quotient of 1.0.
3. TPH vapor intrusion noncancer hazard quotient = (Soil Gas TPH:Benzene Ratio x Benzene Concentration)/TPH Indoor Air Action Level. Benzene indoor air action levels presented and discussed in HEER EHE guidance (HDOH 2011).
4. TPH drives vapor intrusion risk when HQ>1.0 at noted target benzene concentration and risk.

Table 24. Vapor intrusion risk posed by TPH in soil gas at different target risks for ethylbenzene based on the average TPH carbon range makeup and TPH:Ethylbenzene ratio in vapor samples collected over fresh fuel or soil gas samples from key study sites based on comparison to Summa canister carbon range data.

			[1]TPH Vapor Intrusion Hazard Quotient vs Ethylbenzene Concentration and Risk			
Site/Fuel Type	**[1]TPH: Ethylbenzene Ratio (Summa data)**	**[1]TPH Indoor Air Action Level ($\mu g/m^3$)**	**Ethylbenzene =97 $\mu g/m^3$ (VI Risk=10^{-4})**	**Ethylbenzene =9.7 $\mu g/m^3$ (VI Risk=10^{-5})**	**Ethylbenzene =0.97 $\mu g/m^3$ (VI Risk=10^{-6})**	**Vapor Intrusion Risk Driver**
Gasoline (Fresh Vapors)	442:1	590	73	7.3	0.7	TPH begins to drive vapor intrusion risk as ethylbenzene in soil gas or indoor approaches a cancer risk of 10^{-5}.
Diesel (Fresh Vapors)	113:1	230	47	4.7	0.5	
JP-8 (Fresh Vapors)	273:1	230	115	12	1.2	TPH begins to drive vapor intrusion risk when ethylbenzene in soil gas or indoor air is below a cancer risk of 10^{-6}.
Site A (JP-4/AVGAS)	4,033:1	530	738	74	7.4	
Site B (mixed fuels)	-	460	-	-	-	
Site C (JP-8 +/- JP-4)	6,983:1	260	2,605	261	26	
Site D (JP-4/AVGAS)	1,567:1	220	691	69	6.9	
Site E (diesel)	34,373:1	130	25,647	2,565	256	

1. See Table 9; TPH calculated as sum of carbon range data for Summa canister tube samples (does not includes consideration of >C10 aromatics or >C12 aliphatics).
2. See Table 17. Based on weighted TPH toxicity using Summa canister carbon range data and a noncancer Hazard Quotient of 1.0.
3. TPH vapor intrusion noncancer hazard quotient = (Soil Gas TPH:Ethylbenzene Ratio x Ethylbenzene Concentration)/TPH Indoor Air Action Level. Ethylbenzene indoor air action levels presented and discussed in HEER EHE guidance (HDOH 2011).
4. TPH drives vapor intrusion risk when HQ>1.0 at noted target ethylbenzene concentration and risk.

Table 25. Summary of TPH versus benzene as the vapor intrusion risk driver for vapors over fresh fuel and samples collected at key study sites.

Site/Fuel Type	Vapor Intrusion Risk Driver	
	TPH Drives Risk	**[1]Benzene Drives Risk**
Gasoline (Fresh Vapors)		X
Diesel (Fresh Vapors)		X
JP-8 (Fresh Vapors)		X
Site A (JP-4/AVGAS)	X	X
Site B (mixed fuels)	X	
Site C (JP-8 +/- JP-4)	X	
Site D (JP-4/AVGAS)	X	
Site E (diesel)	X	

1. Assuming a minimum, target benzene cancer risk of 10^{-5} for fresh fuels and 10^{-6} for aged release sites..

Table 26a. Comparison of laboratory methods for Total Petroleum Hydrocarbons (TPH) in soil gas samples (Phase II data).

Sample ID	TO-3 (TPHg)	TO-15 (TPHg)	TO-17 (TPHg)	[1]TO-17 (TPHd)	TO-15 MA-APH (sum of carbon ranges)	TO-17 MA-APH (sum of carbon ranges)
Gasoline #2	3,800,000	26,000,000	20,000,000	ND (<400,000)	8,342,000	16,387,000
JP8#1	7,200,000	14,000,000	2,100,000	380,000	6,010,000	3,457,000
Diesel#3-HDOH	540,000	570,000	1,100,000	2,000,000	208,200	766,000
HAFB-SP43-VMP10	22,000,000	40,000,000	18,000,000	730,000	19,520,000	13,900,000
HAFB-SP43-VMP11	30,000,000	45,000,000	4,600,000	710,000	19,982,000	23,444,000
HAFB-SP43-VMP12	3,200	6,100	10,000	ND (<20,000)	2,158	ND (<5,660)
HAFB-SP43-VMP16	82,000,000	86,000,000	26,000,000	320,000	37,830,000	30,743,000
HAFB-SP43-VMP17	8,000,000	11,000,000	20,000	ND (<17,000)	6,530,000	12,210
FV-GP-01-HDOH	39,000	53,000	27,000	ND (<17,000)	28,472	25,910
FV-GP-08-HDOH	2,200,000	2,700,000	860,000	130,000	1,609,700	1,558,000
FV-GP-16R-HDOH	6,100,000	13,000,000	10,000,000	890,000	6,917,000	8,866,000
HAFB-VP26-B05(18)-HDOH	46,000,000	130,000,000	19,000,000	ND (<80,000)	49,412,000	12,767,300
HAFB-VP26-B05(24)-HDOH	320,000,000	270,000,000	37,000,000	ND (<80,000)	94,275,000	64,455,000
HAFB-VP26-B07(20)-HDOH	42,000,000	110,000,000	14,000,000	ND (<80,000)	38,267,500	13,193,400
HAFB-VP26-B07(25)-HDOH	140,000,000	300,000,000	29,000,000	ND (<80,000)	100,396,000	29,233,200
HAFB-ST03-B58 (347)	1,400,000	1,800,000	1,600,000	1,200,000	624,000	1,525,800
HAFB-ST03-B58 (422)	1,700,000	2,400,000	1,600,000	1,100,000	944,000	1,536,600
HAFB-ST03-B58 (492)	1,700,000	2,600,000	1,600,000	1,200,000	898,000	1,618,000
HAFB-ST03-B59 (388)	180,000	220,000	180,000	170,000	72,000	169,000
HH-OU1C-MW10SG	100,000,000	220,000,000	30,000,000	170,000	67,017,000	36,948,000
HH-OU1C-MW22R	39,000,000	180,000,000	29,000,000	710,000	65,304,100	23,034,000
HH-OU1C-OTNS1	2,100	2,100	ND (<20,000)	ND (<20,000)	699	ND (<5,660)

Notes

1. TO-17 TPHdiesel data provided for reference only. Note that the reported concentration of TPHd in the vapor sample collected over fresh diesel was higher than the reported concentration of TPHg for the same sample, calibrated to a gasoline standard.

Table 26b. Relative proportion of reported TPHg with respect to highest concentration reported for that sample (see also Figure 40).

Sample ID	TO-3 (TPHg)	TO-15 (TPHg)	TO-17 (TPHg)	TO-17 (TPHd)	TO-15 MA-APH (sum of carbon ranges)	TO-17 MA-APH (sum of carbon ranges)
Gasoline #2	0.1	1.0	0.8	-	0.3	0.6
JP8#1	0.5	1.0	0.2	-	0.4	0.2
Diesel#3-HDOH	0.5	0.5	1.0	-	0.2	0.7
HAFB-SP43-VMP10	0.6	1.0	0.5	-	0.5	0.3
HAFB-SP43-VMP11	0.7	1.0	0.1	-	0.4	0.5
HAFB-SP43-VMP12	0.3	0.6	1.0	-	0.2	0.6
HAFB-SP43-VMP16	1.0	1.0	0.3	-	0.4	0.4
HAFB-SP43-VMP17	0.7	1.0	0.0	-	0.6	0.0
FV-GP-01-HDOH	0.7	1.0	0.5	-	0.5	0.5
FV-GP-08-HDOH	0.8	1.0	0.3	-	0.6	0.6
FV-GP-16R-HDOH	0.5	1.0	0.8	-	0.5	0.7
HAFB-VP26-B05(18)-HDOH	0.4	1.0	0.1	-	0.4	0.1
HAFB-VP26-B05(24)-HDOH	1.0	0.8	0.1	-	0.3	0.2
HAFB-VP26-B07(20)-HDOH	0.4	1.0	0.1	-	0.3	0.1
HAFB-VP26-B07(25)-HDOH	0.5	1.0	0.1	-	0.3	0.1
HAFB-ST03-B58 (347)	0.8	1.0	0.9	-	0.3	0.8
HAFB-ST03-B58 (422)	0.7	1.0	0.7	-	0.4	0.6
HAFB-ST03-B58 (492)	0.7	1.0	0.6	-	0.3	0.6
HAFB-ST03-B59 (388)	0.8	1.0	0.8	-	0.3	0.8
HH-OU1C-MW10SG	0.5	1.0	0.1	-	0.3	0.2
HH-OU1C-MW22R	0.2	1.0	0.2	-	0.4	0.1
HH-OU1C-OTNS1	0.1	0.1	1.0	-	0.0	0.3
Average:	0.6	0.9	0.5		0.4	0.4

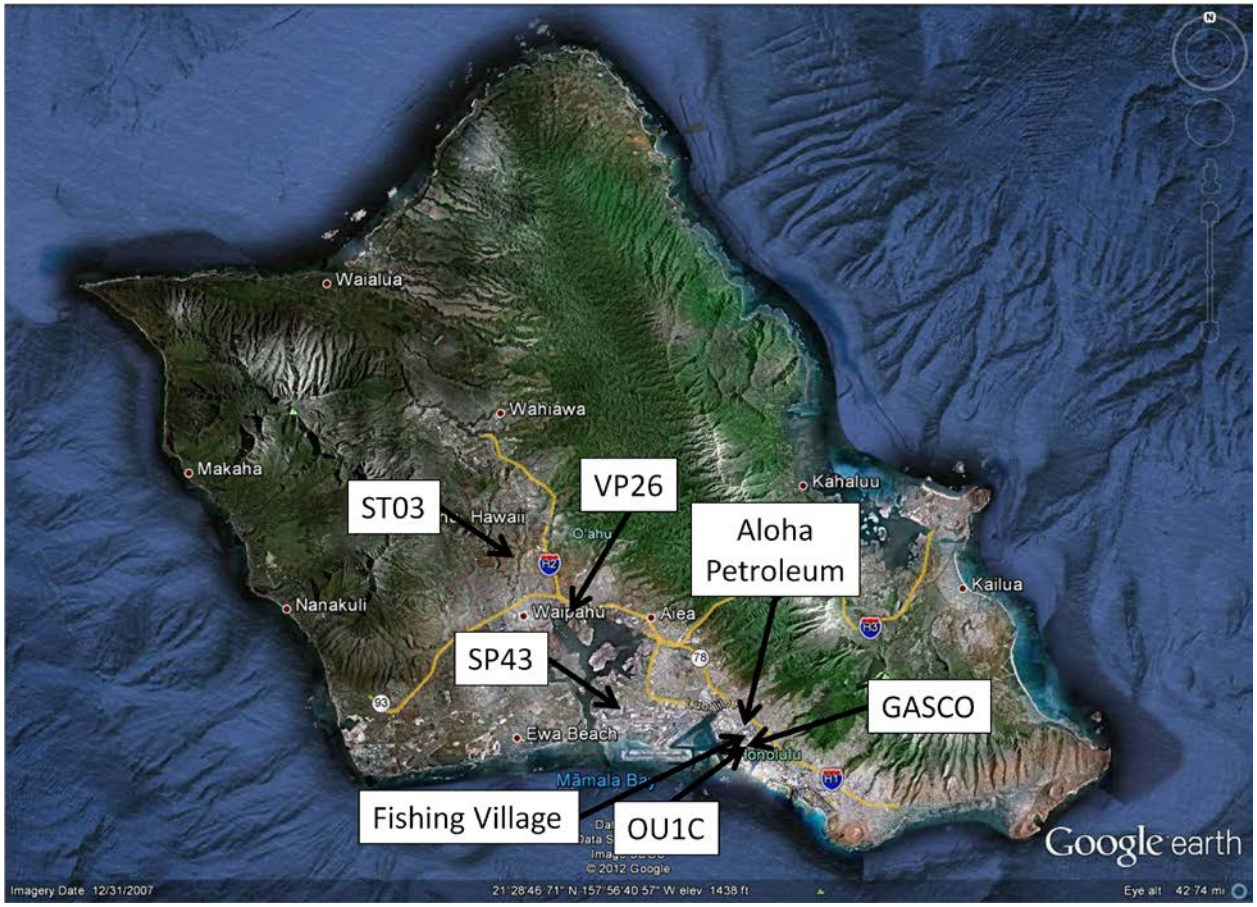
Table 27. Comparison of laboratory methods for benzene in soil gas samples (Phase II data).

Site	Sample ID	[1]TO-15 Benzene (µg/m^3)	[2]TO-17 Benzene (µg/m^3)	[3]TO-3 Benzene (µg/m^3)
Fresh Fuels and Auto Exhaust	Gasoline #2	29,000	340,000	28,000
	Gasoline Exhaust	4,700	3,900	5,400
	JP8#1	20,000	7,600	19,000
	Diesel#3	1,000	2,800	2,000
	Diesel Exhaust	14	430	36
Site A (October 2011)	HAFB-VP26-B05(18)-HDOH	40,000	16,000	150,000
	HAFB-VP26-B05(24)-HDOH	280,000	620,000	1,000,000
	HAFB-VP26-B07(20)-HDOH	84,000	35,000	180,000
	HAFB-VP26-B07(25)-HDOH	45,000	22,000	700,000
Site B (October 2011)	HH-OU1C-MW10SG	16,000	10,000	360,000
	HH-OU1C-MW22R	16,000	3,600	130,000
	HH-OU1C-OTNS1	3.1	64	34
Site C	HAFB-SP43-VMP10	1,600	1,700	500
	HAFB-SP43-VMP11	480	750	11,000
	HAFB-SP43-VMP12	4.8	80	3.8
	HAFB-SP43-VMP16	1,500	1,200	1,600
	HAFB-SP43-VMP17	500	53	160
Site D (October 2011)	HAFB-ST03-B58 (347)	32	81	42
	HAFB-ST03-B58 (422)	43	91	500
	HAFB-ST03-B58 (492)	42	130	750
	HAFB-ST03-B59 (388)	180	70	580
Site E (Oct 2011)	FV-GP-01-HDOH	4.7	100	96
	FV-GP-08-HDOH	49	320	2,400
	FV-GP-16R-HDOH	245	260	2,200

Notes:

1. Benzene reported for Summa canister sample using TO-15 (reported with MA-APH data; see Table 9 and Attachment 6).
2. Benzene reported for sorbent tube sample using TO-17 (reported with MA-APH data; see Attachment 6).
3. Benzene reported for Summa canister sample using TO-3 (see Attachment 6). Most TO-3 benzene data qualified by laboratory: "Reported value may be biased due to apparent matrix interferences."

Figure 1. Project site locations. All sites located on O‘ahu, Hawai‘i.



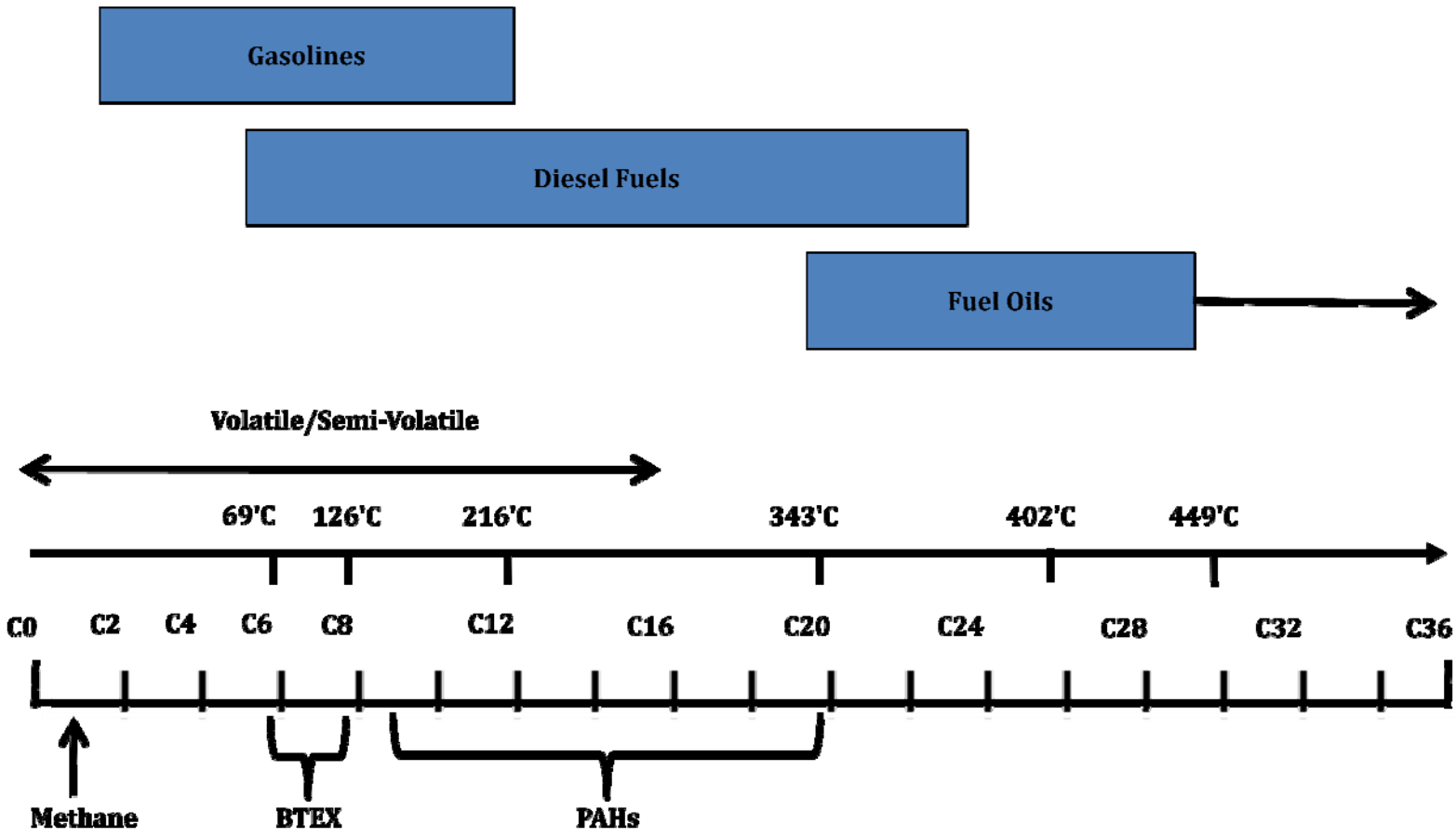


Figure 2a. Composition of typical petroleum fuels with respect to the number of carbon molecules in individual compounds.

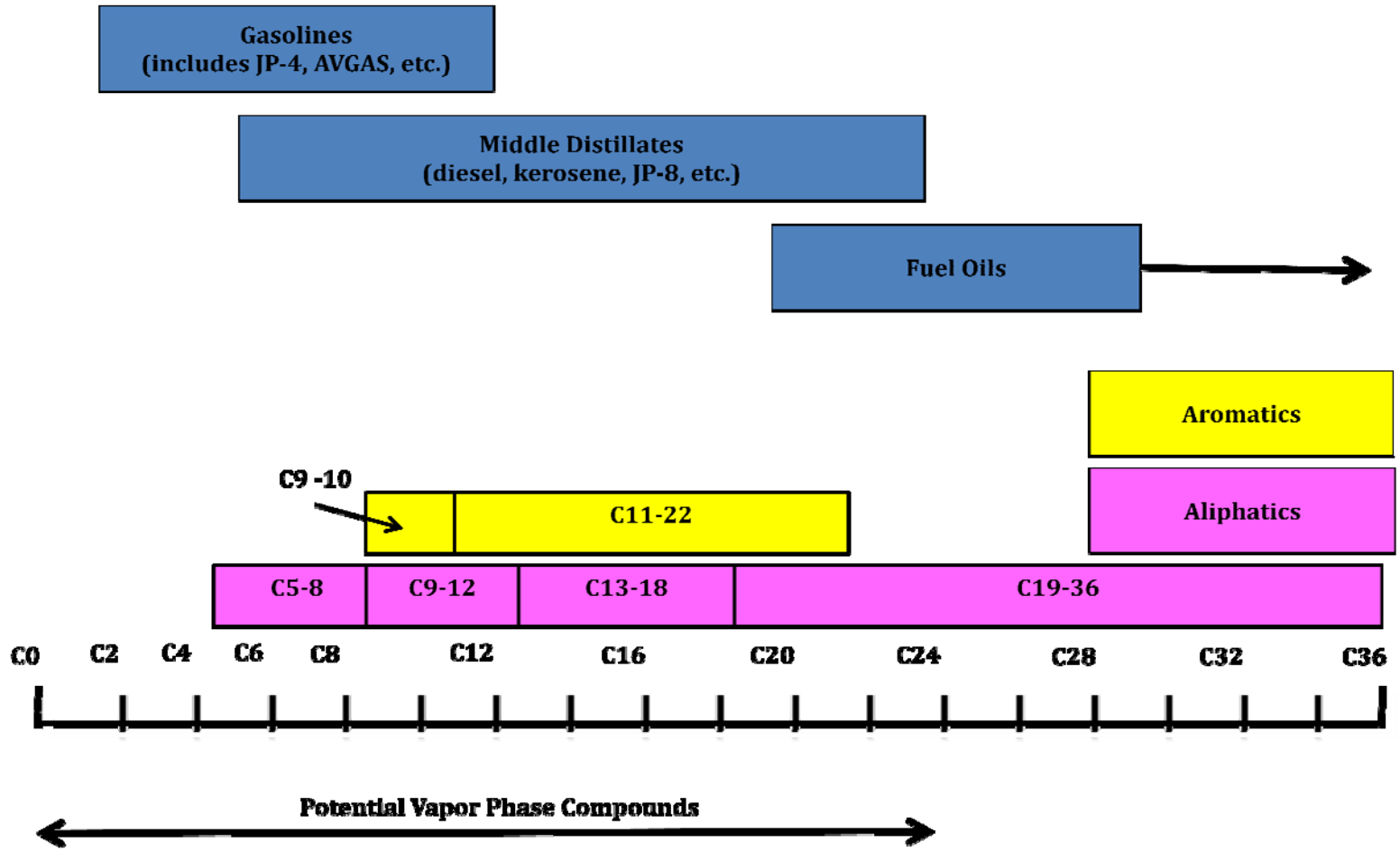


Figure 2b. Massachusetts DEP TPH Carbon Ranges. "TPH" represents the sum of individual aromatic and aliphatic carbon range fractions, excluding BTEX, naphthalene and other individually targeted compounds. Vapor-phase TPH is typically dominated by C5-C8 and C9-C12 aliphatic compounds.

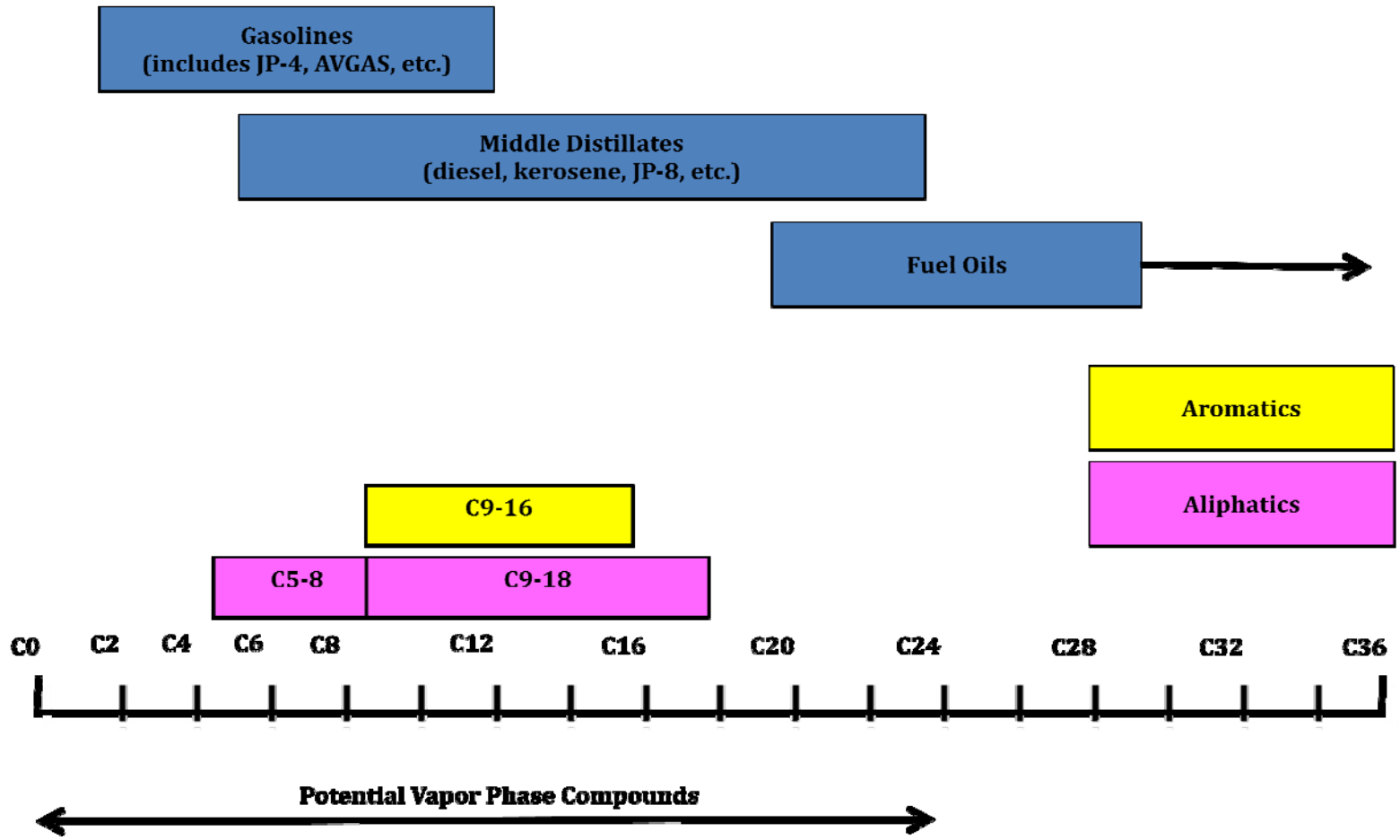
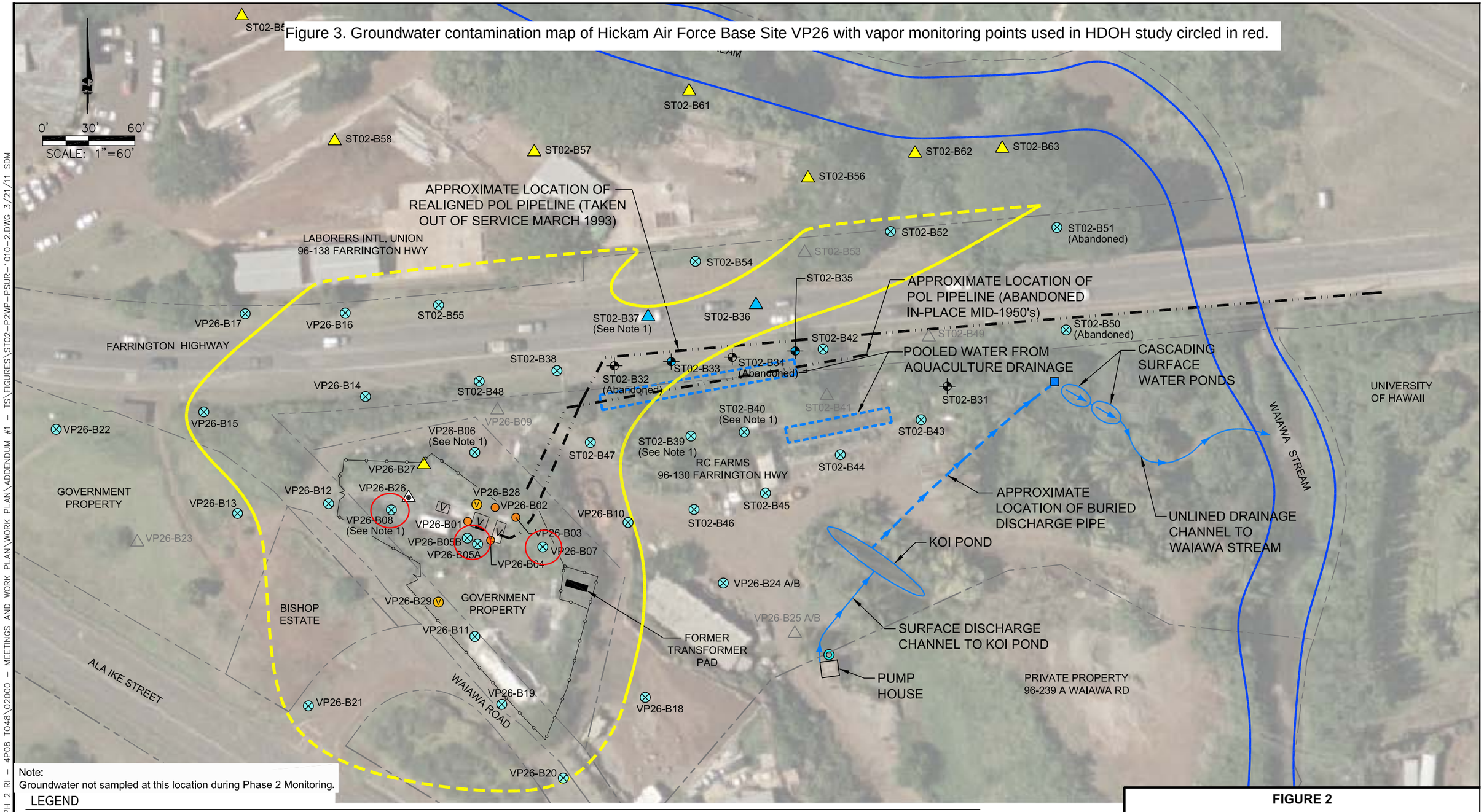


Figure 2c. Target vapor-phase aliphatic and aromatic carbon range fractions.

Figure 3. Groundwater contamination map of Hickam Air Force Base Site VP26 with vapor monitoring points used in HDOH study circled in red.



Note:
Groundwater not sampled at this location during Phase 2 Monitoring.

LEGEND

- Phase 1 Soil, Soil Vapor, and Groundwater Sampling Location with Permanent MW Installation
- Phase 1 Monitoring Wells Sampled during Phase 2
- Phase 1 Soil and Soil Vapor Sampling Location
- Phase 2 Sampling Location and Installed Groundwater Monitoring Well
- Valve Pit
- Phase 2 Soil and Groundwater "Grab Sample" Location
- Proposed Additional Phase 2 Soil and Groundwater Sampling Location
- Proposed Phase 2 Soil and Groundwater Sampling Location - Not Sampled
- Proposed LNAPL Recovery Well
- Bioventing Well
- Koi Pond Effluent Transition To Surface Flow
- Active Irrigation Well
- Estimated extent of groundwater contamination following the Phase 2 investigation matching or exceeding 2008 EALs (dotted line represents undefined extent)
- Approximate location of stream bank
- Approximate Location of POL Pipeline
- Approximate Property Boundary
- Chainlink Fence

FIGURE 2

SITE LAYOUT AND PROPOSED ADDITIONAL PHASE 2 RI SAMPLING LOCATIONS ST02 AND VP26 IRP SITE ST02

Hickam POL Pipeline, Oahu, Hawaii

PARSONS

Honolulu, Hawaii

S:\ES\REMED\746859 – HPOL PH 2 RI – 4P08 TO48\02000 – MEETINGS AND WORK PLAN\WORK PLAN\ADDENDUM #1 – TS\FIGURES\ST02-P2WP-PSUR-1010-2.DWG 3/21/11 SDM

Figure 4. LNAPL thickness map of Honolulu Harbor OU1C site with vapor monitoring points used in HDOH study circled in red.

Prepared by: URS Corp. J:\IDPP_Project\av_project\60_SoilGasInvestigation\Phase2\Fig2_OU1C_DOTHarbors_SoilGasLocs_081009.mxd ssm 10-16-09

OU3

Nimitz Highway eastbound

OU1C

Former Roberts Yard

Oceantronics

Bella Pietra / McCabe Hamilton

Harbor Police

PIER 24

PIER 23

Soil probe OTNS-1A was installed 6/10/2011 (4 feet North and 2 feet East of OTNS-1)

Soil probe OTNS-1 was abandoned 6/6/2011

OTPD-1
OTSS-2
OTNS-1
OTNS-2
OTSS-1
OTSS-3
MW-13
MW-14
MW22-SG
MW-22
MW-48
BPSS-1
BPPD-1
BPSS-3
BPSS-5
BPSS-2
BPSS-2
MW-15
HPSS-1
HPSS-4
HPSS-2
HPSS-3
HPPD-1
MW10-SG
MW-10
PRT-SG
MW-07
MW07-SG

N

0 25 50 100 150 Feet

IDPP
IWILEI DISTRICT Participating Parties, LLC

Legend

- MONITORING WELL LOCATION
- 2007 PHASE 1 LNAPL AND SOIL GAS SAMPLE LOCATION
- LNAPL SAMPLE LOCATION
- SUB-SLAB SOIL GAS SAMPLE LOCATION
- SOIL GAS SAMPLE LOCATION
- NEAR-SLAB SOIL GAS SAMPLE LOCATION
- LOCATION INCLUDES PRESSURE DIFFERENTIAL PROBE AND SUB-SLAB SOIL GAS SAMPLE LOCATION, APPROXIMATELY ONE FOOT APART

Name DENOTES AREA BUSINESSES

SPECIFIC VOLUME (GAL/SQ FT)
- 0.01-1.00
- 1.01-2.00
- 2.01-3.00
- 3.01-4.00

OU BOUNDARIES
- OU1C
- OU2
- OU3

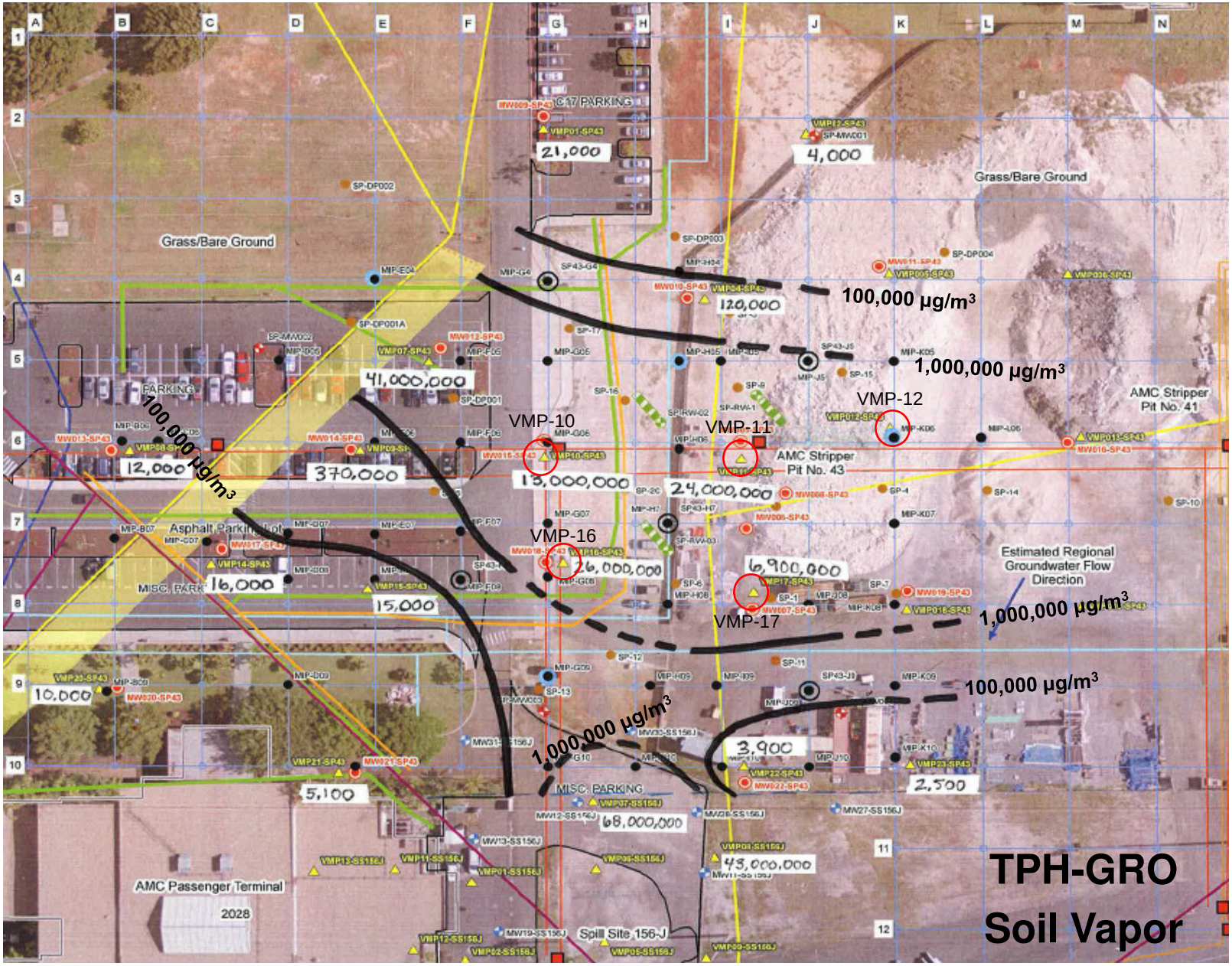
NOTES:
Specific volume contours based on Figure 5-6 from LCSM (Aquiver, Inc., 2009).
Imagery was obtained from the United States Geological Survey data clearinghouse at: http://hawaii.wr.usgs.gov/oahu/earthdata.html. Imagery was collected by National Geospatial-Intelligence Agency between February 2004 and May 2005.

Soil Gas and LNAPL Sample Locations

Honolulu, Oahu, Hawaii

Figure 2

Figure 5. TPHg soil gas map of Hickam Air Force Base Site SP43 with vapor monitoring points used in HDOH study circled in red.



S:\ES\REMED\747579 – HICKAM ST03 PH 3 RI\02000 – MEETINGS AND WORK PLANS\WORK PLANS\PRE– DRAFT\WP\FIGURES\CAD\HICK–ST03LAYOUT3.DWG 2/28/11 SDM

Figure 6. Soil contamination map of Hickam Air Force Base Site ST03 with vapor monitoring points used in HDOH study circled in red.

94-474 HOKUILI ST
ST03-B70 (ABANDONED)
CASTLE & COOKE HOMES HAWAII, INC.
ST03-B71
94-393 ANANIA DR.
ST03-B69
VP15
ST03-B50
ST03-B51
TEMPORARY ACCESS RAMP
UTILITY ESMT.
EWA PL
ST03-B56
ST03-B49
ST03-B53
PROPOSED VMP TO BE DELETED FROM THE PHASE 3 PROGRAM
ST03-B54
ST03-B52
ST03-B52A
ST03-B67
ST03-B60 (MULTIDEPTH VMP)
ST03-B47
ST03-B46
ST03-B59 (NESTED VW)
ST03-B58
94-397 ANANIA DR.
94-399 ANANIA DR.
WATER ESMT.
ST03-B57
ST03-B44
ST03-B43
ST03-B42
VP15A
ST03-B45
94-425 HOKULEWA PL
ST03-B55
KAMEHAMEHA HWY (STATE OF HAWAII)
94-401 ANANIA DR.
ST03-B68
94-0 STATE OF HAWAII
94-380 KUAHELANI AVE
94-403 ANANIA DR.
EDGE OF PAVEMENT
ARMY COMM. LINES AND FIBER OPTIC CABLE IN PARALLEL TRENCHES
APPROXIMATE LOCATION OF POL PIPELINES
94-407 ANANIA DR.
94-409 ANANIA DR.
ANANIA DR. (CITY & COUNTY OF HONOLULU)

LEGEND

- Phase 3 Boring and Monitoring Well
- Phase 3 Boring and Multidepth VMP
- Phase 3 Boring and Nested VW
- Approximate Location of POL Pipelines
- Approximate Property Boundary
- Approximate Easement Boundary
- Guardrail
- Buried Utility Line
- Utility Box
- Valve Pit
- Estimated Extent of Soil Contamination Exceeding Tier 1 EALs
- Phase 1 RI Soil and Soil Vapor Sampling Location (Installed in Jan/Feb 2008)
- Phase 2 RI Soil and Soil Vapor Sampling Location (Installed in Sept/Oct 2009) Completed as a Vapor Monitoring Point
- Phase 2 RI Soil and Soil Vapor Sampling Location (Installed in Sept/Oct 2009) Completed as a Vent Well
- Abandoned Phase 2 RI Soil Sampling Location (Installed in Sept/Oct 2009)
- Angled Boring (red triangle indicates boring location at ground surface; open triangle indicates termination of boring at subsurface depth).
- Phase 2 RI Soil Vapor Sampling Location (Installed Oct/Nov 2010)

Notes:
1. Surveyed coordinates for Phase 1 Remedial Investigation (RI) locations are in WGS 84, UTM Zone 4N (meters), and were provided by Ace Land Surveying, LLC., Honolulu, HI.
2. Geo-referenced aerial imagery obtained from USGS Earth Data Imagery website http://hawaii.wr.usgs.gov/oahu/earthdata.html (projected in UTM).
3. Geo-referenced property boundaries obtained from City and County of Honolulu, Dept. of Permitting & Planning website – http://gis.hicentral.com (as of October, 2008; projected in UTM).
4. Surveyed coordinates for Phase 2 RI locations are in WGS 84, UTM Zone 4N (meters), and were provided by Hawaii Engineering Group, Inc., Honolulu, HI.

0' 20' 40'
SCALE: 1"=40'

FIGURE 1

SITE LAYOUT AND SAMPLING LOCATIONS
SUBSITE ST03

Phase 3 RI/TS at Subsite ST03
Hickam POL Pipeline
Oahu, Hawaii

PARSONS
Honolulu, Hawaii

Figure 7. TPHg soil gas map of Fishing Village site with vapor monitoring points used in HDOH study circled in black.

Figure 8. Groundwater TPH gasoline map of the School Street Aloha Petroleum site with vapor monitoring points used in HDOH study circled in red.

LEGEND

- Monitoring Well and Concentration (mg/L)
- Wells Not Used for Groundwater Monitoring
- Former UST Location
- Concentration Isocontour (mg/L) (Dashed where inferred)
- Areal Extent of Plume (mg/L)
  - 10 - 100
  - > 100

Notes:

This figure represents one interpretation of contaminant migration; other interpretations are possible.

Groundwater sample data presented in this figure were collected December 20 through 30, 2010.

There is no DOH GAL for TPH-G.

Where two monitoring wells were completed adjacent to each other, and at different screened intervals, the data from the well exhibiting the highest concetration was used for contouring.

J indicates an estimated value. Analyte detected at a level less than the Reporting Limit (RL) and greater than or equal to the Method Detection Limit (MDL).

Distribution of TPH-G in Groundwater

RELEASE RESPONSE REPORT - 4TH QUARTER 2010
Aloha Petroleum, Ltd. – Island Mini Mart
1403 North School Street - Honolulu, Hawaii

WESTON SOLUTIONS
841 BISHOP STREET SUITE 2301 HONOLULU, HAWAII 96813 808.275.2900

DRAWN	DATE	CONTRACT NO.
S. Fallon	2010-12-23	
CHKD BY: M. Ambler	CHK DATE: 2010-12-23	WORK ORDER NUMBER:

SHEET

Figure 6-5

Figure 9. Benzene soil gas map of GASCO site with vapor monitoring points used in HDOH study circled in red.

LETTER OF COMPLETION
(HDOH, 2008b)

NO FURTHER ACTIVE
REMEDIATION DETERMINED
(HDOH, 2008a)

N

S

IWILEI ROAD

FORMER FUEL
LOAD AREA

PACIFIC STREET

CCPI, LOWES, WESTON SHARED EASEMENT

LETTER OF COMPLETION
(HDOH, 1999)

REMEDIAL ACTION
MEMORANDUM
(HDOH, 2008c)

GREASE TRAP

LOCKER ROOM

GAS HOLDER #4

GAS HOLDER #3

DISPOSAL WELL #1

LIQUID PURIFICATION UNIT

STACK

STEAM ACCUMULATOR

GENERATOR #7

NORTH GENERATOR #6

SOUTH GENERATOR #6

NORTH GENERATOR #8

SOUTH GENERATOR #8

STORAGE TANKS

TAR SEPARATION AREA

WASH BOX

PRIMARY SCRUBBER #6

PRIMARY SCRUBBER #1

PRIMARY SCRUBBER #7

PRIMARY SCRUBBER #8

SALT WATER WELL #1

SALT WATER WELL #2

PURIFIER #5

PURIFIER #6

PURIFIER #7

PURIFIER #8

PURIFIER #1

PURIFIER #2

PURIFIER #3

PURIFIER #4

PURIFIER #9

STATION METER HOUSE

CALORIMETER HOUSE

MACHINE SHOP

SECONDARY SCRUBBER #2

SECONDARY SCRUBBER #3

DIESEL STORAGE TANK

STORAGE TANK #6

PRIMARY UNDERGROUND SETTLING TANK

PUMP HOUSE

TAR THICKENER PIT

COOLING TOWER

FILTER BUILDING

BOILER #1

BOILER #10

BOILER #7

UTILITY BLDG

BENZENE RECOVERY UNIT

OIL SCRUBBER

EXHAUSTER HOUSE

BENZENE TREATING AREA

STORAGE WAREHOUSE

BOILER #9

BOILER #8

BOILER #4

BOILER #6

COMPRESSOR ROOM

WATER SEPARATOR

OIL TANK #10 FEEDSTOCK AST

RELIEF GAS HOLDER #3

PLANT OFFICE

LABORATORY

OIL AND TAR SEPARATOR

DISPOSAL WELL #2

ARTESIAN WELL
SALT WATER EMERGENCY PIPE WELL

LEGEND

- Site Boundary
- Sample Location
- IAS/ SVE Treatment Area
- Historical Features
- Soil Removed
- Neighboring Property Boundary

Soil Vapor Benzene Results *(mg/kg)*

< 246	< EAL
246 - 1,048	> EAL
1,048 - 10,482	> C/I VI ECR=10^{-6}
10,482 - 87,600	> C/I VI ECR=10^{-5}
87,600 - 104,821	> C/I VI HQ=1
104,821 - 1,048,205	> C/I VI ECR=10^{-4}
1,048,205 - 224,000,000	> C/I VI ECR=10^{-3}

NOTES:
1. Hatched areas denotes remediation completed, no long required, or in progress.
2. EAL reference (HDOH, 2008 Summary Table B).

Benzene in Soil Vapor

Remedial Investigation Report
Second Quarter 2008
616 Iwilei Road • Honolulu, Oahu, Hawaii

FIGURE
5-65

WESTON SOLUTIONS
841 BISHOP STREET SUITE 2301 HONOLULU, HAWAII 96813 808.585.0448

DRAWN	DATE	CONTRACT NO.
R.Cabuco	2008-10-25	NA
CHKD BY:	CHK'K DATE:	WORK ORDER NUMBER:
C.Morgan	2008-10-25	14225.001.001.0100.00

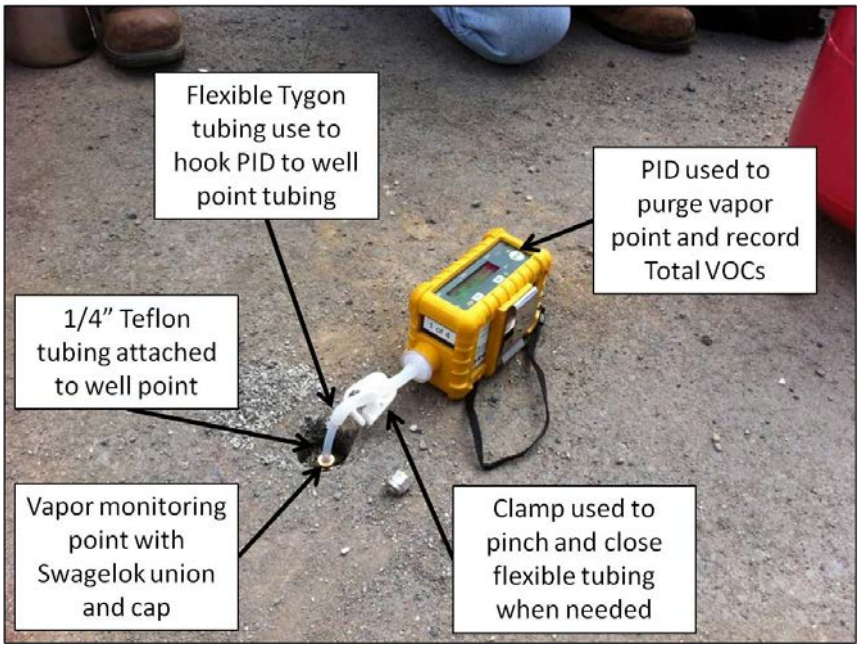


Figure 10. Purging of vapor monitoring points with a PID.


Figure 11. Connection of Summa and flow controller sampling train to vapor monitoring point.

Figure 12. Use of a plastic garbage bag as a helium shroud during Phase I of the study.

Figure 13. Five-gallon plastic bucket shroud with ports for sample collection and helium injection (not used due to height of the combined Summa canister and flow controller obtained from the lab for this study).

Figure 14. Use of a Tupperware container as a helium shroud during Phase II of the study (see also Attachment 4).

Figure 15. TO-17 sorbent tube sampling train using a 60ml syringe (50ml draw over thirty seconds for maximum 100 ml/minute flow rate; note use of second/upstream tube to check for breakthrough).

Data File: /chem/msd2.i/25oct11.b/2102512.d

Page 1

Date : 25-OCT-2011 13:45

Client ID:

Instrument: msd2.i

Sample Info: 6.0ml #12035

Operator: mtw

Column phase: RTx-624

Column diameter: 0.32

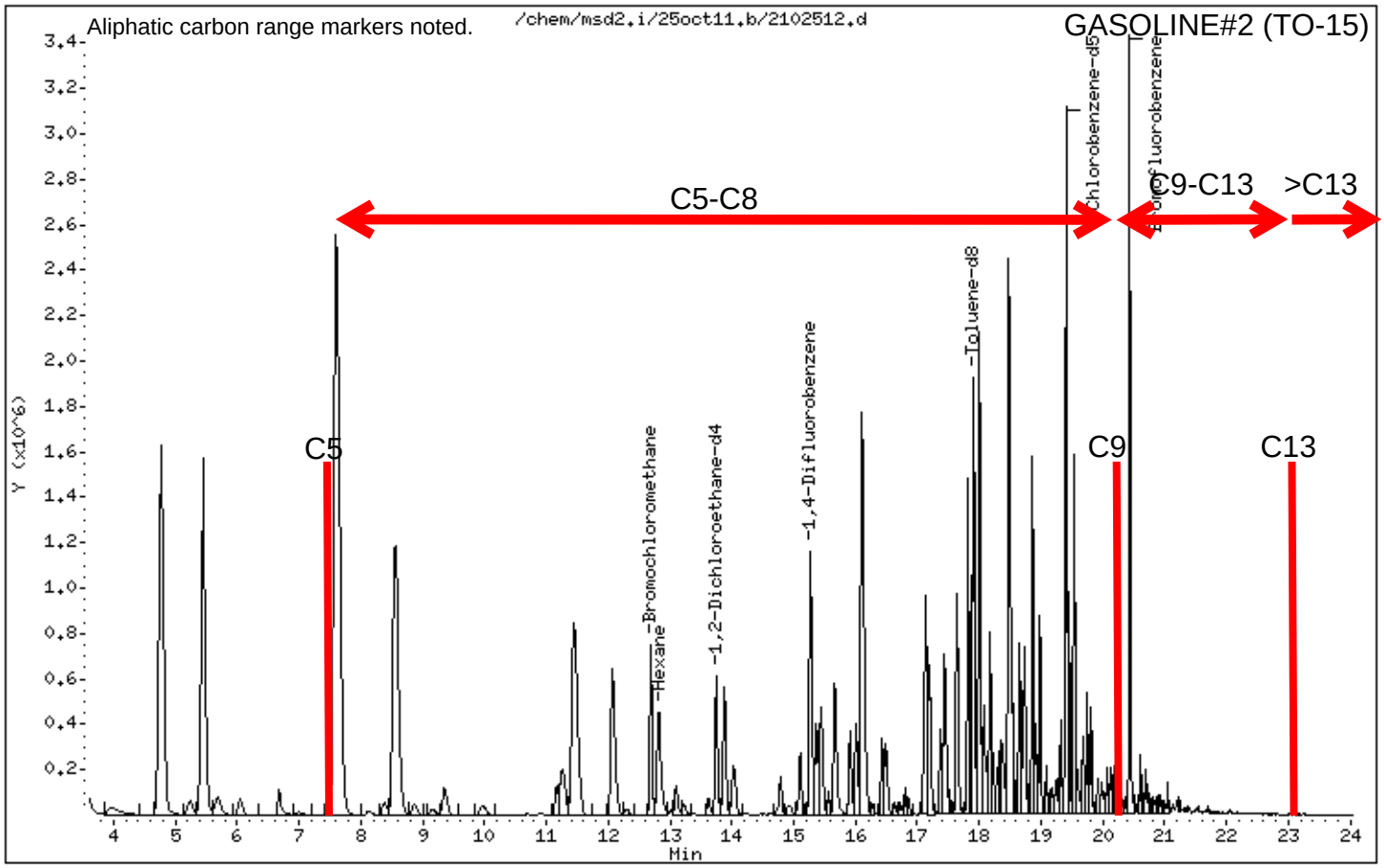
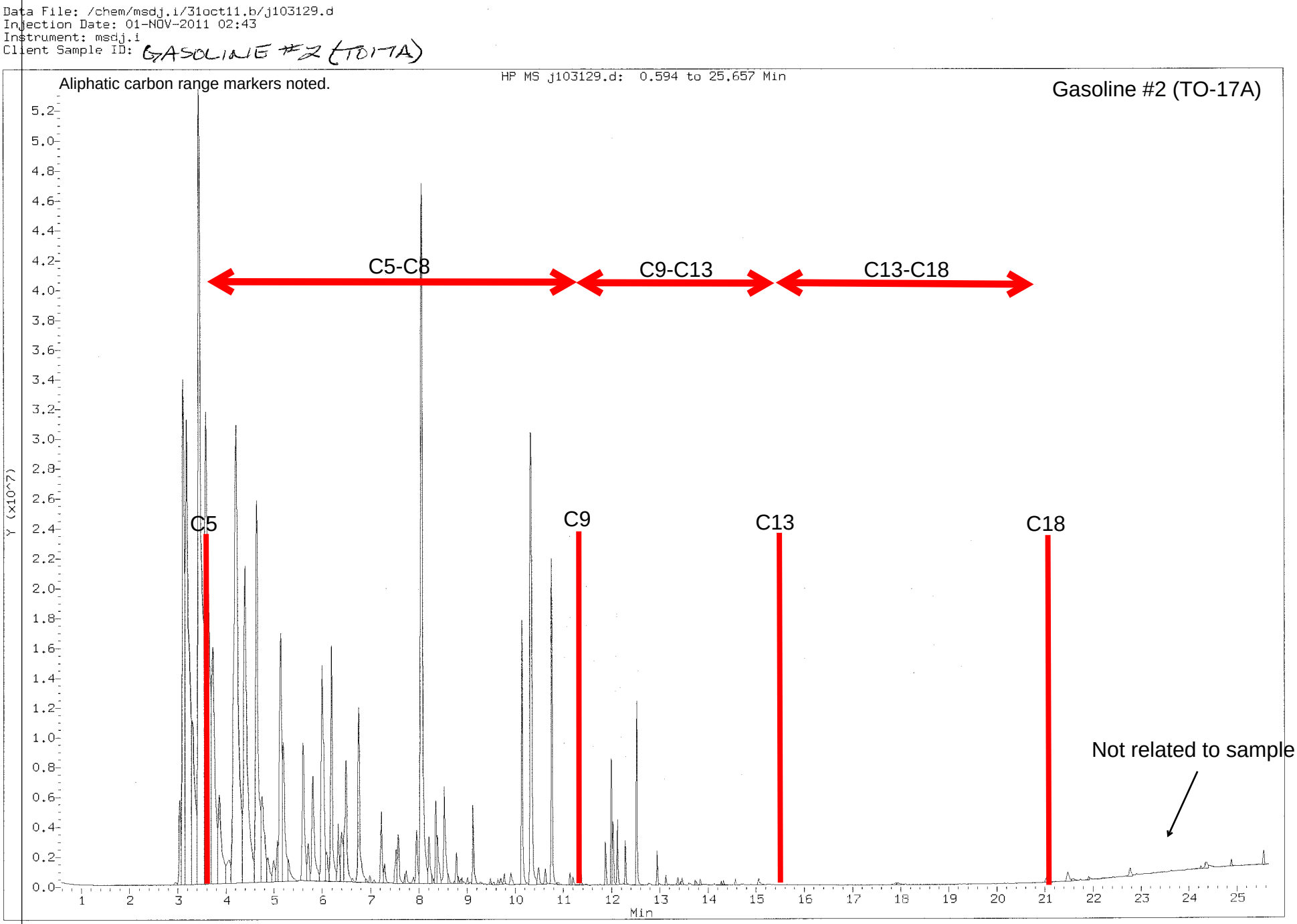


Figure 16a. Example gas chromatogram of vapors collected in summa canister from fresh gasoline fuel with key carbon range markers indicated.

Figure 16b. Example gas chromatogram of vapors collected with a sorbent tube from fresh gasoline fuel with key carbon range markers indicated.



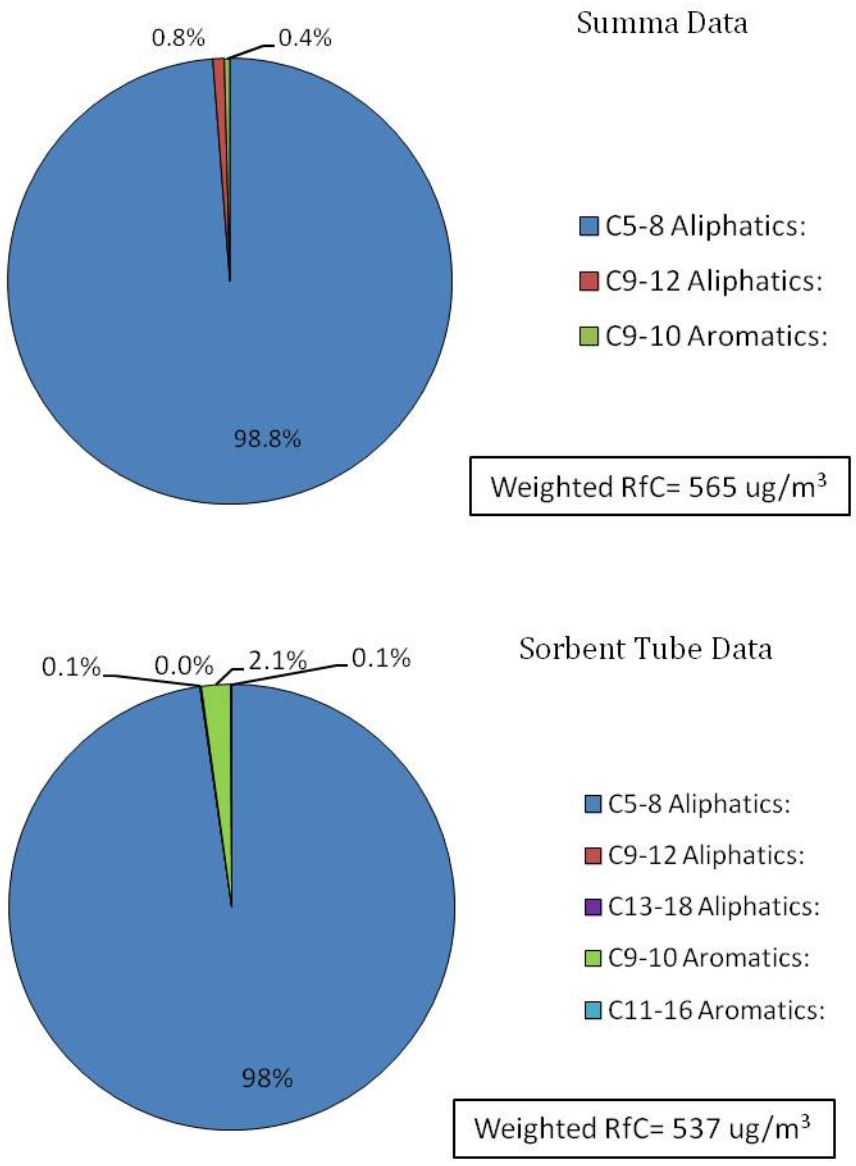


Figure 17. Pie chart of average TPH carbon range makeup of petroleum vapors based on Summa canister versus sorbent tube samples of vapors from fresh gasoline and correlative, weighted Reference Concentration for inhalation toxicity.

Data File: /chem/msd2.i/24oct11.b/2102412.d

Page 1

Date : 24-OCT-2011 14:04

Client ID:

Instrument: msd2.i

Sample Info: 30ml #37711

Operator: mtw

Column phase: RTx-624

Column diameter: 0.32

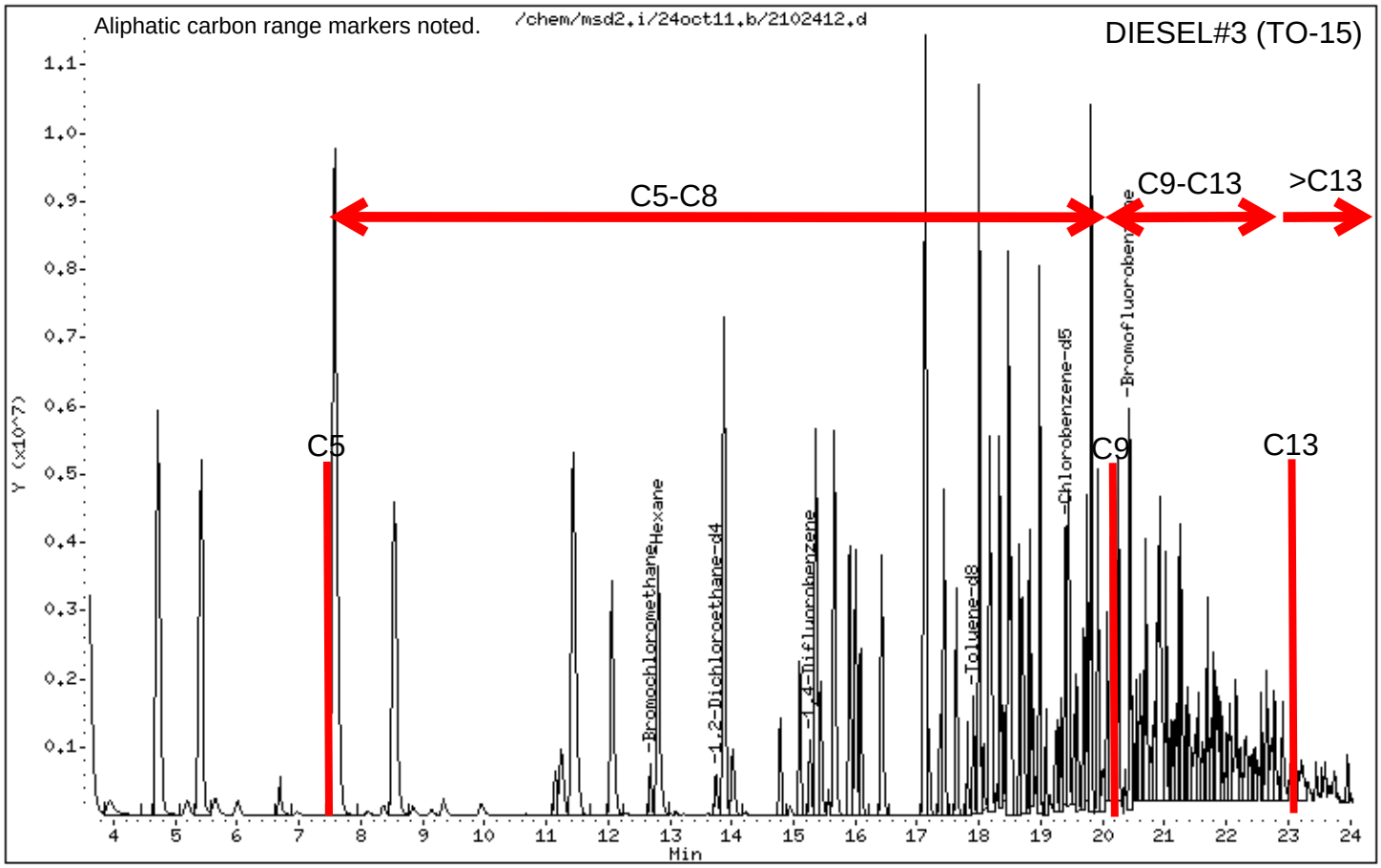
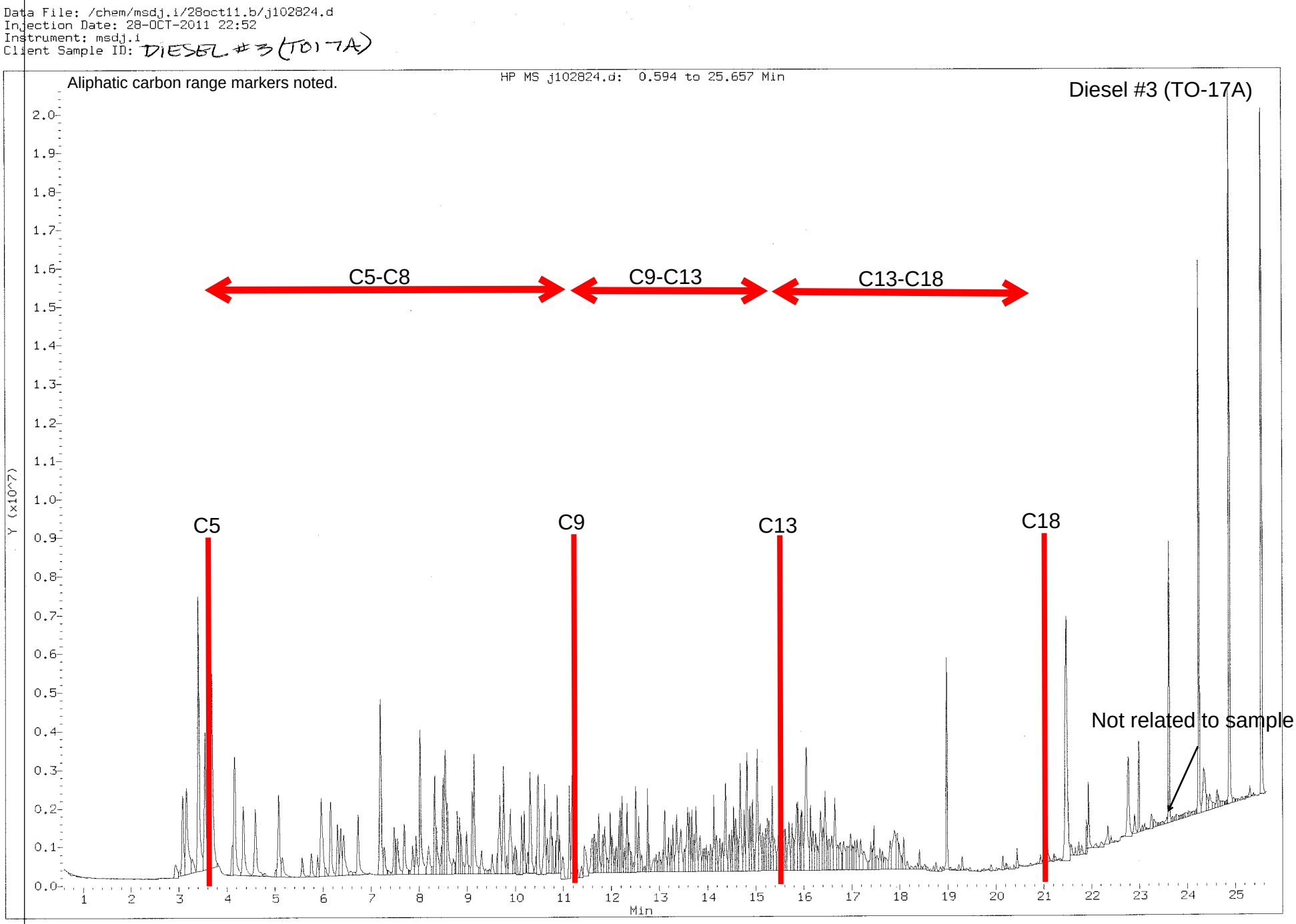


Figure 18a. Example gas chromatogram of vapors collected in summa canister from fresh diesel fuel with key carbon range markers indicated.

Figure 18b. Example gas chromatogram of vapors collected with a sorbent tube from fresh diesel fuel with key carbon range markers indicated.



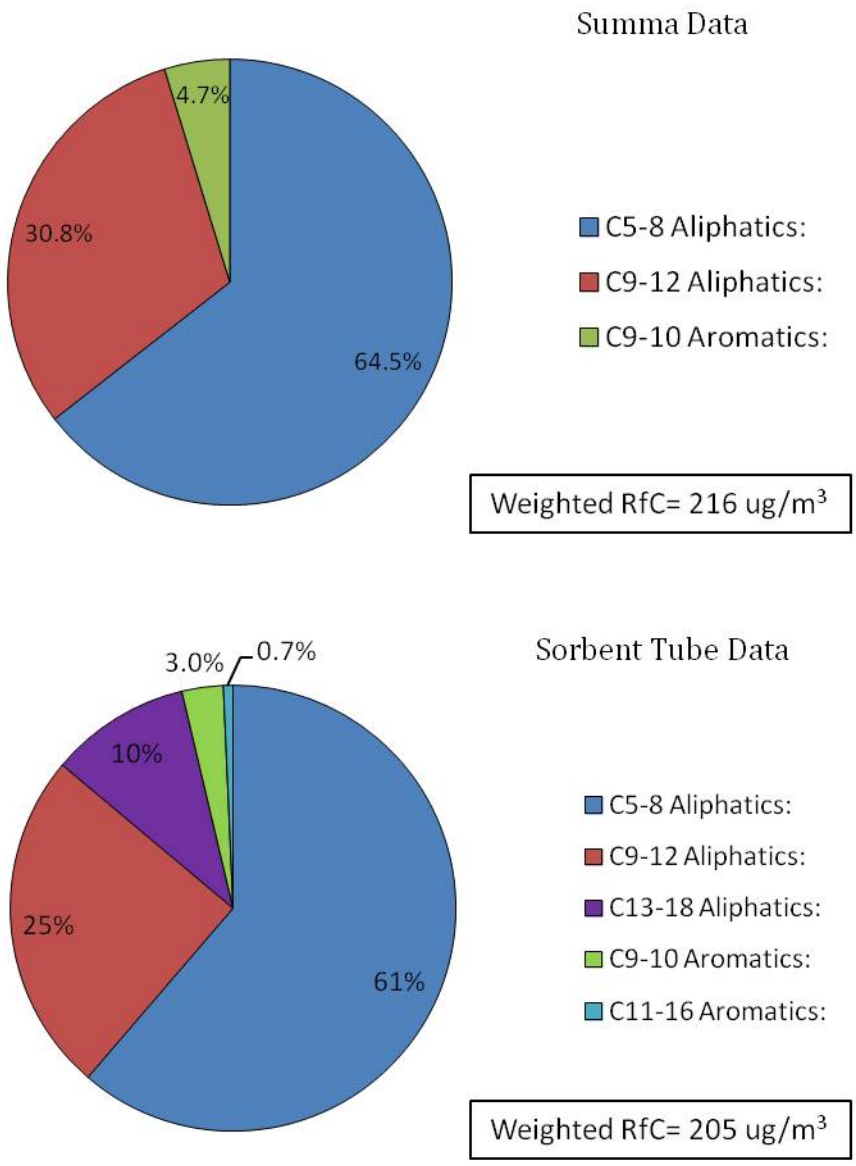


Figure 19. Pie chart of average TPH carbon range makeup of petroleum vapors based on Summa canister versus sorbent tube samples of vapors from fresh diesel and correlative, weighted Reference Concentration for inhalation toxicity.

Data File: /chem/msd2.i/12oct11.b/2101220.d

Page 1

Date : 12-OCT-2011 18:55

Client ID:

Instrument: msd2.i

Sample Info: 2.0ml #34656

Operator: EA

Column phase: RTx-624

Column diameter: 0.32

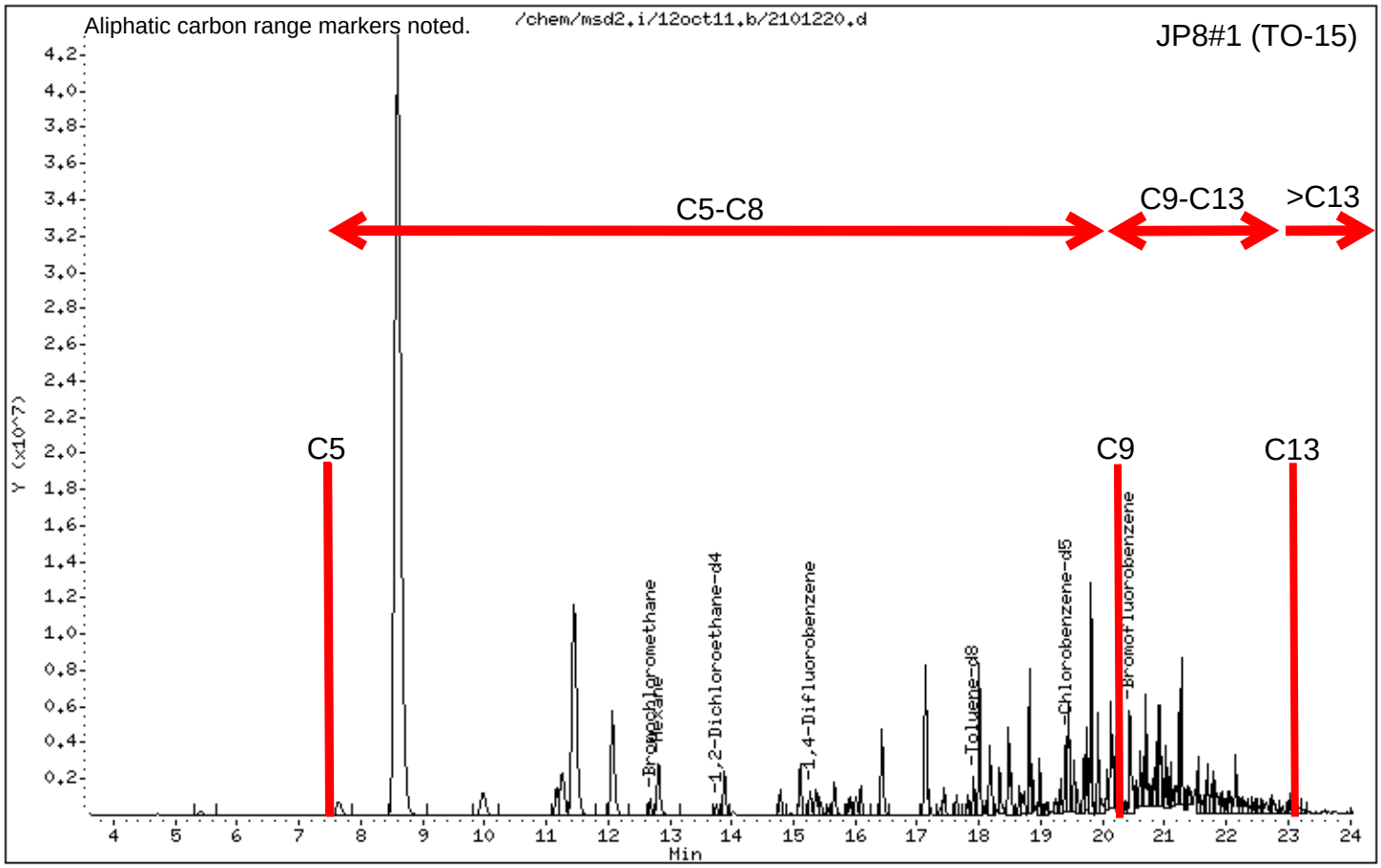
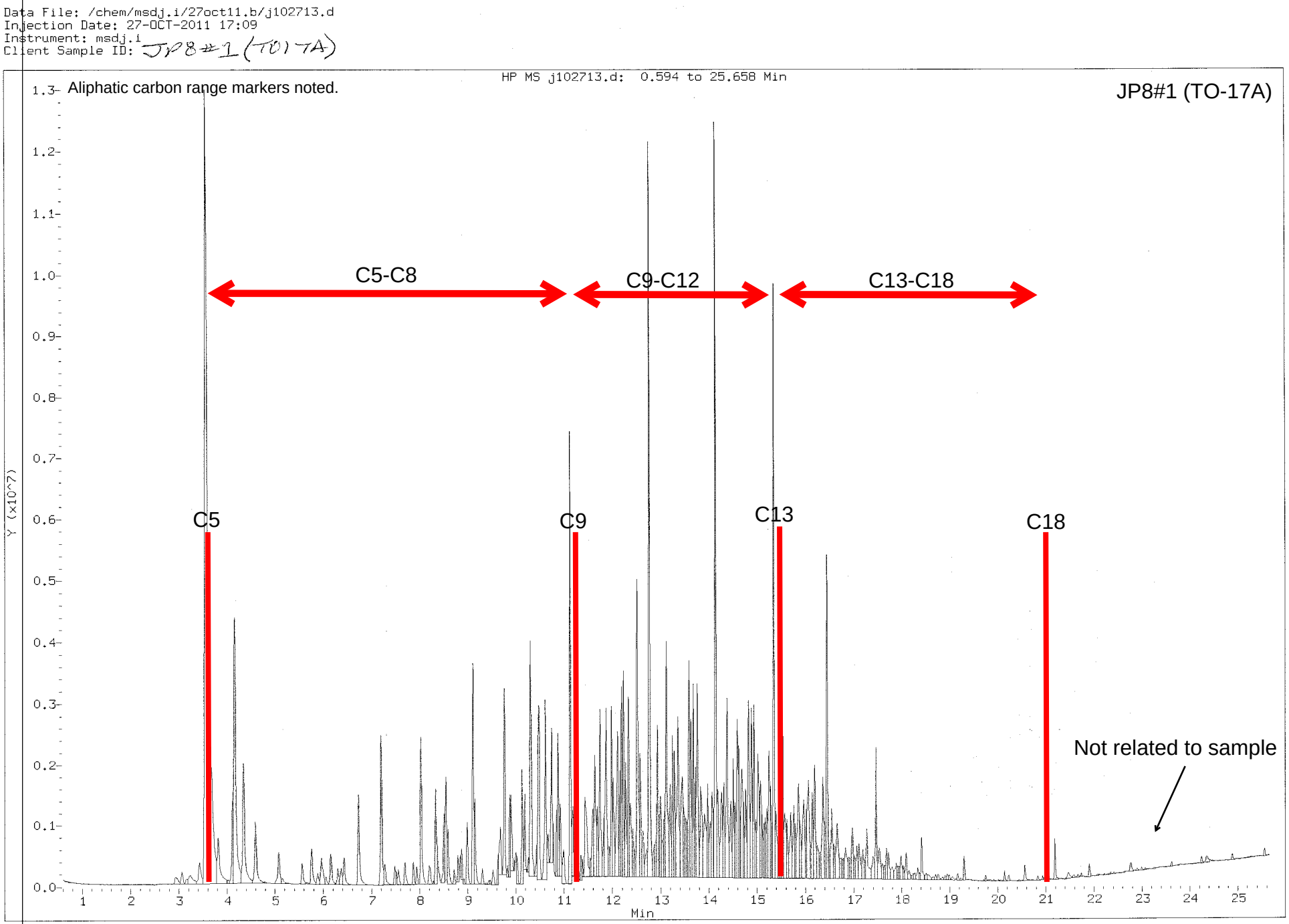


Figure 20a. Example gas chromatogram of vapors collected in summa canister from fresh JP-8 fuel with key carbon range markers indicated.

Figure 20b. Example gas chromatogram of vapors collected with a sorbent tube from fresh JP-8 fuel with key carbon range markers indicated.



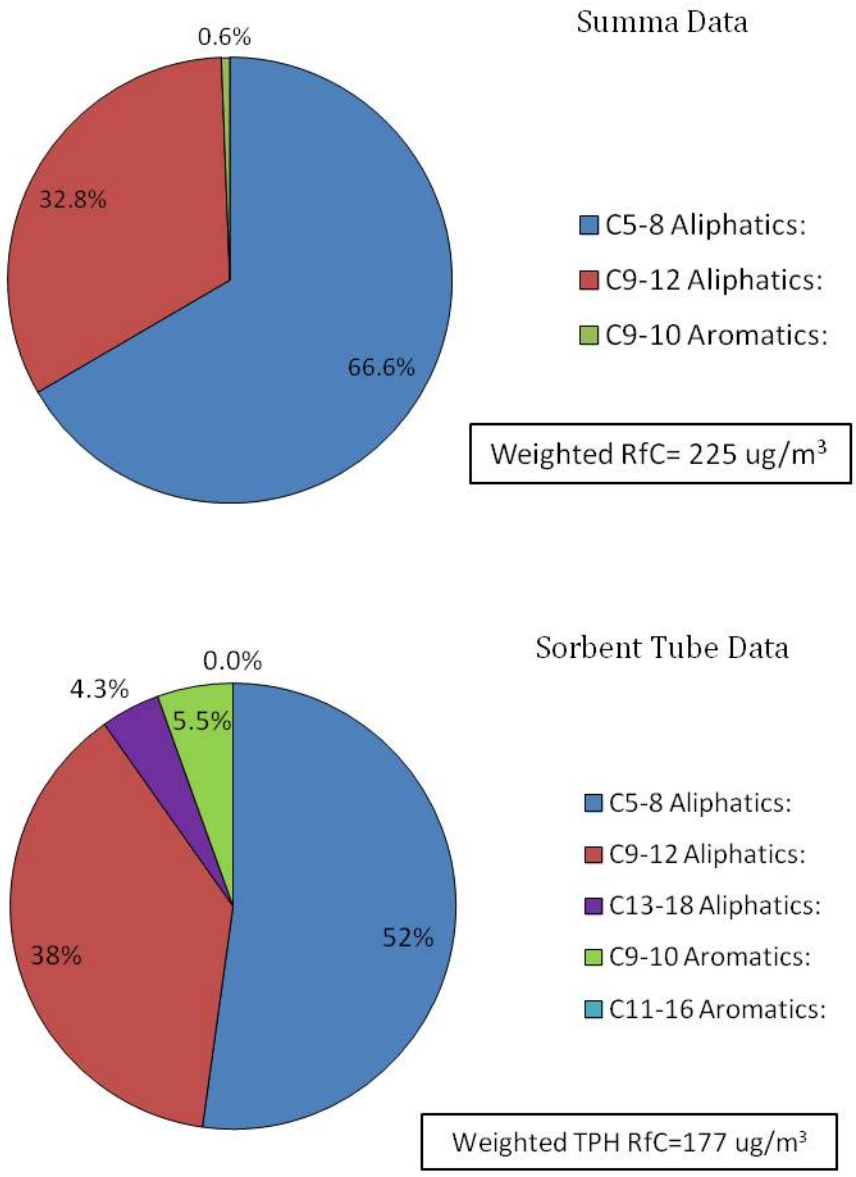


Figure 21. Pie chart of average TPH carbon range makeup of petroleum vapors based on Summa canister versus sorbent tube samples of vapors from fresh JP-8 and correlative, weighted Reference Concentration for inhalation toxicity.

Data File: /chem/msd2.i/24oct11.b/2102422.d

Page 1

Date : 24-OCT-2011 22:46

Client ID:

Instrument: msd2.i

Sample Info: 6.0ml #37684

Operator: srs

Column phase: RTx-624

Column diameter: 0.32

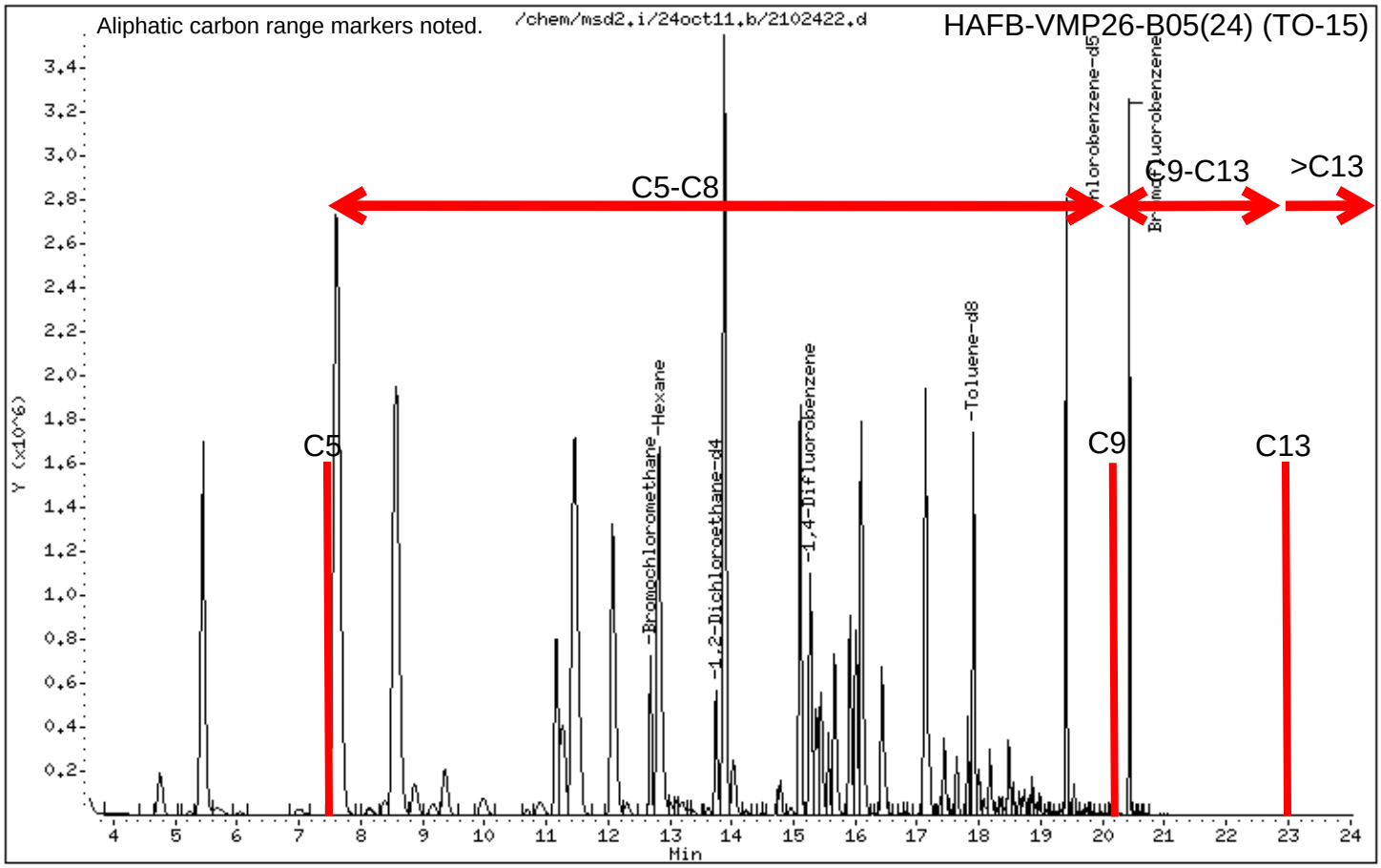
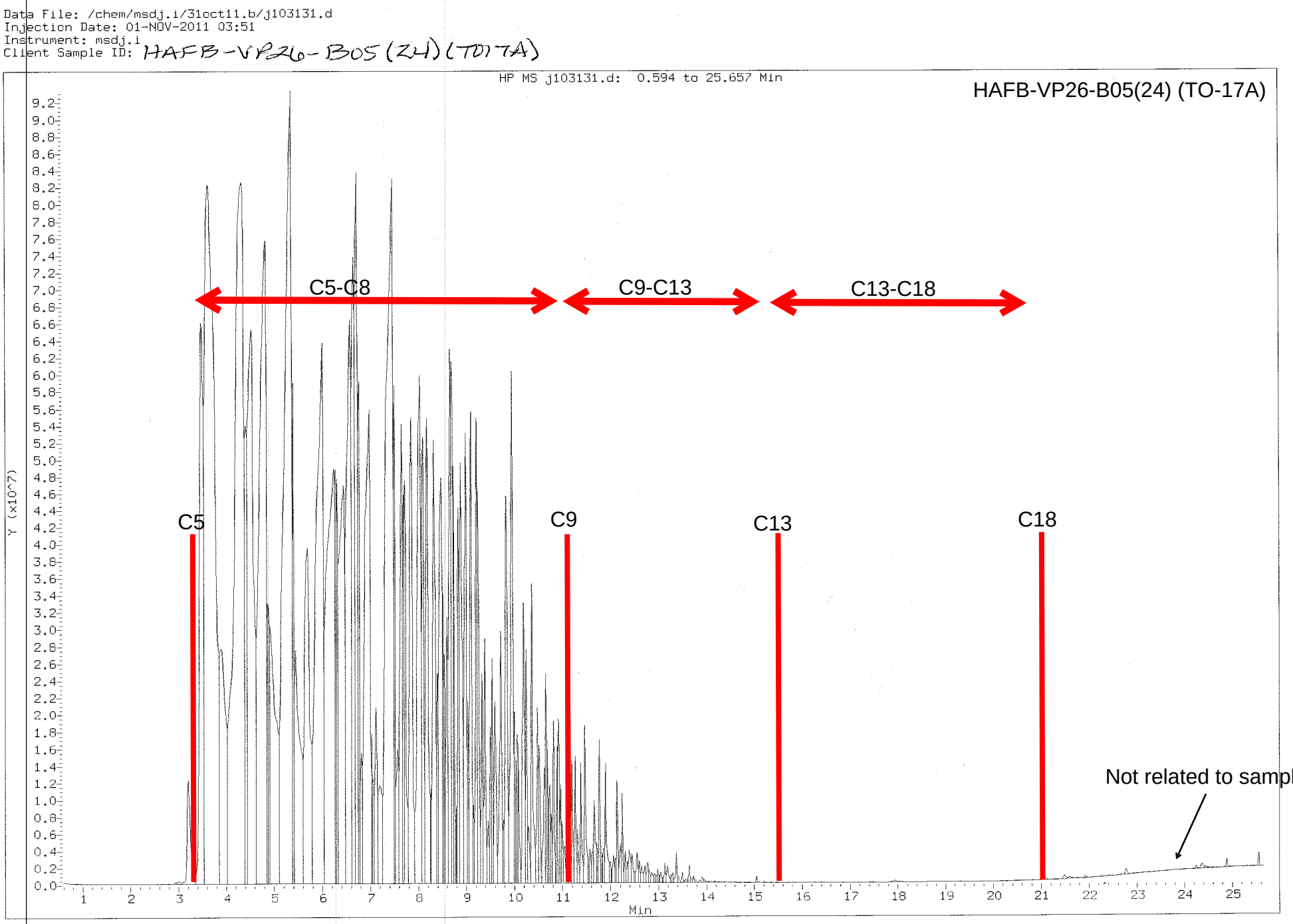


Figure 22a. Example gas chromatogram of vapors collected in summa canister from Site A (JP-4/ AVGAS?) fuel with key carbon range markers indicated.

Figure 22b. Example gas chromatogram of vapors collected with a sorbent tube from Site A (JP-4/AVGAS?) fuel with key carbon range markers indicated.



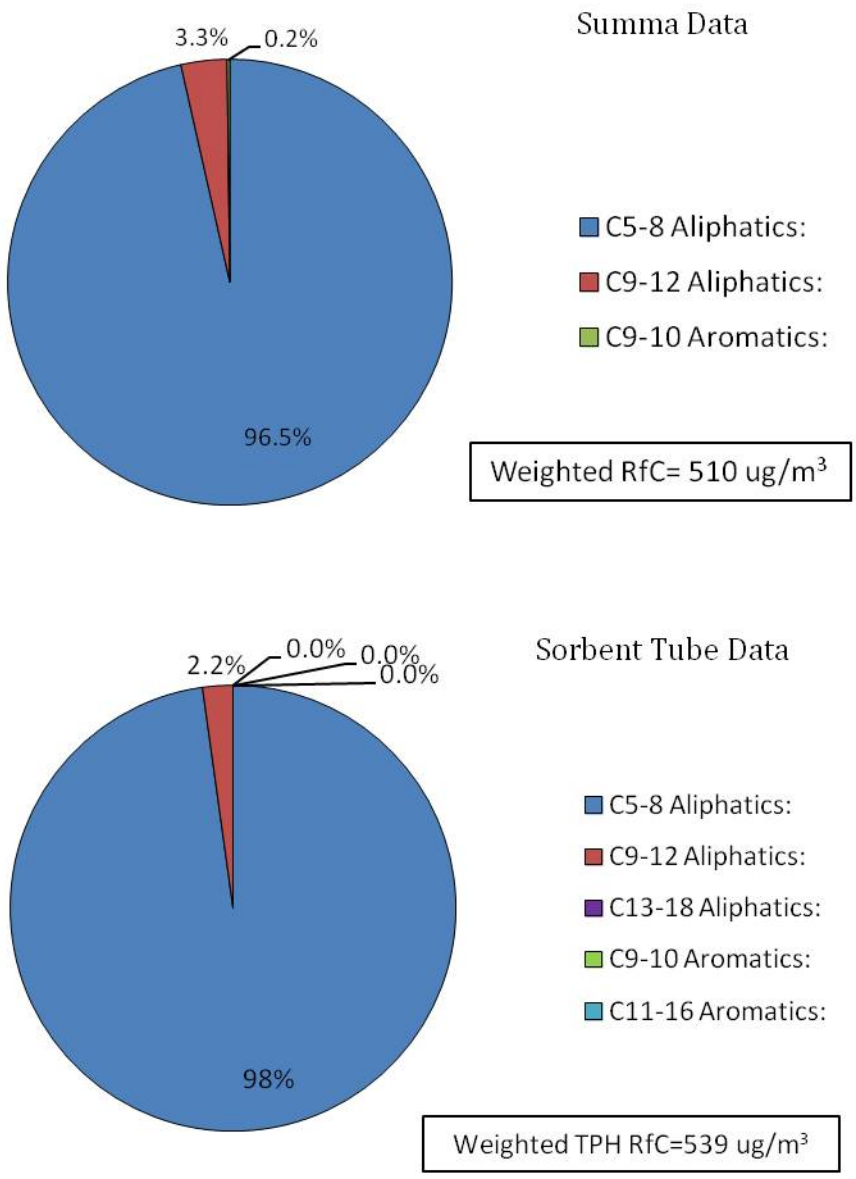


Figure 23. Pie chart of average TPH carbon range makeup of petroleum vapors based on Summa canister versus sorbent tube samples from Site A (JP-4/AVGAS) and correlative, weighted Reference Concentration for inhalation toxicity.

Data File: /chem/msd2.i/25oct11.b/2102510.d

Page 1

Date : 25-OCT-2011 12:28

Client ID:

Instrument: msd2.i

Sample Info: 2.0ml #34574

Operator: mtw

Column phase: RTx-624

Column diameter: 0.32

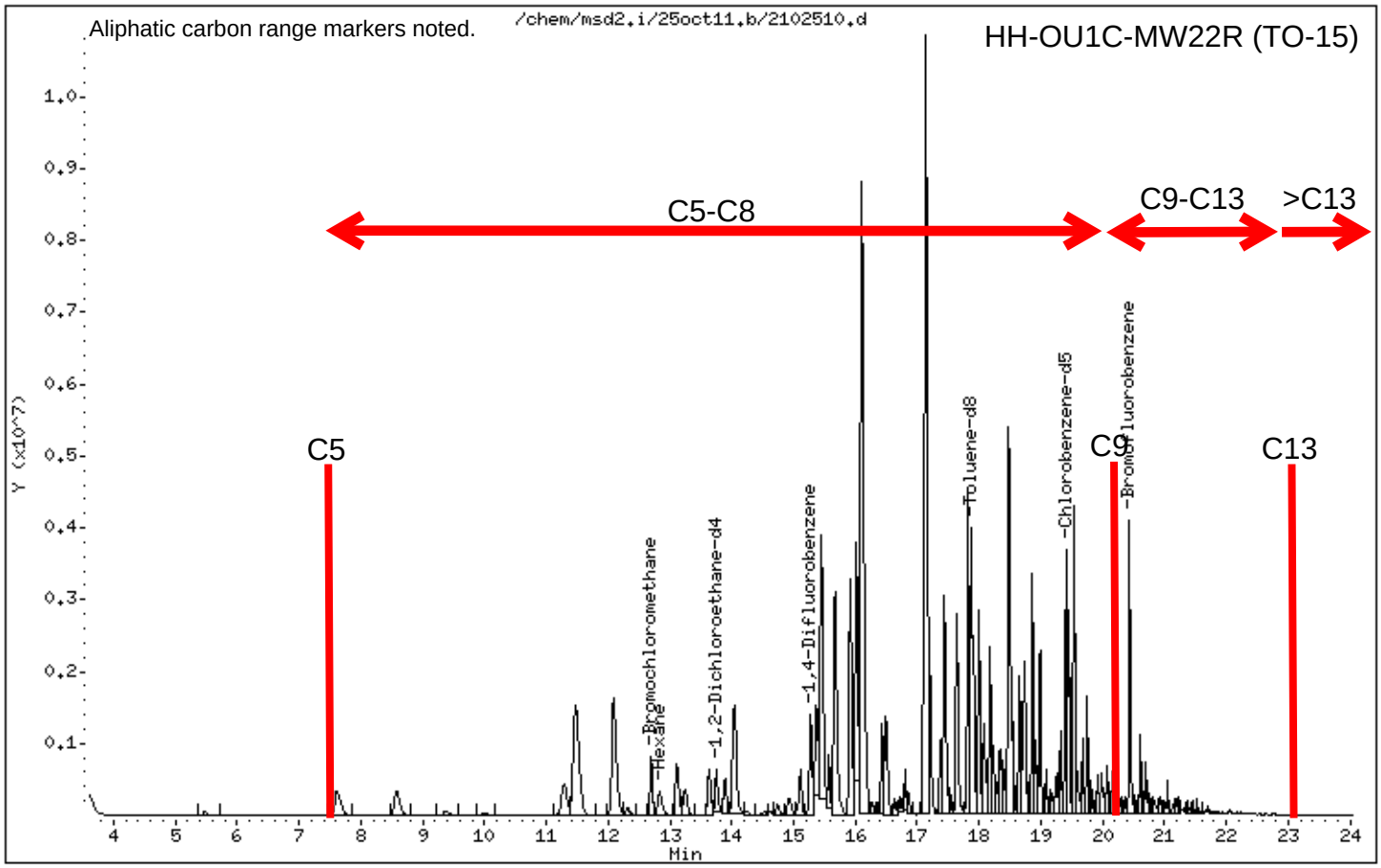
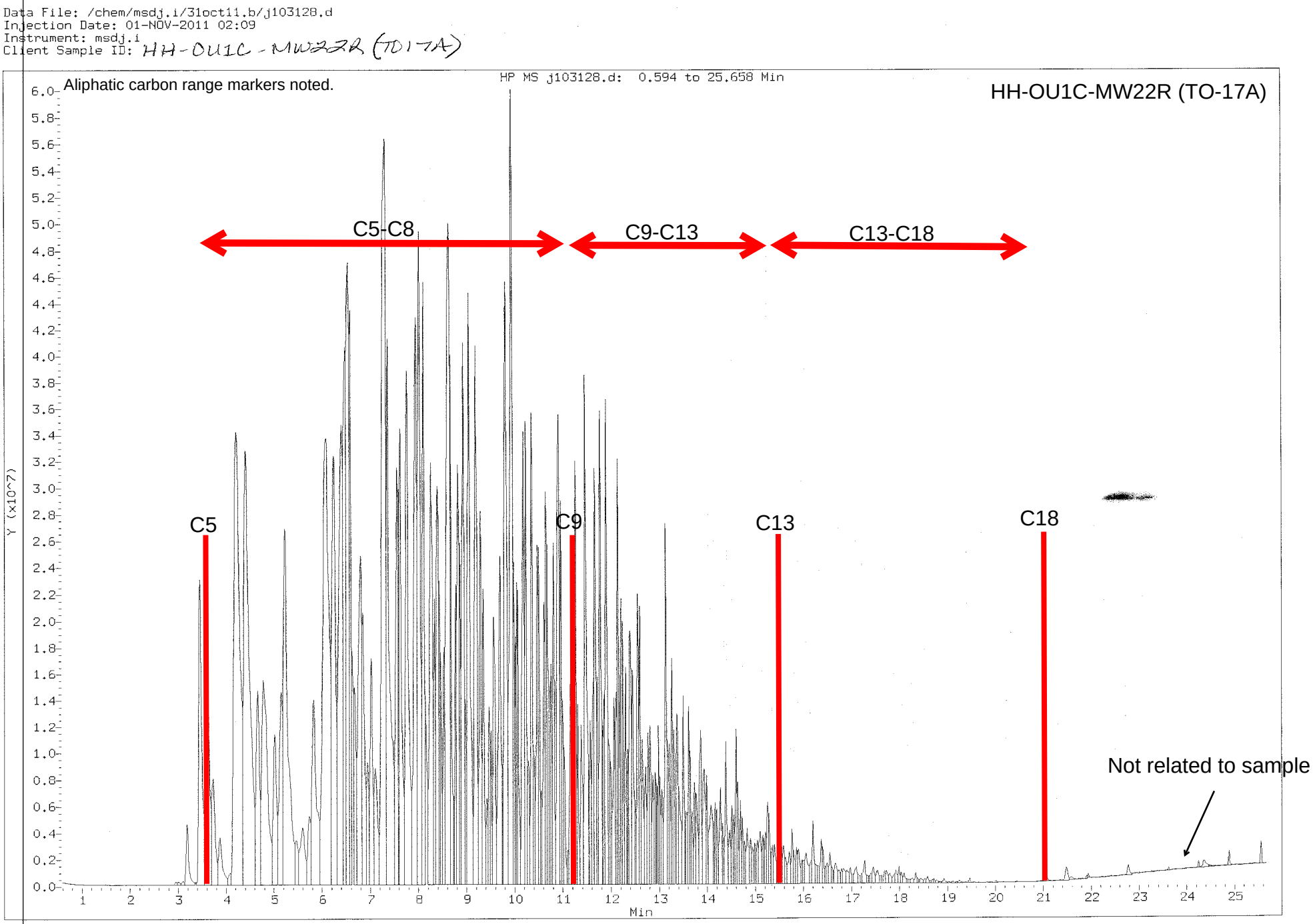


Figure 24a. Example gas chromatogram of vapors collected in summa canister from Site B (mixed fuels) with key carbon range markers indicated.

Figure 24b. Example gas chromatogram of vapors collected with a sorbent tube from Site B (mixed fuels) with key carbon range markers indicated.



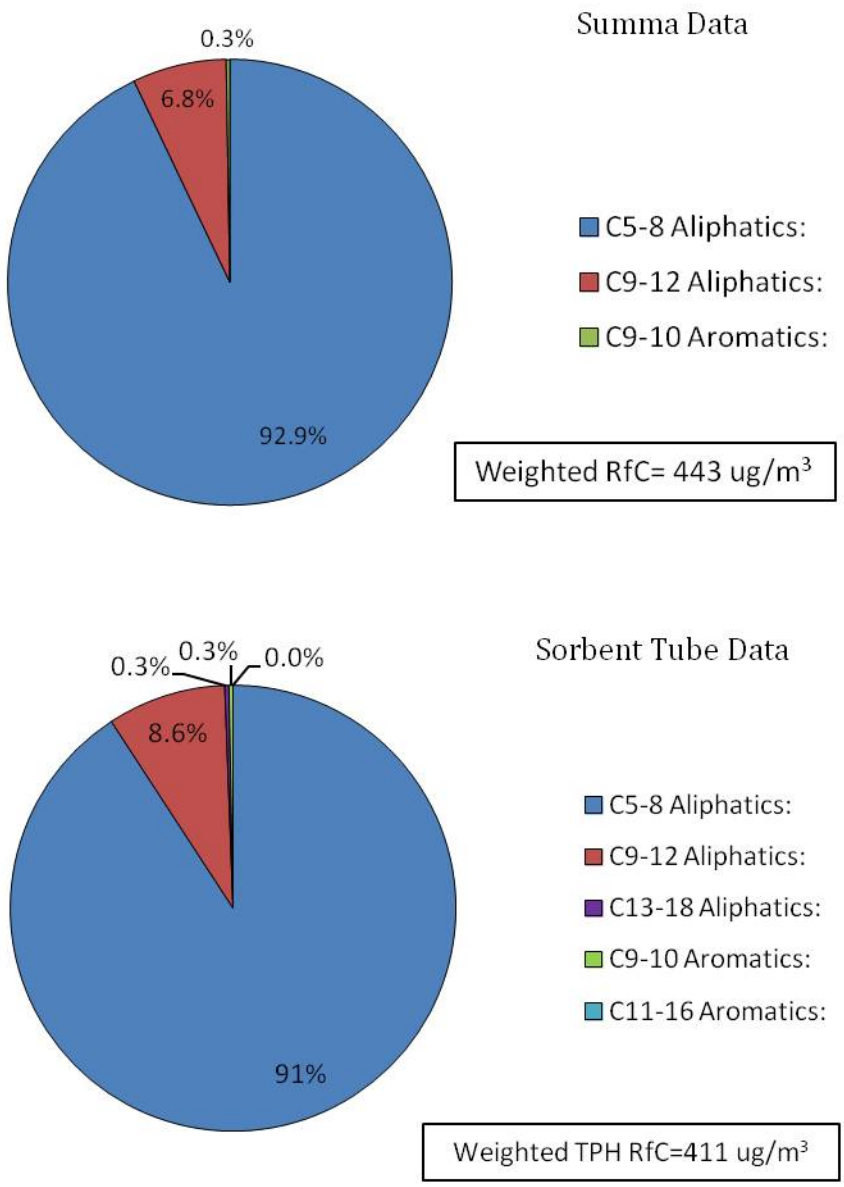


Figure 25. Pie chart of average TPH carbon range makeup of petroleum vapors based on Summa canister versus sorbent tube samples from Site B (mixed fuels) and correlative, weighted Reference Concentration for inhalation toxicity.

Data File: /chem/msd2.i/12oct11.b/2101218.d

Page 1

Date : 12-OCT-2011 17:31

Client ID:

Instrument: msd2.i

Sample Info: 2.0ml #36517

Operator: EA

Column phase: RTx-624

Column diameter: 0.32

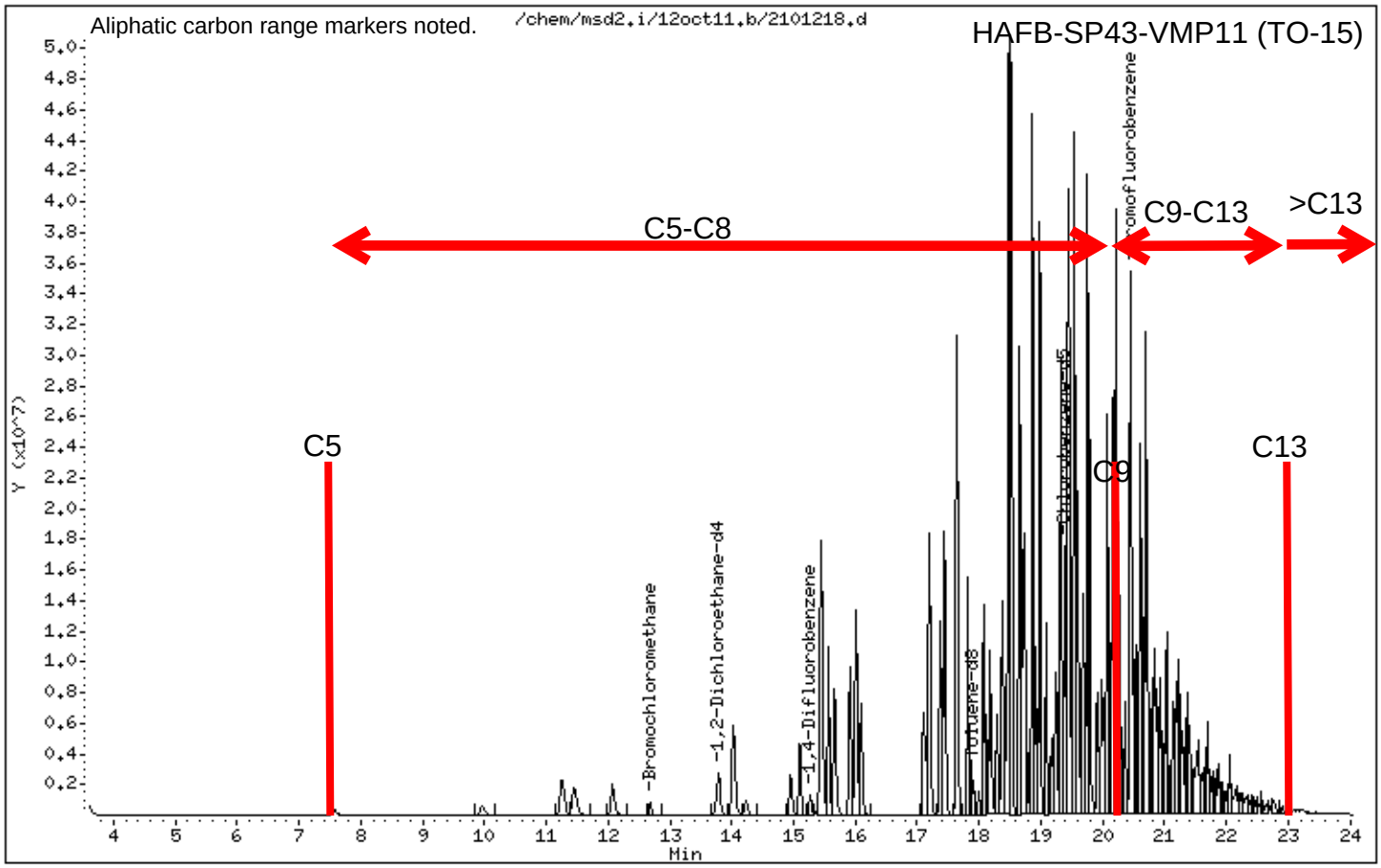
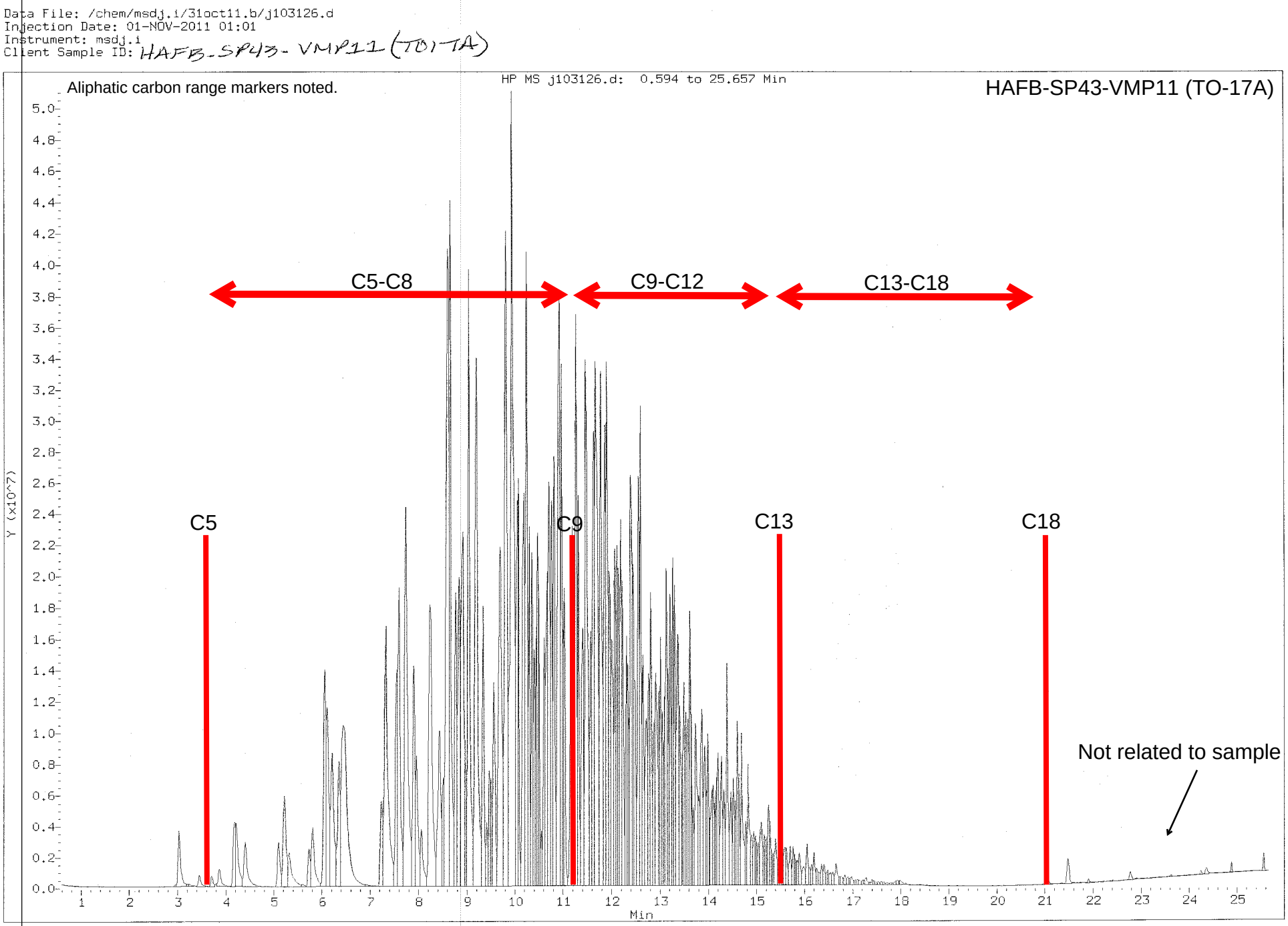


Figure 26a. Example gas chromatogram of vapors collected in summa canister from Site C (JP-8 +/- JP-4) with key carbon range markers indicated.

Figure 26b. Example gas chromatogram of vapors collected with a sorbent tube from Site C (JP-8 +/- JP-4) with key carbon range markers indicated.



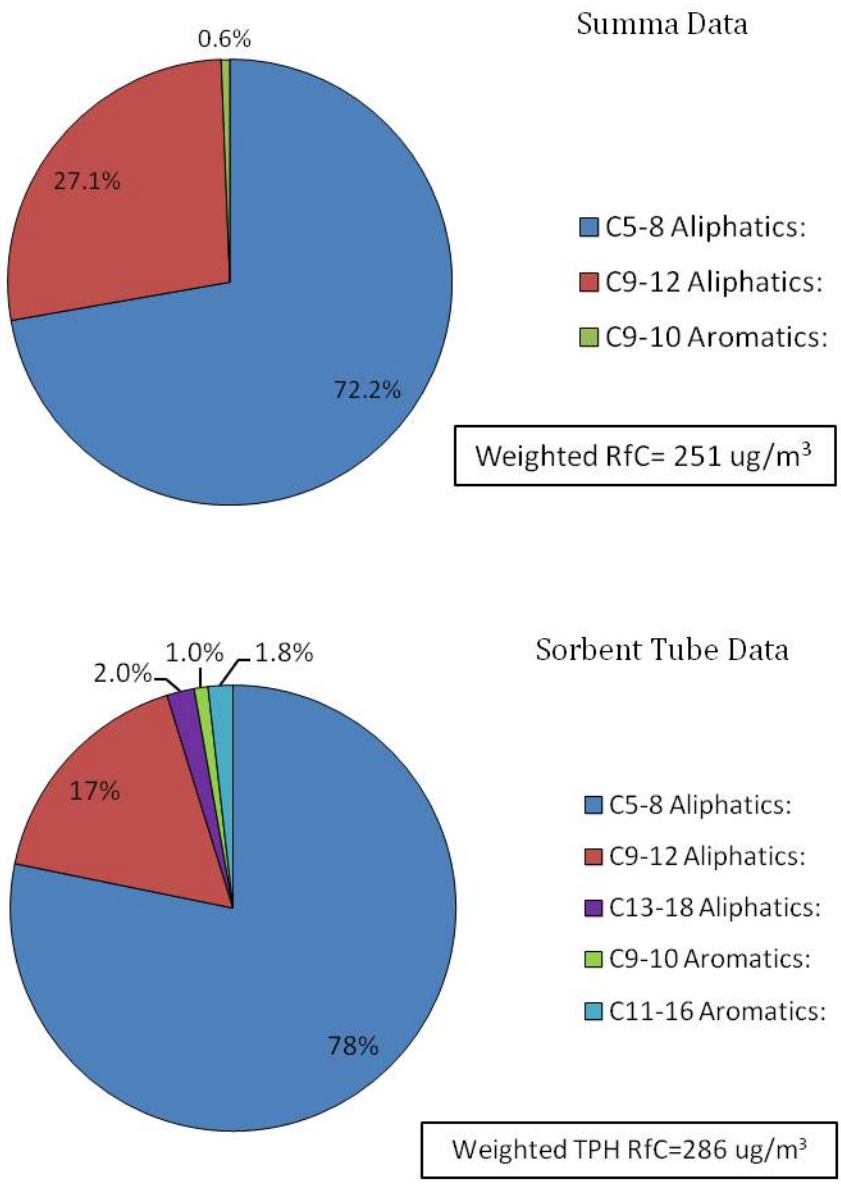


Figure 27. Pie chart of average TPH carbon range makeup of petroleum vapors based on Summa canister versus sorbent tube samples from Site C (JP-8 +/- JP-4) and correlative, weighted Reference Concentration for inhalation toxicity.

Data File: /chem/msd2.i/21oct11.b/2102115.d

Page 1

Date : 21-OCT-2011 18:08

Client ID:

Instrument: msd2.i

Sample Info: 15ml #3039

Operator: srs

Column phase: RTx-624

Column diameter: 0.32

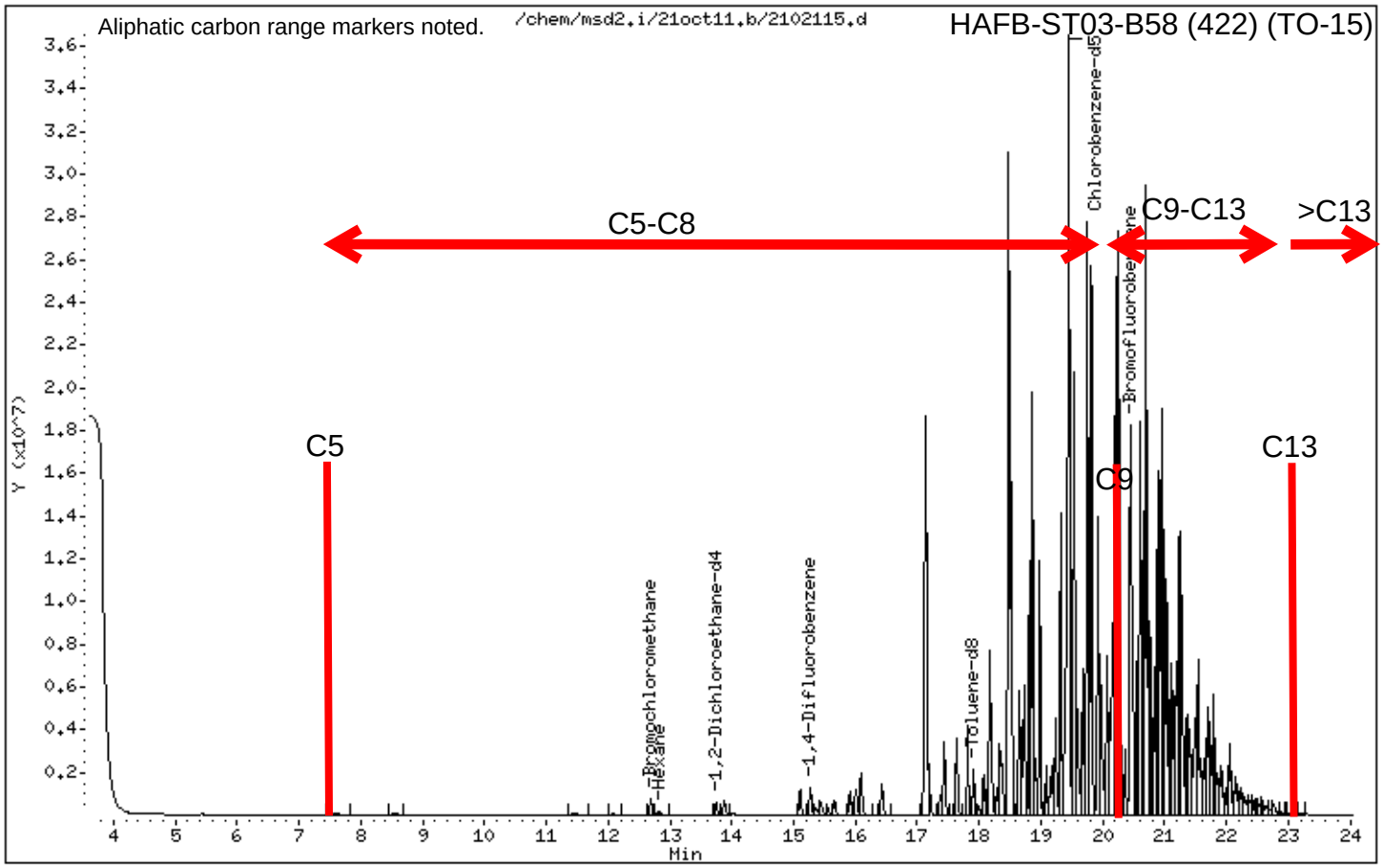
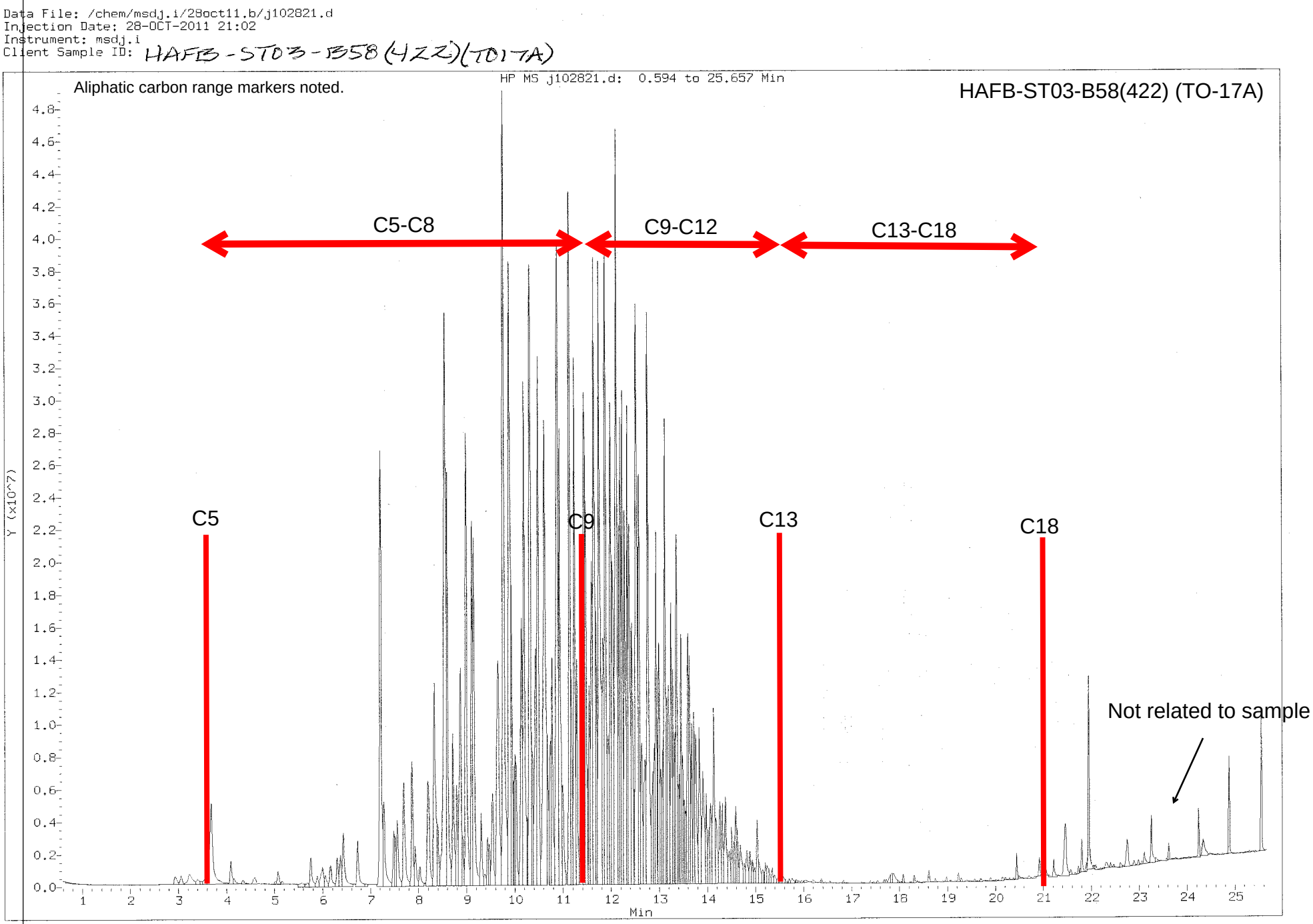


Figure 28a. Example gas chromatogram of vapors collected in summa canister from Site D (JP-4/AVGAS?) with key carbon range markers indicated.

Figure 28b. Example gas chromatogram of vapors collected with a sorbent tube from Site D (JP-4/AVGAS?) with key carbon range markers indicated.



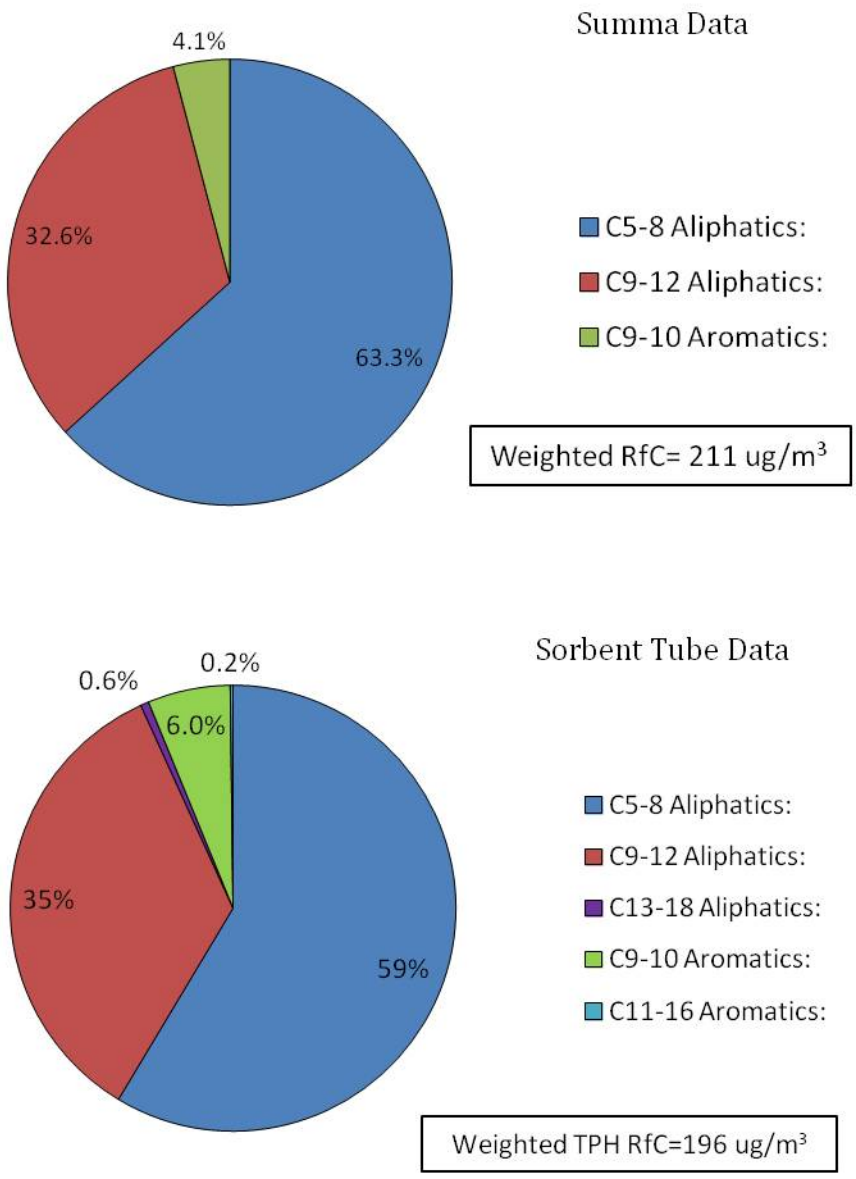


Figure 29. Pie chart of average TPH carbon range makeup of petroleum vapors based on Summa canister versus sorbent tube samples from Site D (JP-4/AVGAS) and correlative, weighted Reference Concentration for inhalation toxicity.

Data File: /chem/msd2.i/12oct11.b/2101224.d

Page 1

Date : 12-OCT-2011 21:52

Client ID:

Instrument: msd2.i

Sample Info: 2.0ml #37738

Operator: EA

Column phase: RTx-624

Column diameter: 0.32

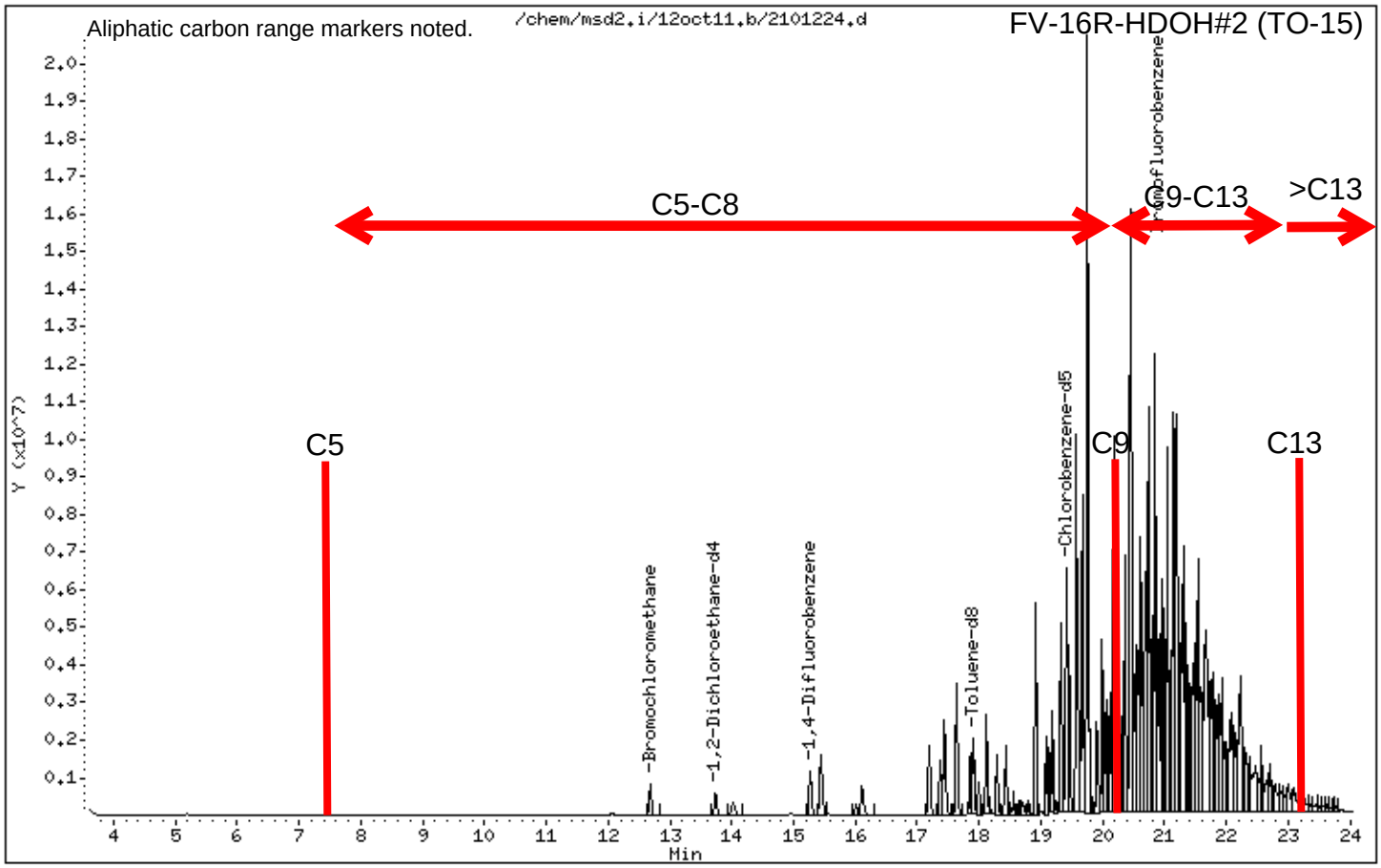
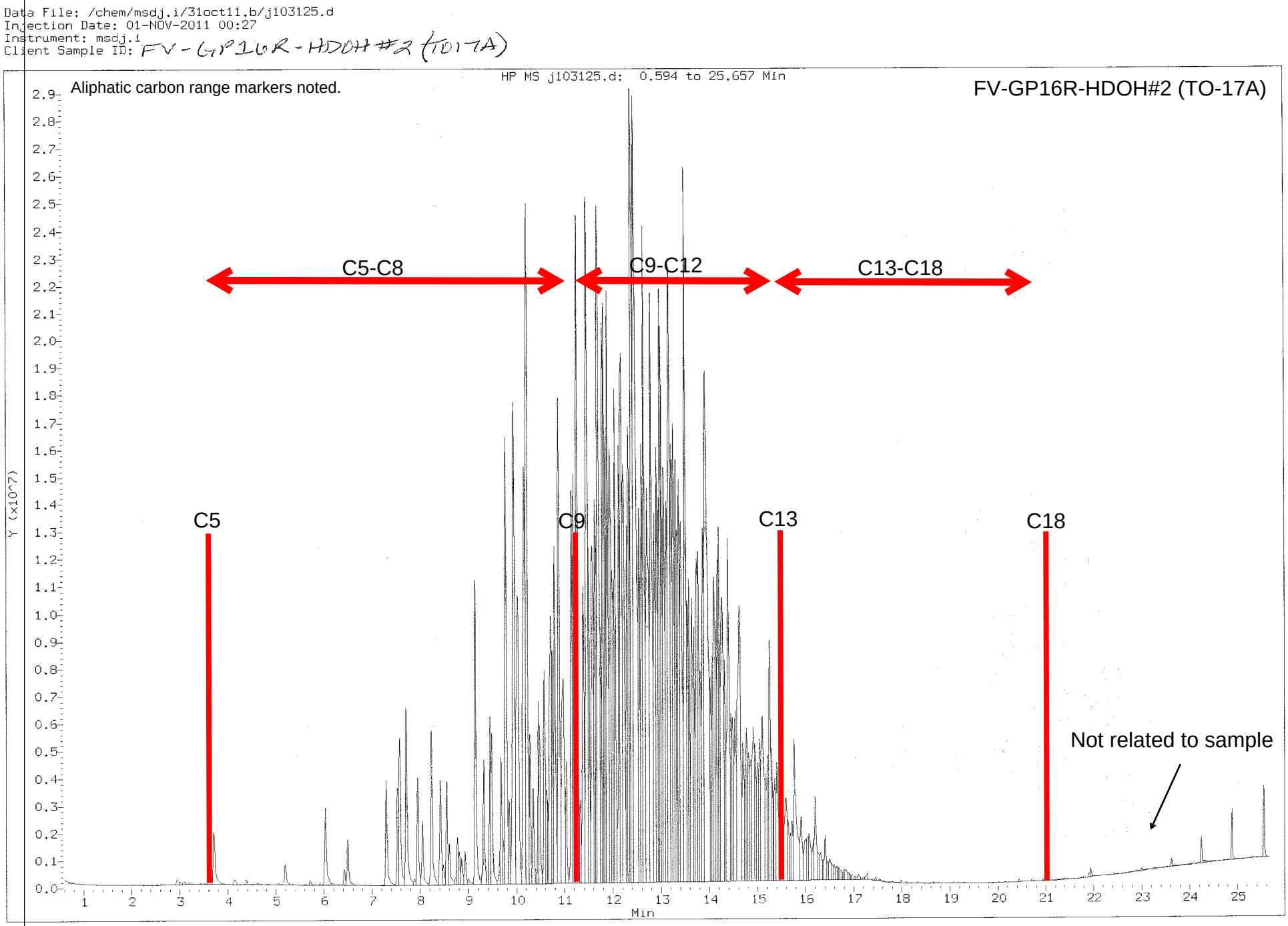


Figure 30a. Example gas chromatogram of vapors collected in summa canister from Site D (diesel) with key carbon range markers indicated.

Figure 30b. Example gas chromatogram of vapors collected with a sorbent tube from Site D (diesel) with key carbon range markers indicated.



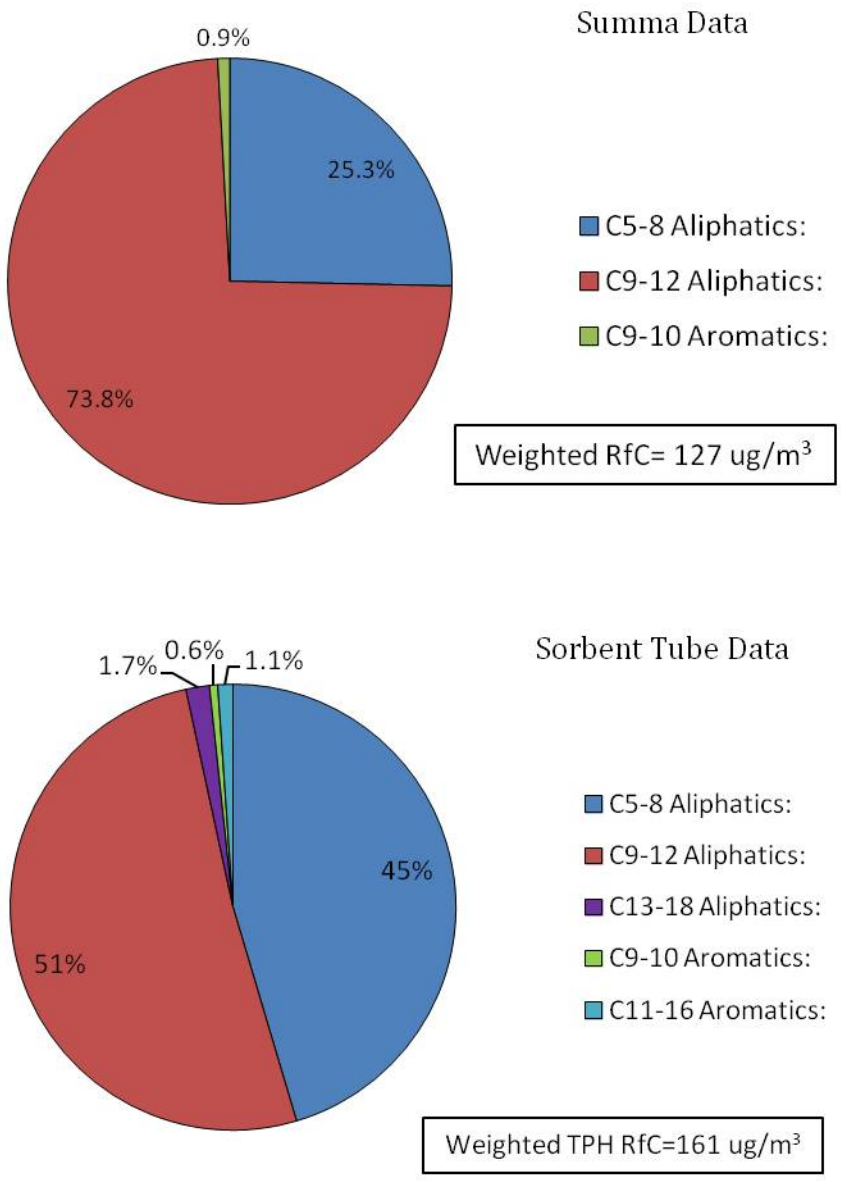


Figure 31. Pie chart of average TPH carbon range makeup of petroleum vapors based on Summa canister versus sorbent tube samples from Site E (diesel) and correlative, weighted Reference Concentration for inhalation toxicity.

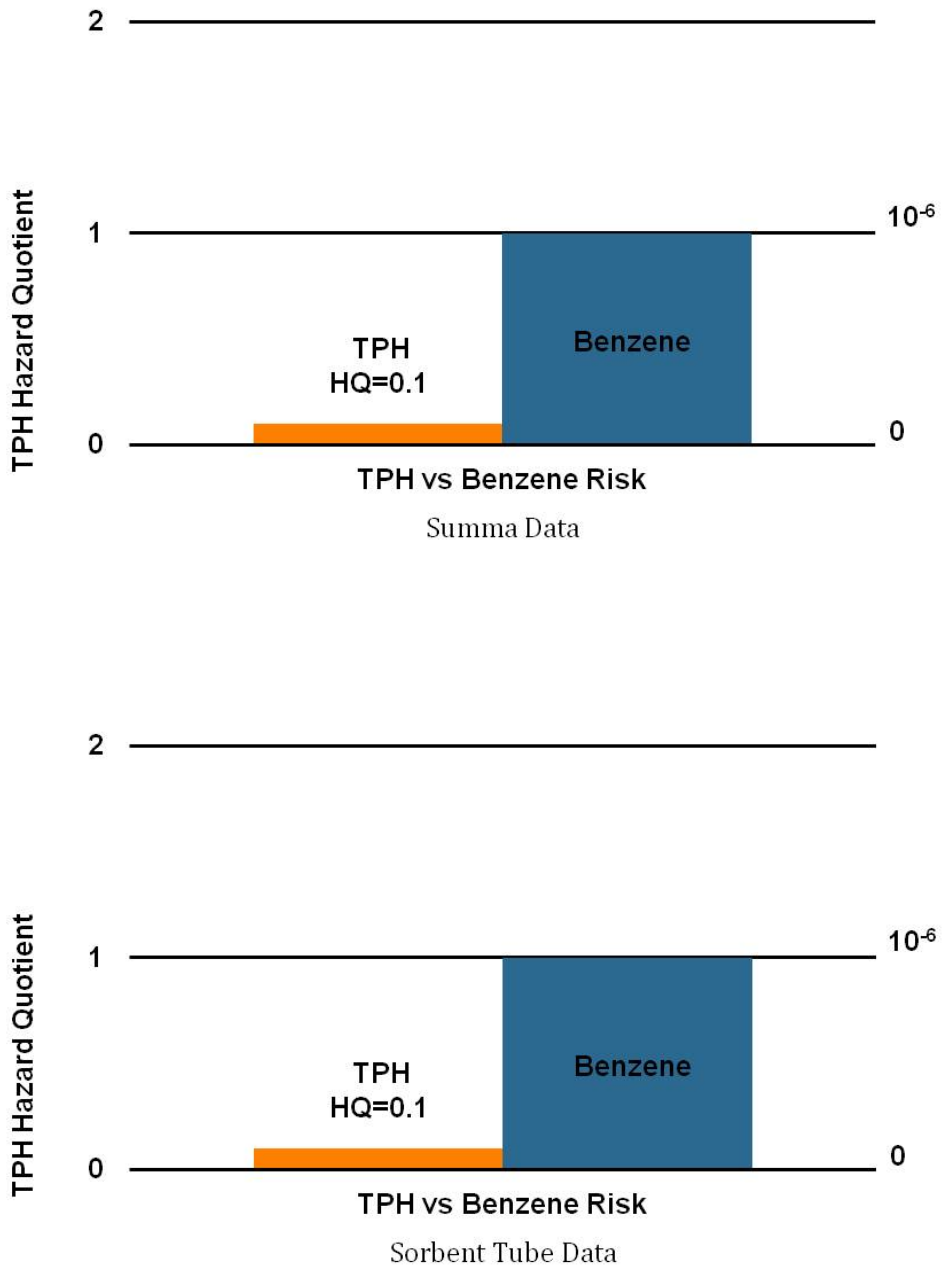
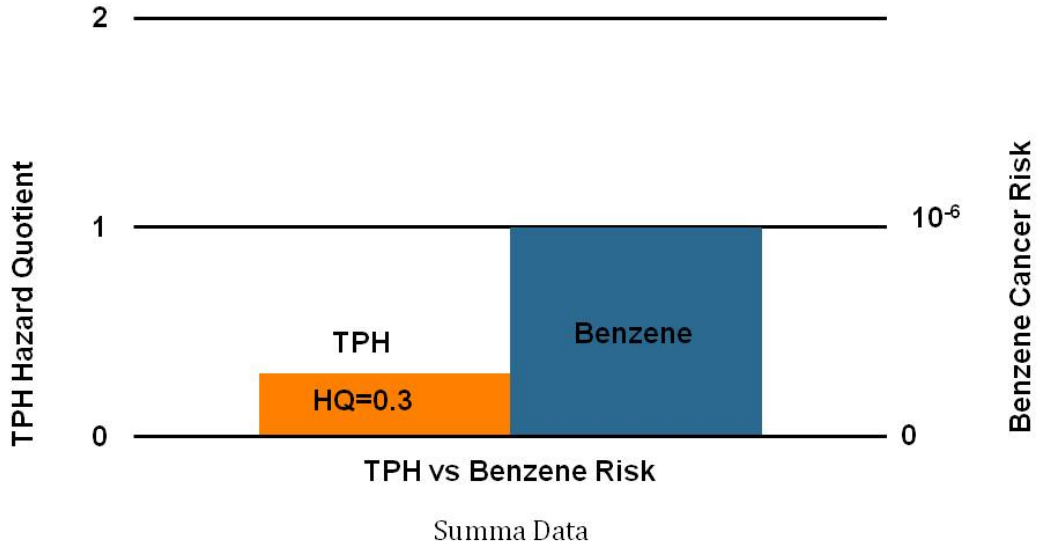


Figure 32. TPH versus benzene as the risk driver for petroleum vapors collected over fresh gasoline based on Summa vs sorbent tube carbon range data. Benzene adequate to evaluate vapor intrusion hazards provided that a target 10^{-5} cancer risk is used (TPH noncancer HQ<1 when benzene risk 10^{-5}).



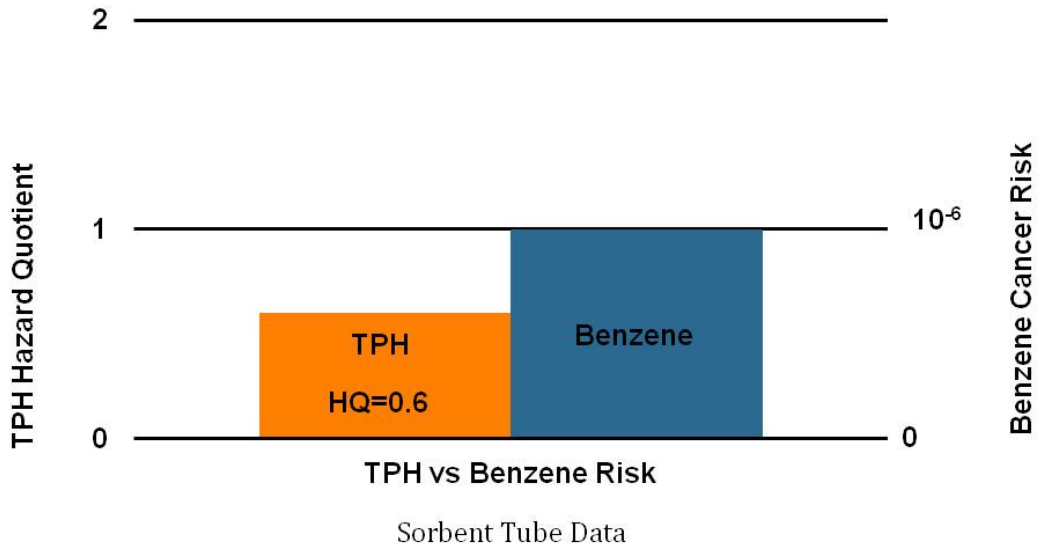


Figure 33. TPH versus benzene as the risk driver for petroleum vapors collected over fresh diesel based on Summa vs sorbent tube carbon range data. Benzene adequate to evaluate vapor intrusion hazards (TPH noncancer HQ<1 when benzene risk 10^{-6}).

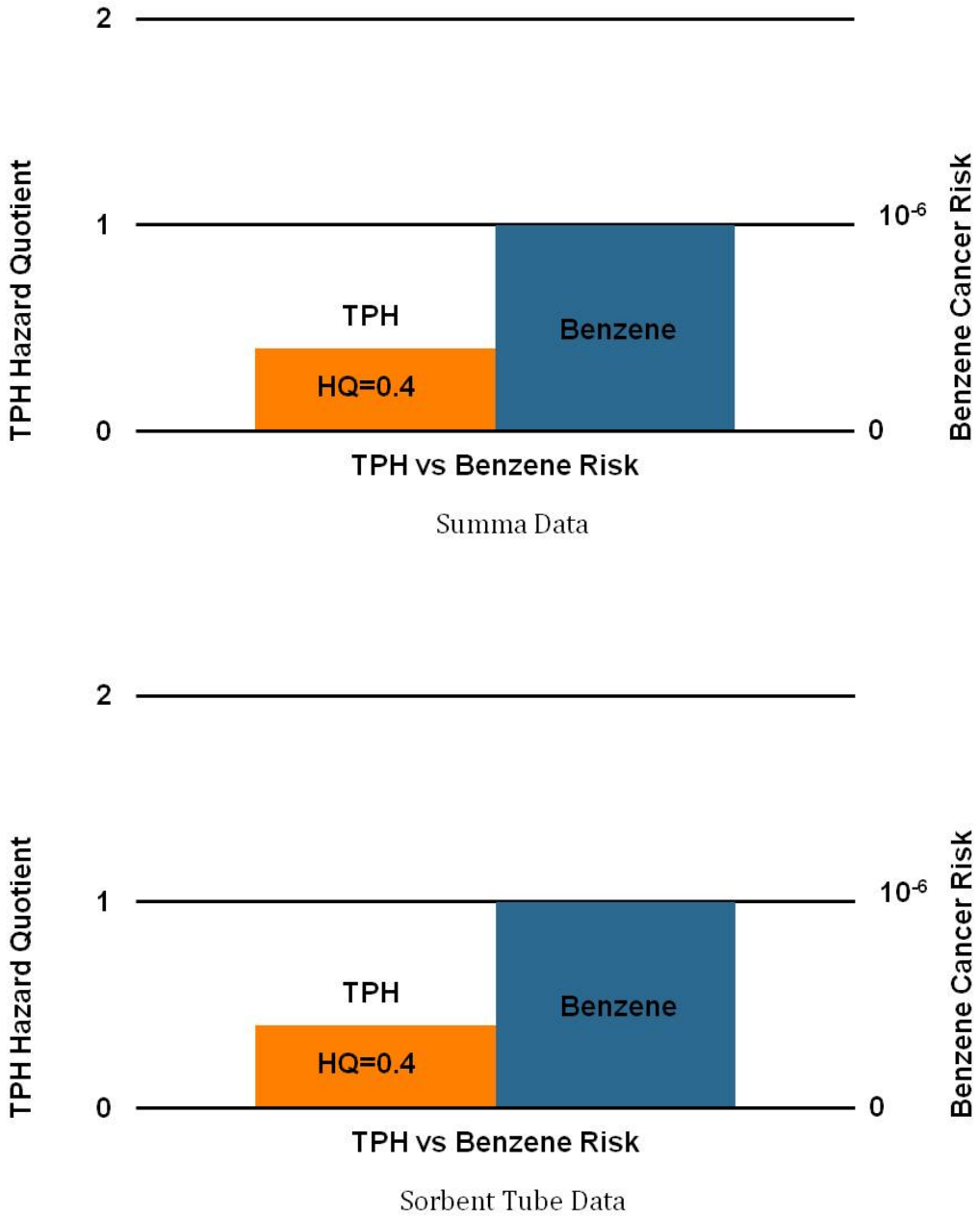


Figure 34. TPH versus benzene as the risk driver for petroleum vapors collected over fresh JP-8 jet fuel based on Summa vs sorbent tube carbon range data. Benzene adequate to evaluate vapor intrusion hazards provided that a target 10^{-6} cancer risk is used (TPH noncancer HQ<1 when benzene risk 10^{-6}).

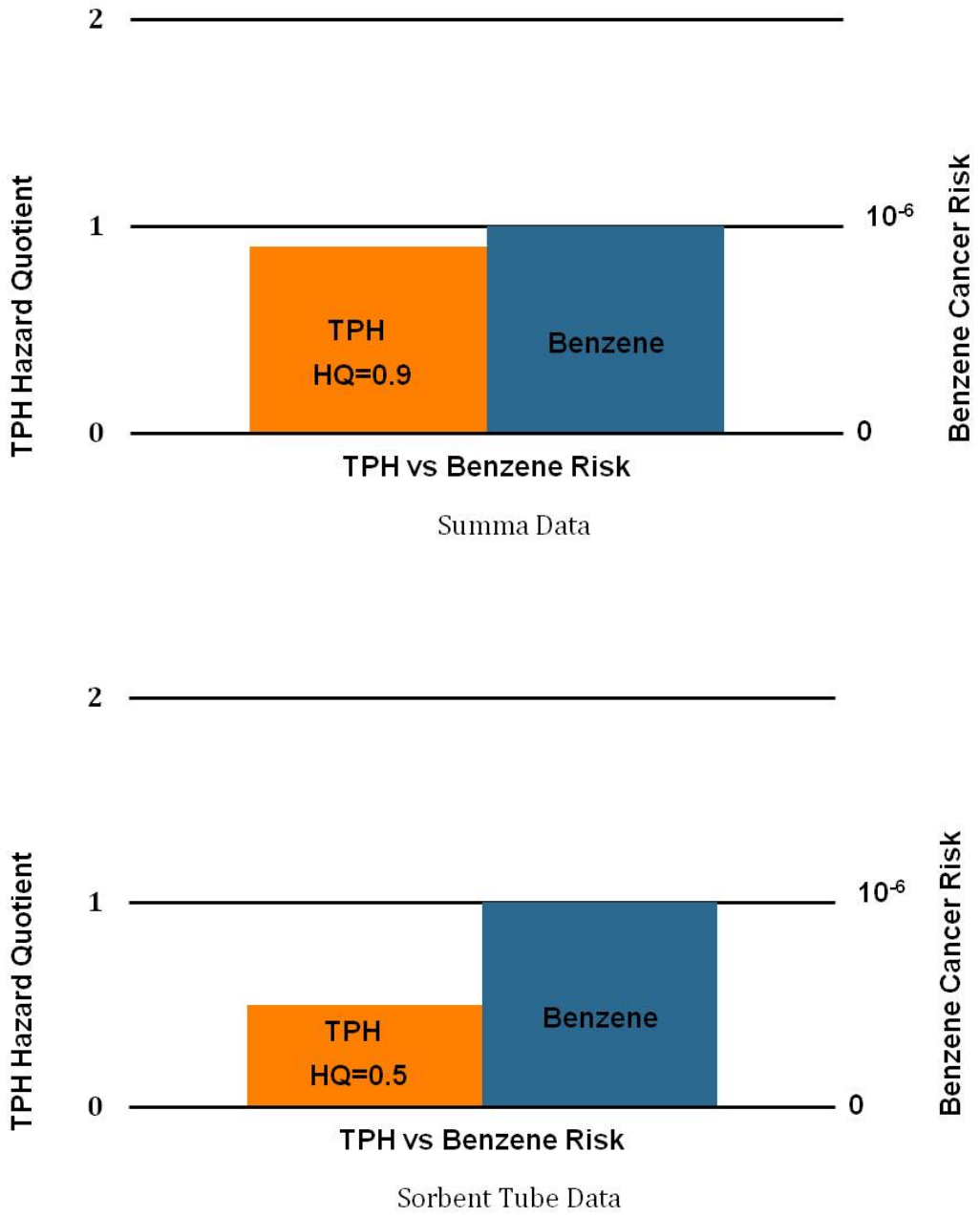


Figure 35. TPH versus benzene as the risk driver for petroleum vapors in soil gas samples collected from Site A (JP-4/AVGAS) based on Summa vs sorbent tube carbon range data. Benzene adequate to evaluate vapor intrusion hazards provided that a target 10^{-6} cancer risk is used (TPH noncancer HQ<1 when benzene risk 10^{-6}).

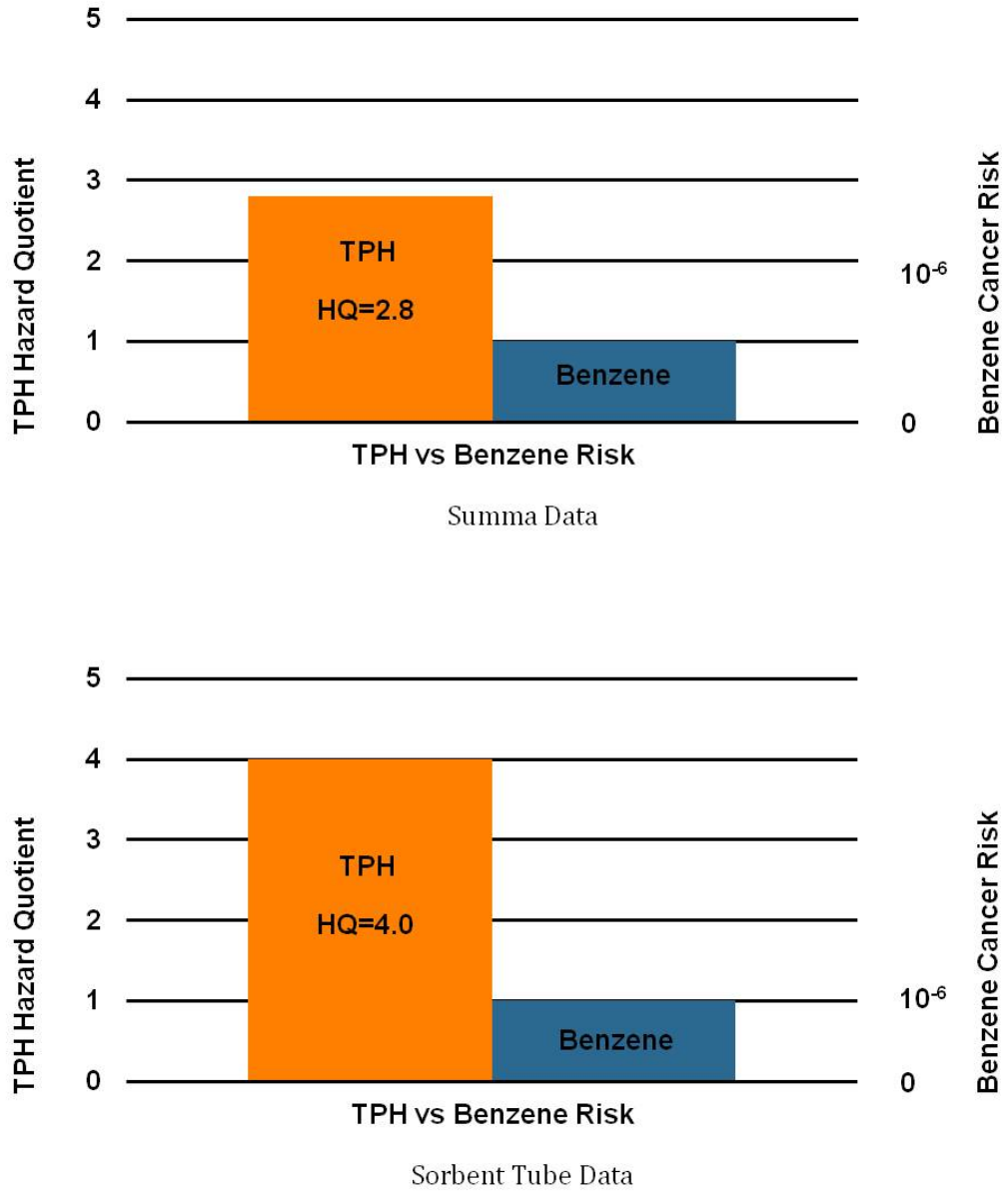


Figure 36. TPH versus benzene as the risk driver for petroleum vapors in soil gas samples collected from Site B (mixed fuels) based on Summa vs sorbent tube carbon range data. TPH *always* drives potential vapor intrusion hazards (TPH noncancer HQ>1 even when benzene risk 10^{-6}).

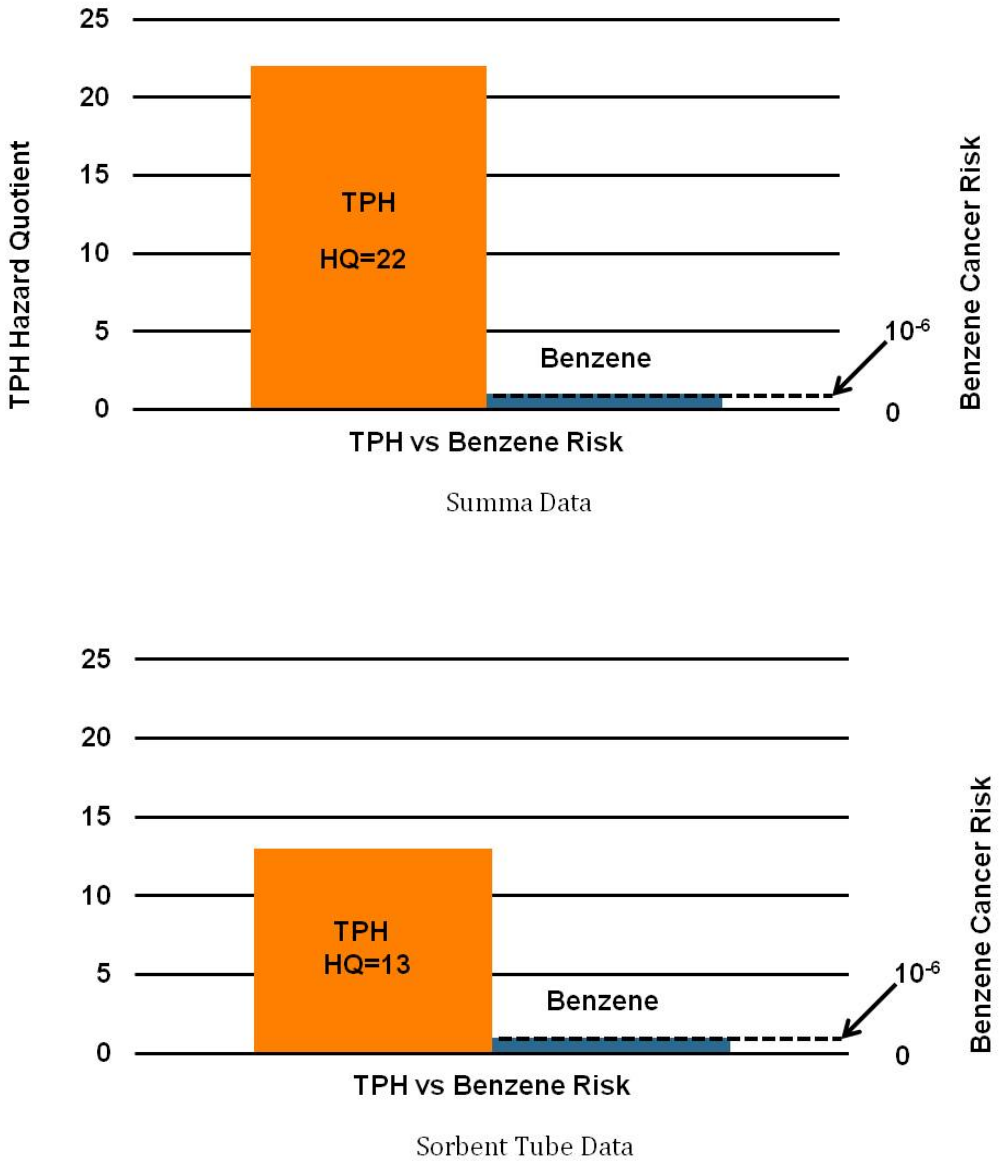
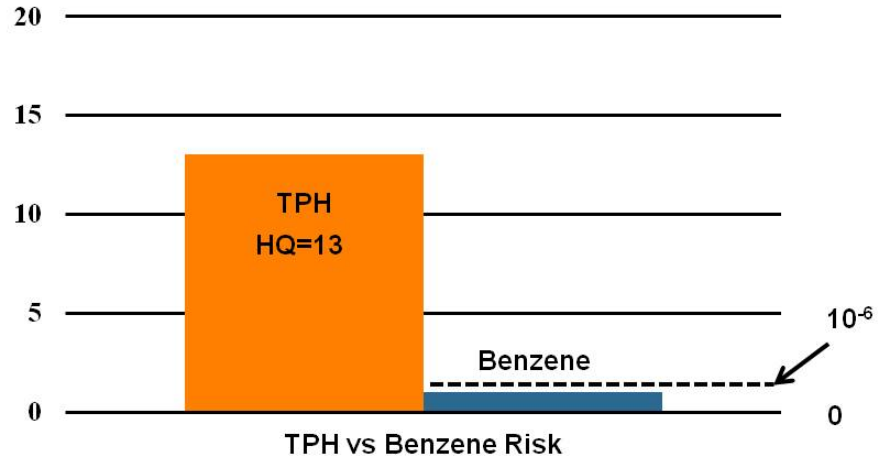
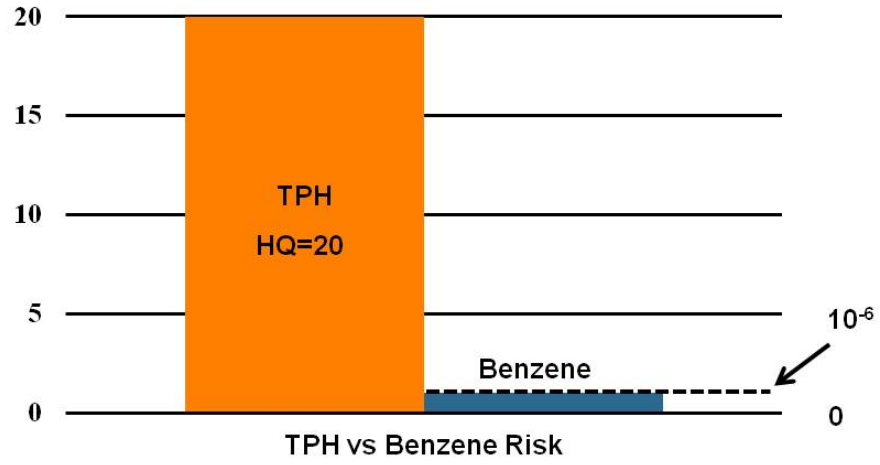


Figure 37. TPH versus benzene as the risk driver for petroleum vapors in soil gas samples collected from Site C (JP-8 +/- JP-4) based on Summa vs sorbent tube carbon range data. TPH *always* drives potential vapor intrusion hazards (TPH noncancer HQ>1 even when benzene risk 10^{-6}).

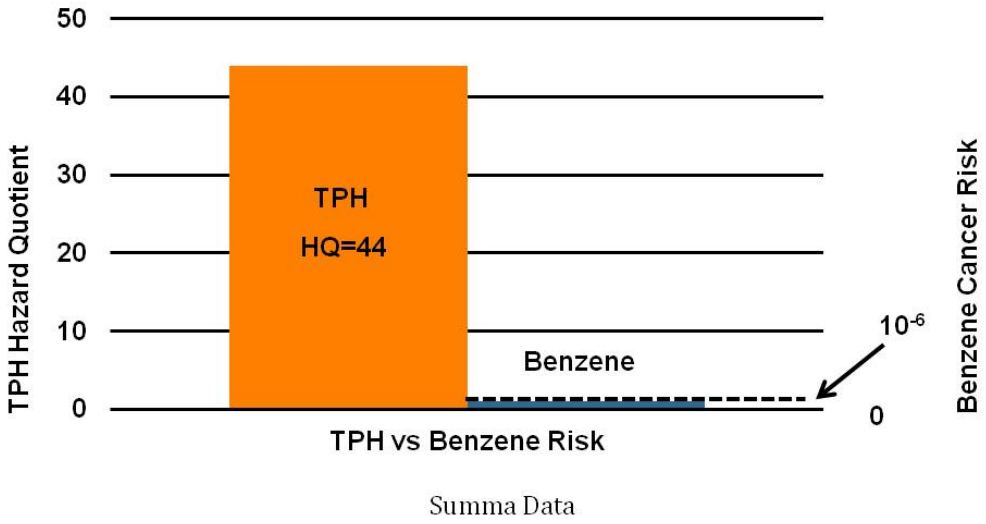


Summa Data

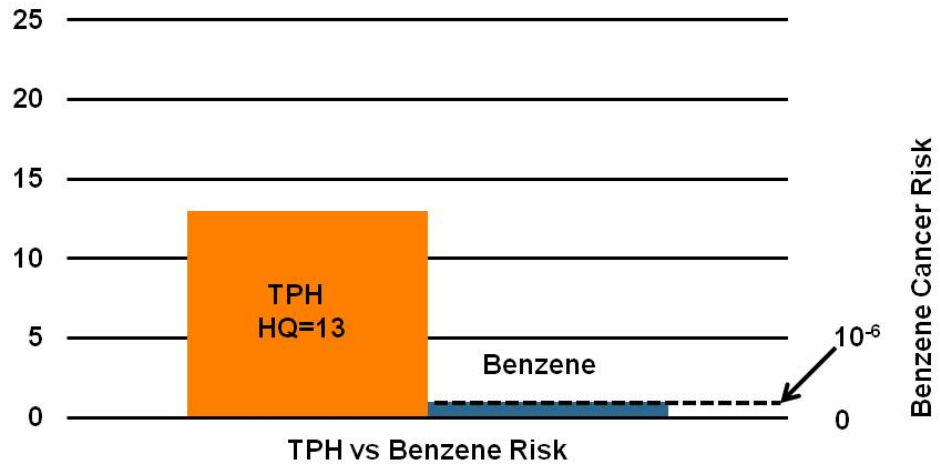


Sorbent Tube Data

Figure 38. TPH versus benzene as the risk driver for petroleum vapors in soil gas samples collected from Site D (JP-4/AVGAS) based on Summa vs sorbent tube carbon range data. TPH *always* drives potential vapor intrusion hazards (TPH noncancer HQ>1 even when benzene risk 10^{-6}).



Summa Data



Sorbent Tube Data

Figure 39. TPH versus benzene as the risk driver for petroleum vapors in soil gas samples collected from Site E (diesel) based on Summa vs sorbent tube carbon range data. TPH *always* drives potential vapor intrusion hazards (TPH noncancer HQ>1 even when benzene risk 10^{-6}).

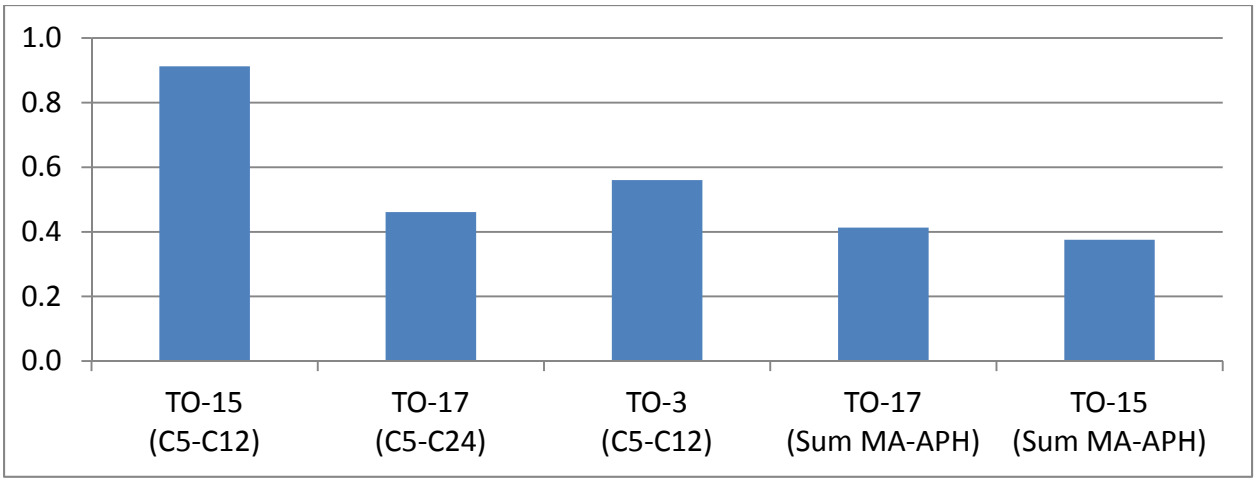


Figure 40. Comparison of average, relative TPHgasoline concentrations for individual samples tested using different laboratory methods during Phase II of the study (see Table 26a&b). TO-3 and TO-15 data reflect Summa canister samples. TO-17 data reflect sorbent tube samples collected immediately after corresponding Summa canister sample.

Attachment 1: Overview of Petroleum Chemistry from Appendix 1, Chapter 6 of the HEER EHE Guidance (HDOH 2011)

Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater

Volume 2: Background Documentation for the Development of Tier 1 Environmental Action Levels

Appendix 1: Detailed Lookup Tables

Hawai`i Edition

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Fall 2011
(revised January 2012 to correct TPH toxicity factors; see Chapter 6)

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DISCLAIMER

This document, *Evaluation of Environmental Hazards at Sites with Contaminated Soil and Groundwater* (Fall 2011), is a technical report prepared by staff of the Hawai'i Department of Health (HDOH), Environmental Management Division. The document updates and replaces the document *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater* (Interim Final, March 2009 and interim updates).

The document provides guidance for identification and evaluation of environmental hazards associated with contaminated soil and groundwater. The Environmental Action Levels (EALs) presented in this document and the accompanying text are specifically *not* intended to serve as: 1) a stand-alone decision making tool, 2) guidance for the preparation of baseline environmental risk assessments, 3) a rule to determine if a waste is hazardous under the state or federal regulations, or 4) a rule to determine when the release of hazardous substances must be reported to the HDOH.

The information presented in this document is not final action. HDOH reserves the right to change this information at any time without public notice. This document is not intended, nor can it be relied upon, to create any rights enforceable by any party in litigation in areas associated with HDOH. HDOH may elect to follow the information provided herein or act at a variance with the information, based on an analysis of site-specific circumstances.

This document will be periodically updated. Please send comments, edits, etc. in writing to the above contact. It is cautioned, however, that reference to the action levels presented in this document without adequate review of the accompanying narrative could result in misinterpretation and misuse of the information.

6

Soil, Soil Gas and Groundwater Action Levels for TPH

6.1 Introduction

Petroleum is a complex mixture of hundreds of different compounds composed of hydrogen and carbon (i.e., "hydrocarbon" compounds). The carbon range makeup of common petroleum fuels is noted in Figure 3. Non-specific, aliphatic and aromatic compounds collectively reported as Total Petroleum Hydrocarbons or "TPH" make up the overwhelming majority of the hydrocarbon mass in fuels and in vapors emitted from fuels (discussed below, see also Appendix 6). Individual, "indicator" compounds such as benzene, toluene, ethylbenzene and xylenes (BTEX) as well as naphthalene and other targeted polyaromatic hydrocarbons (PAHs) only make up a small percentage of the total mass in fuels and in vapors.

Testing and evaluation of the TPH component of petroleum-contaminated soil and groundwater and in associated soil gas in addition to targeted, individual compounds is therefore important. A summary of target analytes for petroleum in soil gas, soil and water in addition to TPH and with respect to different fuel types is provided in Table 6-1. In many cases the TPH component of the contamination will drive risk to human health and the environment over the minority fraction represented by individual BTEX and PAH compounds.

The development of risk-based action levels for Total Petroleum Hydrocarbons (TPH) in soil, soil gas and groundwater is described below. For the purposes of this document, petroleum mixtures are subdivided into "gasolines", "middles distillates" and "residual fuels", following the methodology used by the American Petroleum Institute (API 1994). Middle distillates include common diesel fuel, kerosene and jet fuels such as JP-8. The action levels are based on the assumed carbon range makeup of fuel types and associated

vapors in conjunction with carbon range-specific toxicity factors published by USEPA and Massachusetts, among other agencies.

Several published documents were available to select a default, carbon range makeup of different fuel types (e.g., TPHWG 1998, MADEP 1997, 2003). Published data on the carbon range makeup and toxicity of vapors associated with petroleum fuels are limited. In 2011, the HEER office carried out a soil gas study of key, petroleum-contaminated sites in Hawai‘i to help fill this data gap and update the EHE guidance and associated TPH EALs. The results of that study are summarized below and presented in Appendix 6.

Not surprisingly, and as described below and in Appendix 6, vapors are strongly biased toward lighter-end aliphatic compounds in comparison to the parent fuel type. Significant vapors were identified at both gasoline and middle distillate release sites. Gasoline is routinely considered to be “volatile” and a potential vapor intrusion hazard. As is obvious by their distinctive smell, middle distillates such as diesel fuel are also volatile and can pose vapor intrusion hazards if present at high enough concentrations and mass in soil and groundwater.

Sections 7 and 9 of the HEER office *Technical Guidance Manual* describes laboratory methods for testing of TPH in soil, water and soil gas contaminated with petroleum fuels. Detailed carbon range analysis of the aliphatic and aromatic makeup of the TPH component of the petroleum and development of site-specific, TPH action levels can be carried out as needed as an alternative to the action levels published in this guidance (see Volume 1). This is not anticipated to be necessary or cost-beneficial at most sites, however. An exception might be the need for more detailed carbon range data for soil gas at sites where reported concentrations of TPH exceed the Tier 1 action levels be less than a factor of three, the approximate magnitude that site-specific action levels might be increased over the default action level.

As discussed in the Volume 1, the use of EALs as final “cleanup levels” for petroleum-related compounds that are known to be highly biodegradable may be unnecessarily conservative. This is especially true TPH and petroleum-related compounds. Final cleanup levels should be evaluated on a site-specific basis and in conjunction with guidance from the overseeing regulatory agency (e.g., refer to HDOH 2007).

6.2 TPH Carbon Range Makeup of Fuels and Fuel Vapors

A summary of the selected, default carbon range TPH makeup of fuels and fuel vapors is provided in Table 6-2. This was used in combination with carbon range toxicity factors published by USEPA and other agencies to developed risk-based action levels for TPH in

indoor air, soil gas, soil and groundwater. A detailed summary of data collected as part of the HEER office 2011 soil vapor study is provided in Appendix 6.

A detailed review of the chemistry and carbon range makeup of different petroleum fuel types is presented in guidance published by the Total Petroleum Hydrocarbon working Group (TPHWG 1998). Summaries have also been published by several states, including Massachusetts (MADEP 1997, 2003) and Indiana (IDEM 2010). A brief overview is provided below, with a focus on gasoline, #2 diesel fuel and residual fuels such as motor oil.

6.2.1 Gasolines

Gasolines are defined as petroleum mixtures characterized by a predominance of branched alkanes and aromatic hydrocarbons with carbon ranges of C6 to C12 and lesser amounts of straight-chain alkanes, alkenes and cycloalkanes of the same carbon range (TPHWG 1998). Based on information published by the State of Indiana, a relative TPH carbon range makeup of gasoline fuels (not including BTEX, naphthalene and other individual, targeted compounds) of 45% C5-C8 aliphatics, 12% C9-C12 aliphatics and 43% C9-C12 aromatics was selected for development of TPHgasoline action levels for soil and groundwater (see Table 6-2a). Separately targeted, individual such as BTEX and naphthalene generally do not make up more than 5% of gasoline fuels in Hawai‘i. Other compounds such as MTBE are not added in significant quantities.

An assumed TPH carbon range makeup of vapors associated with gasolines of 99% C5-C8 aliphatics, 0.5% C9-C12 aliphatics and 0.5% C9-C10 aromatics was selected for development of TPHgasoline soil gas action levels (see Table 6-2b). This was based on vapor data for locally purchased gasoline tested by HDOH, published information (e.g., BioVapor 2010) and site-specific data collected during the 2011 HEER office study (see Appendix 6). Vapors associated with fresh gasoline are dominated by C2-C4 aliphatics and C5-C8 aliphatics, with only a minor component (<5%) of BTEX and non-specific aromatic compounds (see Appendix 6). Vapors associated with weathered fuel, as is the case at most gasoline-release sites, are dominated by C5-C8 aliphatics with little to no C2-C4 aliphatics remaining and again a relatively minor component of BTEX and non-specific aromatic compounds (see Appendix 6; may differ on the mainland due to local gasoline formulations). The C2-C4 aliphatics primarily pose explosion hazards. Chronic toxicity factors have not been developed for these compounds.

The ratio of TPH to benzene in soil gas at gasoline-contaminated sites is typically less than 500:1, with the ratio lower ratio (i.e., increased proportion of benzene) at fresh release sites and higher ratio at more weathered sites (i.e., preferential loss of benzene).

6.2.2 Middle Distillates

Middle distillates (e.g., kerosene, diesel fuel, home heating fuel, JP-8 jet fuel, etc.) are characterized by a wider variety of straight, branched and cyclic alkanes, polynuclear aromatic hydrocarbons (PAHs, especially naphthalene an methylnaphthalenes) and heterocyclic compounds with carbon ranges of approximately C9 to C25. A small component of C5-C8 aliphatics and BTEX aromatics is also present.

Diesel #2 was selected as the most representative fuel for this petroleum type due to its more widespread use in comparison to other fuels. (JP-8 jet fuel is essentially diesel fuel with an increased component of lighter-end compounds.) Based on guidance published by the State of Indiana (IDEM 2010), an assumed, carbon range makeup for Diesel #2 fuel of 0.4% C5-C8 aliphatics, 35.2% C9-C12 aliphatics, 42.5% C19 and greater aliphatics, 14.2% C9-C12 aromatics and 7.7% C13 and higher aromatics was selected for development of soil and groundwater TPH action levels (see Table 6-2a). This is in line with the carbon range makeup of individual chemicals in diesel fuel published by the TPH Working Group (TPHWG 1998).

Selection of a default, carbon range makeup of vapors associated with middle distillates is less straight forward than for gasolines. Published data regarding the specific, carbon range makeup of vapors associated with diesel fuel and other middle distillates is lacking. Vapor headspace chromatograms have been published by a few private entities, however (e.g. Hayes 2007, NCFS 2011). Not surprising given the chemical makeup of middle distillate fuels, the chromatograms suggest a dominance of C12 and greater aliphatic compounds in vapors associated with these fuels, with an accompanying significant amount of C5-C8 aliphatics. The increased presence of the latter in vapor in part reflects the preferential release of lighter-end and more volatile aliphatic compounds from the fuels. Elevated C5-C8 aliphatics in the vapor could also reflect degradation of longer-chain compounds. The USGS has documented the latter in groundwater for a diesel release site they have been monitoring since the 1980s (Chaplain et al, 2002). Aromatic compounds, including BTEX and naphthalene make up only a small amount of the total mass of vapor-phase compounds.

Commercial laboratories are only able to reliably report up to C12 aliphatics and C10 aromatics in soil gas samples collected in summa canisters (e.g., see Hayes 2007). This is because longer-chain vapor compounds tend to condense on the inside of the canisters stick and are not extracted when a aliquot is removed for testing. This in turn means that the soil gas samples collected in summa canisters at middle distillate release sites could significantly under report the total concentration of TPH present in the soil gas and subsequently under represent the potential vapor intrusion hazard posed by the contamination.

In order to address this potential concern HDOH collected TO-17 sorbent tube soil gas samples at five key petroleum sites as part of its 2011 study. The TO-17 samples allowed full capture and extraction of the full range of petroleum compounds present in the soil gas. The samples were collected by drawing a fixed volume of soil gas (e.g., 50ml) through a narrow tube filed with a carbon-based sorbent material (see Appendix 6). Summa canister samples were also collected at the sites for comparison. The laboratory extracts and measures the mass of targeted VOCs captured by the sorbent material. Dividing this by the volume of soil gas (or air) drawn through the tube yields the original concentration of the individual VOC in the soil gas.

Soil gas data collected by HDOH at several middle distillate release sites in Hawai‘i revealed wide variations in the ratio of C5-C8 and C9-C12+ aliphatic compounds between and even within sites (see Appendix 6). In some cases C9-C12+ aliphatics dominated, in agreement with published chromatograms for headspace samples over diesel fuel (e.g. Hayes 2007, NCFS 2011). In other cases C5-C8 aliphatics dominated. This may have been in part due to mixing of vapors with nearby gasoline releases and/or the breakdown of longer-chain aliphatics into shorter chain aliphatics at more weather sites. Vapor samples collected over fresh fuels were likewise mixed (see Appendix 6), although it is suspected that the fuel associated with the sample that reported a higher proportion of C5-C8 aliphatics may have been excessively warmed in the sun prior to collection of the vapor sample. The distinct presence of C9-C12+ aliphatics in the soil gas samples, however, clearly distinguishes sites with middle distillate contamination from gasoline-release sites.

Based on the results of the HEER office study, an assumed TPH carbon range makeup of vapors associated with middle distillate fuels of 25% C5-C8 aliphatics, 75% C9-C12+ aliphatics and 0% C9-C10 aromatics was selected for development of TPH soil gas action levels (see Table 6-2b and Appendix 6). This reflects the worst-case sample collected at diesel-release site and is considered to be conservative, given that the toxicity of longer-chain aliphatics is assumed to be six times greater than shorter-chain aliphatics (see Table 6-3). An assumed dominance of C9-C12+ aliphatic compounds in middle distillate vapors is consistent with published chromatograms for headspace samples over diesel fuel noted above (e.g. Hayes 2007, NCFS 2011). A high percentage of C12+ aliphatics and C10+ aromatics was not, however, identified in the middle distillate sites investigated even this was predicted by the published chromatograms (maximum 13%, see Appendix 6). This may reflect the fact that the chromatograms reflect vapors collected over fresh fuels.

Small amounts of BTEX and naphthalene were reported in vapor samples collected over fresh fuel. Benzene, naphthalene and other aromatic compounds were present in only trace amounts in soil gas samples collected at targeted middle distillate release sites, however (generally <0.1%). The ratio of TPH to benzene was typically greater than

1,000:1 and in some cases over 10,000:1. Non-specific aliphatics clearly drove vapor intrusion risks at these sites over individual compounds such as benzene and naphthalene. Testing for only the latter in the soil gas samples would have significantly underestimated the vapor intrusion risk.

6.2.3 Residual Fuels Distillates

Residual fuels (e.g., Fuel Oil Nos. 4, 5, and 6, lubricating oils, "waste oils", “oil and grease,” asphalts, etc.) are characterized complex, polar PAHs, naphthenoaromatics, asphaltenes and other high-molecular-weight, saturated hydrocarbon compounds with carbon ranges that in general fall between C24 and C40. Published data on the specific, aliphatic and aromatic makeup of the TPH fraction of residual fuels after subtracting individual, targeted PAH compounds was not identified for use in this guidance but is expected to vary widely between different products and wastes.

For the purposes of this guidance, and as a conservative measure for risk-based action levels, a TPH carbon range composition of 75% C19+ aliphatics and 25% C17+ aromatics was assumed for estimation of a TPH reference dose for residual fuels and subsequent calculation of risk-based action levels (see Table 6-2a). This is based on the aliphatic-aromatic makeup of lubricating and motor oil presented in Table 13 of the TPH Working group guidance (TPHWG 1998). Testing for targeted, individual PAHs in addition to TPH at residual fuel release sits is critical. Motor oil that has been heated to high temperatures can, however, contain a significant proportion of carcinogenic, PAH compounds. Significant amounts of PAHs (e.g., naphthalene) could also be present at former gas manufacturing plants, asphalt production facilities, other sites where PAHs made up a significant proportion of the petroleum product released.

For the purposes of this guidance the makeup of vapors associated with heavy fuels was assumed to be identical to middle distillate vapors, with 25% C5-C8 aliphatics, 75% C9-C12 aliphatics and 0% C9-C10 aromatics (see Table 6-2b). The HEER office study did not include the review or collection of soil gas samples at sites contaminated with heavy petroleum fuels or products (e.g., Bunker C fuel oil). Vapor-phase compounds are expected to be dominated by C9-C12+ aliphatics, with little to no BTEX. As is suspected for some middle distillates sites, C5-C8 and even C9-C12 aliphatics could be present as breakdown products of longer-chain hydrocarbon compounds. Naphthalene may be a concern at manufacture gas plant (MGP) sites. The TPH fraction of soil and groundwater contaminated with residual fuels is only likely to pose significant vapor intrusion hazards if gross contamination is situated immediately beneath building floors, especially in comparison to gasoline- and even diesel-contaminated sites (with the exception of MGP site). Methane buildup may also be a concern at heavy fuel release sites.

Mineral oils used in electrical transformers are highly refined, fractions of crude oil with little to no chemical additives (EPRI 1998). The oils are dominated by C9-C30 aliphatics (approximately 85%) with a less amount of non-specific, aromatic compounds (approximately 15%) and overlap the carbon ranges discussed for middle distillates and residual fuels (see Figure 3). The volatile component of mineral oils is significantly lower than that found in middle distillates. The viscosity of the oils is also significantly greater. Carcinogenic PAHs such as benzo(a)pyrene are not present in detectable amounts. Releases of mineral oils from electrical transformers are relatively small in comparison to releases of diesel fuels and contamination is generally limited.

6.3 Carbon Range TPH Toxicity Factors and Physiochemical Constants

Carbon range toxicity factors published by Massachusetts (MADEP 2003) and more recently by the USEPA (USEPA 2009) were used to calculate weighted inhalation and oral toxicity factors for each of the three noted TPH categories, based on the assumed aliphatic and aromatic makeup of each category. A summary of toxicity factors selected for the each of the targeted carbon ranges is provided in Table 6.3. The following equations were used to calculate weighted Reference Concentrations and Reference Doses (see ODEQ 2003):

Weighted RfC (ug/m^3) =

$$\frac{1}{\left[\left(\frac{(\text{Fraction C5}\cdot 8\text{ aliphatics})}{\text{C5}\cdot 8\text{ aliphatics RfC}}\right)+\left(\frac{\text{Fraction C9}\cdot 12+\text{ aliphatics}}{\text{C9}\cdot 12+\text{ aliphatics RfC}}\right)+\left(\frac{\text{Fraction C9}\cdot 10+\text{ aromatics}}{\text{C9}\cdot 10\text{ aromatics}+\text{ RfC}}\right)\right]}$$

Weighted RfD (mg/kg-day) =

$$\frac{1}{\left[\left(\frac{(\text{Fraction C5}\cdot 8\text{ aliphatics})}{\text{C5}\cdot 8\text{ aliphatics RfD}}\right)+\left(\frac{\text{Fraction C9}\cdot 12+\text{ aliphatics}}{\text{C9}\cdot 12+\text{ aliphatics RfD}}\right)+\left(\frac{\text{Fraction C19}+\text{ aliphatics}}{\text{C19}+\text{ aliphatics RfD}}\right)+\left(\frac{\text{Fraction C9}\cdot 10+\text{ aromatics}}{\text{C9}\cdot 10\text{ aromatics}+\text{ RfD}}\right)\right]}$$

As noted in Table 6-4, weighted, oral Reference Doses of 0.03, 0.02 and 0.12 mg/kg-day were calculated for TPHgasolines, TPHmiddle distillates and TPHresidual fuels, respectively, based on the assumed carbon range makeup of the petroleum products. Weighted, inhalation Reference Concentrations of 571 ug/m^3 and 126 ug/m^3 were calculated for TPHgasolines and TPHmiddle distillates, respectively.

Default physiochemical constant values for TPH categories used in previous editions of the guidance were retained for use in the action level models (see Table H). The constants are based primarily on guidance published by Massachusetts DEP (MADEP 1997, 2002). As summarized below and in Appendix 1, these toxicity factors and physiochemical constants were used to develop soil gas, soil and groundwater TPH action levels. Risk-based action levels for TPH are based on a target, noncancer hazard quotient of 1.0. This is based on an assumption that TPH represents the primary noncancer risk posed by petroleum-contaminated soil, soil gas and groundwater due to the overwhelming mass of hydrocarbon compounds included in the analysis (see Section 1.4 and Appendix 6).

6.4 TPH Action Levels for Indoor Air and Soil Gas

Preliminary, risk-based action levels for TPHgasolines and TPH middle distillates in indoor air and soil gas as were calculated in the same manner as done for other volatile chemicals but with the use of a target, noncancer Hazard Quotient of 1.0 (see above and equations in Appendix 2). An indoor action level of 600 ug/m^3 was calculated for TPHgasolines. An indoor action level of 130 ug/m^3 was calculated for TPHmiddle distillates. Soil gas action levels were calculated using the default, Indoor Air:Soil Gas attenuation factors discussed in Section 2 (Residential: 1/1,000, Commercial/Industrial: 1/2,000). This generates residential soil gas action levels of 600,000 ug/m^3 for TPHgasolines and 130,000 ug/m^3 for TPHmiddle distillates (Table 6-5; soil gas action levels for carbon ranges also provided).

Petroleum release sites often contain a mix of fuels. Vapors in soil gas could likewise be a mix of several fuel types. Applying soil gas (and indoor air) action levels for gasolines versus middle distillate fuels is therefore not straightforward. *For the purposes of this guidance and for initial screening of petroleum-contaminated sites, the more conservative indoor air and soil gas action levels calculated for TPHmiddle distillates were selected for inclusion in the lookup tables for TPHgasolines (see Tables C-2 and C-3).* The same action levels should be applied to petroleum vapors associated with residual fuels. This can be re-evaluated on a site-specific basis as needed by the collection of carbon range data for soil gas and calculation of site-specific action levels, or use of the TPHg soil gas action levels noted in Table 5b if laboratory data confirm that the carbon range makeup of the vapors is similar to that presented in Table 6-2b for gasolines. Note also that the TPH indoor air action levels could be below ambient background levels for indoor and outdoor air, due to the use of petroleum-based cleaners, auto exhaust, etc.

The soil gas action levels likewise do not take into account an expected reduction in concentration and associated risk over time due to biodegradation. This is also true for risk-based, TPH soil action levels presented in the Table I series. This can be evaluated on a site-specific basis as needed.

The collection and evaluation of soil gas samples at sites impacted with impacted with residual fuels is warranted where heavy contamination is to be left in place (see HDOH 2007). Soil gas action levels for vapors associated with TPHmiddle distillates should be applied in the absence of soil gas carbon range data. This will help to rule out potential vapor intrusion hazards and ensure that other sources of petroleum contamination were not missed.

6.5 TPH Action levels for Soil

6.5.1 TPH (gasolines, middle distillates)

Risk-based, direct-exposure action levels for TPHgasolines and TPHmiddle distillates in soil can be calculated in the same manner as done for individual chemicals, using the toxicity factors noted above and physiochemical constants noted in Table H (see Chapter 4). The model calculated residential direct-exposure soil action levels of 250 mg/kg and 210 mg/kg using this approach. These action levels are excessively conservative, in that they do not address biodegradation of TPH in soil over time, especially soil exposed at the surface. In order to address this issue upfront and for the purpose of this guidance, the final, residential direct-exposure soil action level for both TPHg and TPHmd was set to 500 mg/kg, similar to action levels in past editions of this guidance (see Table I-1).

As discussed in Chapter 4, maximum, direct-exposure action levels for volatile liquids in soil are normally set equal to the contaminants theoretical soil saturation level or Csat. This represents the concentration above which the contaminant can no longer be sorbed to soil particles (e.g., organic carbon or clay) or dissolved into the soil moisture (e.g., solubility limits reached). Above this concentration, free product will be present in the soil. This is important because the USEPA model used to calculate action levels for direct-exposure hazards is not valid above the Csat concentration for volatile chemicals (refer to Section 4.2.5). Maximum, direct-exposure action levels for volatile liquids in soil are therefore in general set to the chemical Csat concentration (e.g., refer to xylene action levels in Table I series).

This approach was used to establish Csat and maximum direct-exposure action levels for TPHgasolines (4,500 mg/kg; e.g., refer to Table I series). For TPH as middle distillates (e.g., diesel) the theoretical Csat concentration is much lower – 150mg/kg. This is due to the assumed, lower solubility of diesel and related middle distillate fuels (5 mg/L vs 150 mg/L for TPHg, refer to Table H). Confidence in the Csat value of 150 mg/kg is low, however, and this value is considered to be excessively conservative for use as a maximum, direct exposure action level. The use of alternative approaches to evaluate direct-exposure hazards posed by TPHmd and other volatile contaminants in soil is

currently being evaluated (e.g., using soil gas rather than soil data). For the purposes of this document, it is assumed that the gross contamination action level for TPHmd of 500 mg/kg is adequate for protection of direct-exposure hazards posed by TPHmd. This value was used as an alternative Csat action level for TPHmd in the Table I series. Residual fuels are not considered to pose significant vapor emission hazards other than the potential generation of methane and related explosion hazards (refer to Volume 1).

Massachusetts developed generic physio-chemical constants for the C11-C22 aromatics carbon range fraction based on a review of compounds included within this fraction. These constants were adopted in this document to develop a soil leaching action level for TPH as gasolines and middle distillates (see Tables E and H). The soil action level calculated for leaching of TPH from soil and protection of groundwater that is a source of drinking water (rounded to 100 mg/kg) is coincidental with action levels presented in other technical documents prepared by local regulatory agencies in California (e.g., RWQCBSF 1990; RWQCBLA 1996). Similarly, the soil action level calculated for leaching of TPH from soil and protection of groundwater that could discharge into a body of surface water (rounded to 400 mg/kg (gasolines) and 500 mg/kg (middle distillates)) is coincidental with the action level developed for use in the CalEPA Board Order for the San Francisco Airport (RWQCB SF 1999a).

Ceiling levels for nuisance and other gross contamination concerns developed by Massachusetts for TPH as gasoline and diesel (latter included under "middle distillates") were modified for use in this document (MADEP 1997a,b, refer to Table F series). Based on calculated “odor indexes”, a shallow soil ceiling level of 100 mg/kg was selected for unrestricted (“residential”) land-use scenarios and a ceiling level of 500 mg/kg was selected for commercial/industrial land-use (both categories of TPH). For deep soils, a ceiling level of 5,000 mg/kg was retained (primarily intended to prevent the presence of potentially mobile free product in soil).

6.5.2 TPH (residual fuels)

Risk-based, direct-exposure action levels for TPH as residual fuels were calculated in the same manner as done for individual chemicals, using the toxicity factors and physiochemical constants noted earlier. The action levels developed incorporate the Particulate Emission Factor used by USEPA to calculate RSLs for nonvolatile contaminants (USEPA 2011, refer to Appendix 2). Risk-based action levels for TPHrf in drinking water and soil were then developed in the same manner as done for other chemicals (Table D-3 and Table I series, respectively). As discussed in Volume 1, testing for individual, target indicator compounds is also recommended for soil and groundwater contaminated by heavy fuels (e.g., PAHs, heavy metals, etc.).

Individual PAHs are likely to drive health risks posed by soils contaminated with residual fuels. The non-specific, TPH fraction of the petroleum may, however, pose gross contamination concerns even in the absence of significant PAHs. Following Massachusetts DEP guidance (MADEP 1997a,b), ceiling levels for gross contamination concerns of 500 mg/kg and 2,500 mg/kg were selected for exposed or potentially exposed soils in unrestricted ("residential") and commercial/industrial land use scenarios, respectively (see Table F series). The MADEP ceiling level of 5,000 mg/kg was selected for isolated or otherwise deep soils.

The Massachusetts DEP did not develop specific action levels for leaching of heavy hydrocarbons from soil (refer to C19-C36 carbon range summary in Appendix 6). Residual fuels are by definition characterized by a predominance hydrocarbon compounds with carbon ranges greater than C24. These compounds are considered to be substantially less mobile in the subsurface that hydrocarbon compounds that make up the lighter-weight petroleum mixtures. For TPH that is characterized by a predominance of C23-C32 carbon range compounds, the California EPA Los Angeles Regional Water Board proposes a action level of 1,000 mg/kg for protection of drinking water resources (RWQCBLA 1996). This action level was adopted for use in this document (refer to Table E). The target TPH action level for groundwater was not specifically stated but is presumably 100 ug/L or less.

The Los Angeles Regional Water Board did not present a similar action level for potential leaching of TPH from soil and subsequent discharge of impacted groundwater to a body of surface water. Although conservative, the Los Angeles TPH soil leaching action level 1,000 mg/kg was retained for this purpose (see Table E, refer also to Section 4.4).

The toxicity of mineral oils is relatively low and much less than that assumed for middle distillates. The volatile component of mineral oils is significantly lower than that found in middle distillates. The viscosity of the oils is significantly greater. Significant vapor emissions from soil and groundwater contaminated with mineral oil are not anticipated. For the purpose of this guidance and in order to address potential gross contamination concerns, a mineral oil TPH action level of 5,000 mg/kg is recommended for exposed soils or soils within three feet of the ground surface. For deeper soils an action level of 25,000 mg/kg is recommended. Refer also to the HEER office 2007 guidance for the long-term management of petroleum-contaminated sites (HDOH 2007). These action levels are not specifically called out in the EAL lookup tables.

6.6 TPH Action levels For Groundwater

Regulatory drinking water standards for TPH and petroleum in general have not been developed. Toxicity-based drinking water goals of 100 ug/L for gasoline, 460 ug/L for diesel and 84,000 ug/L for residual fuels were developed using on the USEPA RSL tapwater model and the above-noted toxicity factors (refer to Table F-3). (Note that the action level for residual fuels is likely to exceed the solubility in water, generally <5 mg/L) Action levels for benzene and related light-weight hydrocarbon compounds are considered to provide adequate additional protection of drinking water concerns for gasoline-impacted groundwater when used in conjunction with the TPH action level of 100 ug/L. A TPH-diesel taste and odor threshold of 100 ug/L referenced in the technical document *A Compilation of Water Quality Goals* (RWQCBCV 2007) was referred to as a substitute secondary MCL for all categories of TPH (see Table G-1). This takes precedence over the toxicity-based action level for selection of a final drinking water action level (see Tables D-1a and D-1b).

For the protection of aquatic life, an action level of 500 ug/L was selected for TPH-gasoline in freshwater and 3,700 ug/L in saltwater (see Table D-4b). A single action level of 640 ug/L was selected for TPH-diesel and TPH-residual fuels in both freshwater and saltwater. The freshwater action level for TPH-gasoline is based on a summary of available eco-toxicity data compiled for use at the Presidio of San Francisco under Regional Water Board Order 96-070 (RWQCBSF 1998b, Montgomery Watson 1999). The TPH-gasoline criteria for saltwater and the TPH criteria for diesel and residual fuels in general are based on action levels developed for use at the San Francisco Airport under Regional Water Board Order No. 99-045 (RWQCBSF 1999a).

The groundwater nuisance and odor concerns action level of 5,000 ug/L for TPH (all categories) noted in the Table G series for nondrinking water was taken directly from Massachusetts DEP risk assessment guidance (MADEP 1997a,b). This also corresponds with the approximate solubility of diesel fuel and light motor oil in fresh water (ATSDR 2001) and is intended to address potential nuisance issues (odors, etc.) if discharged to surface water. The TPH ceiling levels for gross contamination concerns are based on 1/2 the solubility of the respective TPH categories (refer to Table G series). The solubility of gasoline in freshwater is approximately 150,000 ug/L. The solubility of diesel range and heavier fuels is assumed to be approximately 5,000 ug/L. These action levels are intended to highlight the potential presence of free product on groundwater.

6.7 Additional Target Indicator Compounds

Laboratory measurement and assessment of each individual compound within a petroleum mixture is technically complex and generally not feasible or appropriate under

most circumstances. More importantly, data regarding the physio-chemical and toxicity characteristics of the majority of petroleum compounds are lacking. Impacts to soil and water from petroleum mixtures are instead evaluated in terms of both TPH and well characterized "indicator chemicals" (e.g., benzene, toluene, ethylbenzene, xylenes and targeted PAHs). Indicator chemicals typically recommended for petroleum mixtures include (after CalEPA 1996):

Monocyclic Aromatic Compounds (primarily gasolines and middle distillates)

- benzene
- ethylbenzene
- toluene
- xylene

Fuel additives (primarily gasolines)

- MTBE
- other oxygenates as necessary

Polycyclic Aromatic Compounds (primarily middle distillates and residual fuels)

- methylnaphthalene (1- and 2-)
- acenaphthene
- acenaphthylene
- anthracene
- benzo(a)anthracene
- benzo(b)fluoranthene
- benzo(g,h,i)perylene
- benzo(a)pyrene
- benzo(k)fluoranthene
- chrysene
- dibenzo(a,h)anthracene
- fluoranthene
- fluorene
- indeno(1,2,3)pyrene
- naphthalene
- phenanthrene
- pyrene.

The TPH EALs should be used in conjunction with EALs for these chemicals. Note that volatile chemicals such as butylbenzene, isopropyl benzene, isopropyl toluene and trimethylbenzenes are often reported in analyses of gasoline and other light-end petroleum products. These chemicals are collectively addressed under action levels for "TPH" and generally do not need to be evaluated separately.

Soil and groundwater impacted by releases of waste oil may also require testing for heavy metals and chemicals such as chlorinated solvents and PCBs. Action levels for these chemicals are included in the lookup tables.

6.8 Ethanol

Gasoline formulations are anticipated to include an increasing proportion of ethanol in the near future. Soil, soil gas, indoor air and groundwater action levels for ethanol have therefore been added to the EAL document. Human-health, chronic toxicity factors for ethanol have not been developed. Ethanol is not considered to pose chronic health risks at the low doses posed by exposure to contaminated soil and groundwater. The action levels are therefore based only on nuisance and gross contamination concerns. "Ceiling Levels" for these concerns are presented in Tables F (soil and indoor air) and I (groundwater and surface water). The final action level for each of the groundwater categories is based on an "Upper Limit" of 50 mg/L (Table G series, see also Tables D-1a and F-1b). The final soil action level presented in each of the soil categories of 45 mg/kg is based on the protection of groundwater to the noted target groundwater action level (Table E, see also Table A and B series). The leaching based action level was adjusted upwards by a factor of ten to take into account the high, anticipated biodegradation rate of ethanol in the environment. The adequacy of this action level should be further evaluated in the field as appropriate (e.g., sites near producing water wells or bodies of surface water). The indoor air action level of 19,200 ug/m^3 (10 ppmv) is based on the published odor threshold potential for ethanol (Table F series, see also Table C-3). This concentration is well below the OSHA Permissible Exposure Limit of 1,000 ppmv for workers.

Although highly mobile in the environment, ethanol is also highly biodegradable, not significantly toxic in low dose, and is likely to only persist in the presence of other, more toxic components of gasoline, including benzene (Ulrich 1999). An assessment and cleanup of contaminated soil and groundwater to address health threats posed by associated compounds is expected to address any potential health concerns posed by exposure to residual ethanol in soil, air or water.

Table 6-1. Target analytes for petroleum contaminated media (see also Section 9 of the HEER office Technical Guidance Manual; HDOH 2009).

Petroleum Product	Media	Recommended Target Analytes
Gasolines	Soil	TPH, BTEX, naphthalene, MTBE and appropriate additives and breakdown products (e.g., DBA, TBA, lead, ethanol, etc.)
	Soil Vapor	Same as soil plus volatile additives and methane
	Groundwater	Same as soil
Middle Distillates (diesel, kerosene, Stoddard solvent, heating fuels, jet fuel, etc.)	Soil	TPH, BTEX, naphthalene, and methylnaphthalenes (1- and 2-)
	Soil Vapor	TPH, BTEX, naphthalene, and methane
	Groundwater	Same as soil
Residual Fuels (lube oils, hydraulic oils, transformer oils, Fuel Oil #6/Bunker C, waste oil, etc.)	Soil	TPH, *VOCs, naphthalene, methylnaphthalenes (1- and 2-), the remaining 16 priority pollutant PAHs, PCBs, and heavy metals unless otherwise justified
	Soil Vapor	TPH, BTEX, naphthalene, and methane
	Groundwater	same as soil

*VOCs include BTEX and chlorinated solvent compounds

Table 6-2a. Default carbon range makeup of TPH in petroleum fuels (after IDEM 2010).

Carbon Range	**[1]TPH$_{gasoline}$**	**[1]TPH$_{diesel}$**	**[2]TPH$_{resfuels}$**
C5-C8 aliphatics	45%	0.4%	0%
C9-C18 aliphatics	12%	35.2%	0%
C19+ aliphatics	0%	42.6%	75%
C9-C16 aromatics	43%	21.8%	25%

1. Indiana Department of Environmental management (IDEM 2010).
2. Massachusetts DEP (MADEP 1997).

Table 6-2b. Default carbon range makeup of TPH in petroleum fuel vapors.

Carbon Range	**[1]TPH$_{gasoline}$**	**[1]TPH$_{diesel}$**
C5-C8 aliphatics	99%	25%
C9-C18 aliphatics	0.5%	75%
C9-C16 aromatics	0.5%	0%

1. Based on HDOH soil as study and published information (see Appendix 6).

Table 6-3. Selected toxicity factors of for individual carbon range fractions.

Carbon Range	**RfD$_{0ral}$ (mg/kg-day)**	**RfC (ug/m^3)**
C5-C8 aliphatics	[b]0.04	[a]600
C9-C18 aliphatics	[a]0.01	[a]100
C19+ aliphatics	[a]3.0	[c]nv
C9+ aromatics	[a]0.03	[a]100

a. USEPA 2009; b. MADEP 2003; c. Not significantly volatile. C17+ aromatics not considered separately.

Table 6-4. Weighted TPH toxicity factors for fuels and fuel vapors.

Carbon Range	**RfD$_{0ral}$ (mg/kg-day)**	**RfC (ug/m^3)**
TPH$_{gasolines}$	0.03	571
TPH$_{middle\ distillates}$	0.02	126
TPH$_{residual\ fuels}$	0.12	-

Table 6-5a. Indoor Air and Soil Gas Carbon Range action levels.

	[1]Indoor Air		[1]Subslab Soil Gas	
Carbon Range	**Residential (ug/m^3)**	**Commercial/ Industrial (ug/m^3)**	**Residential (ug/m^3)**	**Commercial/ Industrial (ug/m^3)**
C5-C8 aliphatics	630	880	630,000	1,800,000
C9-C18 aliphatics	100	150	100,000	290,000
C19+ aliphatics	-	-	-	-
C9+ aromatics	100	150	100,000	290,000

1. Based on a noncancer Hazard Quotient of 1.0. Calculate cumulative risk if used to evaluate site-specific carbon range data for soil gas.

Table 6-5b Indoor Air and Soil Gas TPH action levels.

	Indoor Air		Subslab Soil Gas	
Carbon Range	**Residential (ug/m^3)**	**Commercial/ Industrial (ug/m^3)**	**Residential (ug/m^3)**	**Commercial/ Industrial (ug/m^3)**
$TPH_{gasolines}$	600	870	600,000	1,700,000
[1]$TPH_{middle\ distillates}$	130	330	130,000	370,000
[2]$TPH_{residual\ fuels}$	-	-	-	-

1. TPHmiddle distillate indoor air and soil gas action levels used as Tier 1 TPHgasoline action levels in final EAL tables due to potential for mixed fuel releases at sites. See Section 6.4.

2. Use TPHmiddle distillate indoor air and soil gas action levels sites contaminated with residual fuels.

Attachment 2: Massachusetts DEP overview of TPH Carbon Range Fraction Approach (MADEP 2002)

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Characterizing Risks Posed by Petroleum Contaminated Sites:

Implementation of the MADEP VPH/EPH Approach

FINAL POLICY

October 31, 2002

Policy #WSC-02-411

This Policy provides guidance for parties conducting response actions under the Massachusetts Contingency Plan (MCP) on the use and application of the Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH) methods to characterize risks posed by releases of petroleum products to the environment. This Policy updates and replaces draft documents that were issued on October 31, 1997 and June 2001. Parties who are currently using criteria and guidance contained in the June 2001 draft document may do so until May 1, 2003. A summary of significant changes between these earlier drafts and this Final Policy is provided in Appendix 6.

The information contained in this document is intended solely as guidance. This Policy does not create any substantive or procedural rights, and is not enforceable by any party in any administrative proceeding with the Commonwealth. This Policy provides recommendations and guidance on approaches the Department considers acceptable for meeting the performance standards set forth in the MCP and discussed in this document. These performance standards include, but are not limited to, the Response Action Performance Standards of section 310 CMR 40.0191 of the MCP. Parties using this guidance should be aware that there may be other acceptable alternatives for achieving and documenting compliance with the general regulatory requirements and performance standards of the MCP, including those of 310 CMR 40.0191. The regulatory citations in this document should not be relied upon as a complete list of the applicable regulatory requirements.

This Policy and further information on the development and application of the aliphatic/aromatic hydrocarbon evaluative technique employed by the Department, referred to as the "VPH/EPH" approach, may be obtained at http://www.state.ma.us/dep/bwsc/vph_eph.htm

10/31/02
Date

Signature on Original

Deirdre C. Menoyo
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LIST OF ACRONYMS

AAS	Atomic Absorption Spectroscopy
APH	Air-Phase Petroleum Hydrocarbons
AQWC	Ambient Water Quality Criteria
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CEP	Critical Exposure Pathway
EDB	Ethylene Dibromide
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
EPH	Extractable Petroleum Hydrocarbons
eV	Electron Volt
FID	Flame Ionization Detector
GC	Gas Chromatography or Gas Chromatograph
GC/FID	Gas Chromatograph/Flame Ionization Detector
GC/MS	Gas Chromatograph/Mass Spectrometer
GRO	Gasoline Range Organics
GW	Groundwater
HVAC	Heating, Ventilation, Air-conditioning
ICP-AES	Inductively coupled plasma atomic emissions spectroscopy
IR	Infra-red
LNAPL	Light Non-Aqueous Phase Liquids
LSP	Licensed Site Professional
MADEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan
MtBE	Methyl tertiary butylether
NAPL	Non-Aqueous Phase Liquids
NRS	Numerical Ranking System
OTP	Ortho-terphenyl
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
ppbV	Parts-per-billion by volume
ppmV	Parts-per-million by volume
QA/QC	Quality Assurance/Quality Control
RAF	Relative Absorption Factor
RAO	Response Action Outcome
RfC	Reference Concentration
RfD	Reference Dose
RL	Reporting Limit
SIM	Selective Ion Monitoring
SW	Surface Water
TIC	Tentatively Identified Compound
TOV	Total Organic Vapor
TPH	Total Petroleum Hydrocarbons
TPHCWG	Total Petroleum Hydrocarbon Criteria Working Group
UCL	Upper Concentration Limit
UCM	Unresolved Complex Mixture
UST	Underground Storage Tank
UV	Ultra-violet
VOC	Volatile Organic Compound
VPH	Volatile Petroleum Hydrocarbons
WSC	Waste Site Cleanup

1.0 INTRODUCTION

1.1 Background

Spills and releases of petroleum fuels are the leading source of environmental contamination in Massachusetts. Because petroleum products are a complex and highly variable mixture of hundreds of individual hydrocarbon compounds, however, characterizing the risks posed by petroleum-contaminated soil and water has proven to be difficult and inexact.

Traditional approaches have focused on the identification and evaluation of specific indicator compounds, like benzene, and/or the quantitation of a "Total Petroleum Hydrocarbon" (TPH) value. The limitations of an "indicator only" approach have long been recognized, especially at gasoline-contaminated sites, and it is clear that focusing on a select few compounds cannot adequately characterize the risks posed by all hydrocarbons present. While the quantitation of a TPH value is a step in the right direction, in that an attempt is being made to account for all compounds present, traditional TPH methods and approaches provide little or no information on the composition or toxicity of generated data.

In response to these shortcomings, the Massachusetts Department of Environmental Protection (MADEP) published a document in August 1994 entitled *Interim Final Petroleum Report: Development of Health-Based Alternative to the Total Petroleum Hydrocarbon (TPH) Parameter*. This document presented a new toxicological approach to characterize and evaluate risks posed by petroleum-contaminated sites, by breaking down TPH into collective aliphatic and aromatic fractions.

To support and implement this new toxicological approach, MADEP developed two analytical methods that differentiate and quantitate collective concentrations of aliphatic and aromatic hydrocarbons in soil and water. These methods, for *Volatile Petroleum Hydrocarbons* (VPH) and *Extractable Petroleum Hydrocarbons* (EPH), were issued in draft form in August 1995, and as final procedures in January 1998. At present, MADEP is in the process of finalizing a method for *Air-Phase Petroleum Hydrocarbons* (APH), which will allow for the collective quantitation of aliphatic and aromatic hydrocarbons in air. A draft APH method was issued by the agency in February 2000.

MADEP has integrated this new approach into the Massachusetts Contingency Plan (MCP), by developing and promulgating soil and groundwater cleanup standards for the aliphatic and aromatic ranges of interest. These standards became effective on October 31, 1997. Parties undertaking cleanup actions at petroleum-contaminated sites in Massachusetts now have the means to quickly and easily address risks posed by these complex mixtures, by the optional use of the generic *Method 1* cleanup standards. Conversely, such parties may elect to develop site-specific cleanup standards via use of a *Method 2* or *Method 3* risk assessment process.

1.2 Purpose and Scope

The purpose of this document is to (1) provide a succinct summary of key provisions of the "VPH/EPH" approach, (2) provide greater detail and specificity on important elements of this new approach, and (3) provide technical and regulatory insight, guidance, and ***Rules of Thumb*** to assist Licensed Site Professionals and others in understanding and applying this approach in a practical and cost-effective manner.

Rules of Thumb are suggestions and recommendations on how to approach, evaluate, and resolve investigatory, assessment, and remedial issues. In most cases, they are based upon reasonably conservative or "worst case" assumptions and considerations, and are intended to assist competent professionals in "ruling out" items of concern, or affirming a need to proceed to a more comprehensive level of evaluation. These rules are based upon current information, and are designed to be protective at most, but not all sites. Derivation details are provided in "Background/Support Documentation for the Development of Publication Guidelines and Rules of Thumb", available at: http://www.state.ma.us/dep/bwsc/vph_eph.htm.

Rules of Thumb **may only be applied to the specific situations described in this document, as such guidelines are predicated upon a designated scenario and are reflective of the totality of conservative assumptions incorporated into that scenario. Changing any developmental element of these guidelines and/or applying them to situations not detailed in this document may not be sufficiently protective. Moreover, the use of these rules may not be appropriate at sites with complex or highly heterogeneous contaminant conditions or migration pathways, or at sites or portions of sites with highly sensitive receptors (e.g., drinking water wells).**

While striving to be as useful and complete as possible, nothing in this document should be viewed as limiting or obviating the need for the exercise of good professional judgment.

1.3 Applicability

The provisions of this document are applicable at sites contaminated by releases of one or more petroleum fuels and/or lubricating oils. The guidance contained in this policy is designed to help Licensed Site Professionals (LSPs) and others comply with the risk-based/performance-based requirements of the MCP to adequately investigate and assess releases of oil and waste oil to the environment.

The MCP – since 1988 – has required that parties conducting response actions at disposal sites document or achieve a level of no significant risk of harm to human health, safety, public welfare, and the environment. Because the MCP is performance-based, it does not dictate the specific means by which one demonstrates compliance with these standards. From a practical point of view, however, most parties did not have ready access to the tools and procedures needed to adequately characterize the total risks posed by petroleum contamination – until promulgation of the VPH/EPH approach, analytical methodologies, and Method 1 cleanup standards in 1997. For this reason, MADEP has adopted a prospective and retrospective position on the application of the VPH/EPH approach:

1.3.1 Site Closure on or after October 31, 1997

Since October 31, 1997, MADEP has provided parties conducting response actions a means to easily and adequately assess risks posed by petroleum contaminants. Therefore, all sites closed on or after this date (e.g., by filing of a Response Action Outcome Statement) must demonstrate compliance with this standard, by use of the VPH/EPH approach, or by use of another scientifically valid and health-protective approach. In these cases, the use of an "indicator only" approach is NOT acceptable.

There are no "grand fathering" provisions for sites that were not closed out prior to October 31, 1997. However, this document provides guidance on how one might utilize and/or "convert" old data obtained prior to this date, to more fully assess risks pursuant to the VPH/EPH approach, and support a post-1997 closure submittal.

Notwithstanding the implementation of this new approach, it should be noted that the MCP retains a cleanup standard for Total Petroleum Hydrocarbons (TPH), which is set conservatively at the lowest EPH fractional cleanup standard (typically C_{11}-C_{22} Aromatic Hydrocarbons). Parties may continue to use a TPH approach to characterize heavier petroleum products (i.e., $>C_9$), using the EPH method (in the TPH screening mode) or other scientifically valid and defensible method (See Section 3.7.1).

1.3.2 Site Closure Prior to October 31, 1997

In general, MADEP will not require reevaluation of petroleum-contaminated sites properly closed prior to October 31, 1997. Nonetheless, the agency reserves the right to do so, in cases where direct and compelling exposure concerns are believed to be present, and where human health is being directly threatened. Such concerns may exist at sites where (1) a release of gasoline has impacted a drinking water well, or (2) a release of gasoline has resulted in persistent, long-term odors or vapors within an occupied structure.

In cases where parties voluntarily conduct VPH/EPH testing at sites closed prior to October 31, 1997 (e.g., pursuant to a property transfer evaluation), the applicable "re-opener" language is contained at 310 CMR 40.0317(17). Under the provisions of this section of the MCP, a notification obligation would exist for this newly obtained VPH/EPH data if such information would change or negate the findings of the closure document (e.g., RAO, LSP Evaluation Opinion).

2.0 SUMMARY OF VPH/EPH APPROACH

2.1 The Concept

Petroleum is a mixture of hundreds of hydrocarbon compounds. Industry specifications for refined products, such as gasoline and diesel fuel, are based upon physical and performance-based criteria, not upon a specific chemical formulation. As such, the composition of petroleum products released to the environment are complex and variable, and are a function of (1) the origin and chemistry of the parent crude oil, (2) refining and blending processes, and (3) the use of performance-enhancing additives. Once released to the environment, the chemistry of a petroleum product is further altered by contaminant fate and transport processes, such as leaching, volatilization, and biodegradation.

It would be extremely difficult and expensive to identify and quantitate every single hydrocarbon compound present in petroleum-contaminated media. Even if this activity was accomplished, there is little toxicological data available for the vast majority of petroleum constituents. While there are limited data available on the toxicity of some petroleum fuels, the chemistry of weathered products typically encountered at contaminated sites may be quite different from the chemistry of the fresh product that was the subject of toxicological evaluation.

Based upon an evaluation of information and data available on the chemistry and toxicity of petroleum products, however, it is possible to make some broad observations and conclusions:

- ◊ petroleum products are comprised mainly of aliphatic/alicyclic and aromatic hydrocarbon compounds;
- ◊ aromatic hydrocarbons appear to be more toxic than aliphatic compounds; and
- ◊ the toxicity of aliphatic compounds appears to be related to their carbon number/molecular weights.

These three precepts are the foundation of the VPH/EPH approach. Specifically, under this approach, the **non-cancer** toxicity of petroleum-contaminated media is established by (1) determining the collective concentrations of specified ranges of aliphatic and aromatic hydrocarbons, and (2) assigning a toxicity value (e.g., Reference Dose) to each range. Toxicity values are determined on the basis of a review and/or extrapolation of available toxicological data on hydrocarbon mixtures and specific hydrocarbon compounds. The complete breakdown for all ranges of interest is summarized in Table 2-1.

Table 2-1: Toxicological Approach for Non-Cancer Health Effects

Hydrocarbon Fraction	Reference Dose (mg/kg/day)
C5-C8 Aliphatic Hydrocarbons	0.04[a]
C9-C18 Aliphatic Hydrocarbons	0.1[a]
C19-C36 Aliphatic Hydrocarbons	2.0[a]
C9-C22 Aromatic Hydrocarbons	0.03

[a] updated values (2002)

Cancer effects are evaluated separately, by the identification and quantitation of those specific hydrocarbon compounds, like benzene and certain polycyclic aromatic hydrocarbons (PAHs), which are designated carcinogens. Additional information and details on this approach are provided in the MADEP publication *Interim Final Petroleum Report: Development of Health-Based Alternative to the Total Petroleum Hydrocarbon (TPH) Parameter*, August, 1994, and as amended, available at http://www.state.ma.us/dep/bwsc/vph_eph.htm.

2.2 Hydrocarbon Fractions of Interest

Although the non-cancer toxicity of petroleum-contaminated media can be adequately described by division into the four hydrocarbon fractions listed above, MADEP has chosen to designate six hydrocarbon fractions of interest, because of the following analytical and program considerations:

- ◊ EPA analytical methods have traditionally used one approach for the analysis of volatile organics (i.e., purge and trap), and another for the analysis of semi-volatile/extractable organics (i.e., solvent extraction). To facilitate use by commercial laboratories accustomed to such division, the VPH and EPH methods developed by MADEP maintain this distinction. Moreover, because of the large carbon range covered by the new approach (i.e., C5 to C36), it would be difficult to detect all fractions using just one method: the volatile/purgeable methods can adequately cover the lighter hydrocarbons, but not the heavier fractions (>C12), while, due to losses of low molecular weight hydrocarbons that occur during the sample preparation process, extractable methods are generally unable to reliably detect lighter fractions (<C9).

- ◊ Given the need for two analytical methods, and a desire to minimize use of both methods on all samples, a decision was made to break up the C9-C18 Aliphatic range, to enable detection of all gasoline-range hydrocarbons in the VPH method. In this manner, it would only be necessary to use the VPH procedure to characterize gasoline releases.

For these reasons, it was necessary and desirable to divide the aliphatic and aromatic hydrocarbon ranges of interest into six separate entities; three detected by the VPH method, and three detected by the EPH Method, as listed in Table 2-2.

Table 2-2: Hydrocarbon Fractions of Interest

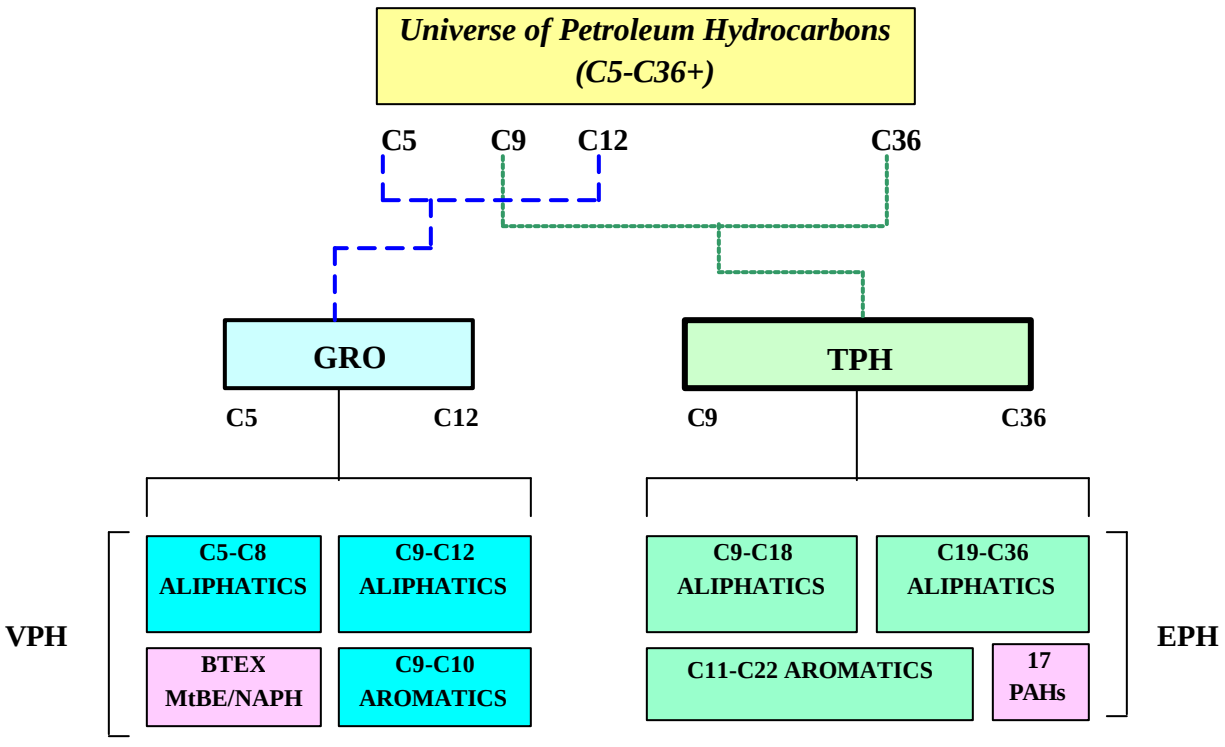
Toxicologically Defined Hydrocarbon Fraction	Analytical/Program Defined Hydrocarbon Fraction	Analytical Method	Reference Dose (mg/kg/day)
C5-C8 Aliphatics	C5-C8 Aliphatics	VPH	0.04[a]
C9-C18 Aliphatics	C9-C12 Aliphatics	VPH	0.1[a]
	C9-C18 Aliphatics	EPH	0.1[a]
C19-C36 Aliphatics	C19-C36 Aliphatics	EPH	2.0[a]
C9-C22 Aromatics	C9-C10 Aromatics	VPH	0.03
	C11-C22 Aromatics	EPH	0.03

[a] updated value (2002)

2.3 Relationship of VPH/EPH to TPH and Gasoline Range Organics (GRO)

The relationship between TPH, GRO, VPH and EPH is graphically displayed in Figure 2-1.

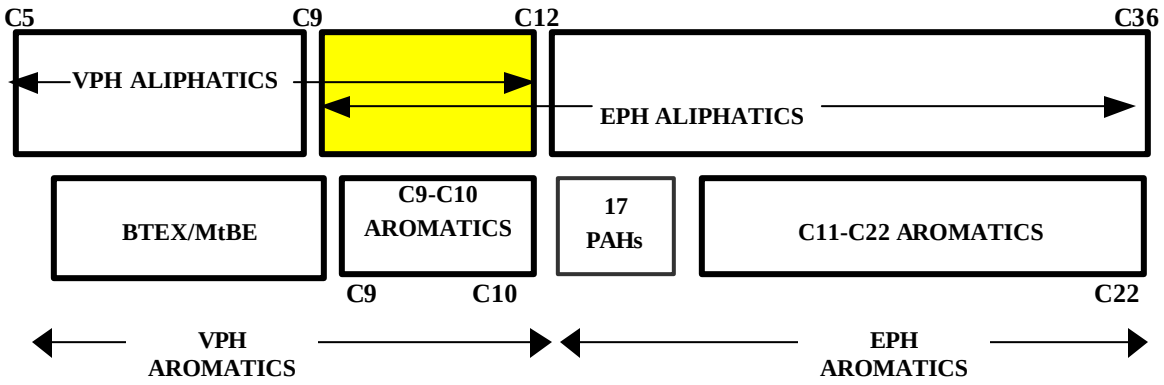
Figure 2-1: Relationship of GRO, TPH, VPH, and EPH



As can be seen in Figure 2-1, if the concentrations of the three EPH fractions and target PAH analytes were added together, it would be equal to a traditional "TPH" value. Similarly, if the three VPH fractions and BTEX/MtBE/naphthalene concentrations were added together, it would equal a GRO value.

It may also be noted that an overlap exists between the VPH and EPH methods, in that C9-C12 aliphatic hydrocarbons are quantitated by both methods. This overlap, further discussed in Section 4.2.3, is graphically illustrated in Figure 2-2.

Figure 2-2: Overlap of VPH and EPH Test Methods



Note that there is no overlap in the aromatic fractions: the C9-C10 Aromatic fraction from the VPH method ends just before naphthalene, and the C11-C22 Aromatic fraction from the EPH method starts just after naphthalene.

2.4 Additional Research and Data Needs

MADEP continues to gather and review information and data on petroleum hydrocarbon chemistry and toxicity. Recent efforts have focused on the review and evaluation of previously unavailable oral and inhalation toxicological data, which has lead to some revisions to the recommended RfD and RfC values for hydrocarbon fractions of interest (see Table 4-13). Additional study is also needed to better evaluate ecological risks posed by aliphatic and aromatic hydrocarbons.

On a national level, the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) has published a number of documents relating to this subject. TPHCWG is comprised of representatives from the oil industry, Department of Defense, EPA, state agencies, environmental consulting firms, and academia. This group has recommended an aliphatic/aromatic fractional approach similar to the MADEP approach. Additional information and recommendations have also been provided on petroleum chemistry, hydrocarbon fate and transport, and analytical methodologies.

A number of TPHCWG publications are available on the World Wide Web at http://www.aehs.com/

3.0 ANALYTICAL METHODS

In order to use the VPH/EPH toxicological approach, it is necessary to be able to measure the collective concentrations of aliphatic and aromatic hydrocarbons in impacted media. Because conventional TPH and EPA test methods cannot produce this type of data, MADEP has developed and published two detailed analytical methods for Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH). Both methods are gas chromatography (GC) techniques, and are modifications of traditional EPA procedures contained in SW-846. As such, most laboratories that have conducted volatile and extractable organic analyses in the past should be able to perform these techniques.

3.1 Gas Chromatography

Chromatography is the separation of compounds or groups of compounds in a complex mixture. In gas chromatography, hydrocarbons in a sample are transferred to the vapor phase by purging (VPH) or heating (EPH). The gaseous sample then flows through a (100 meter long +/-) *capillary column* to a detector. A chemical coating on the walls of the column first sorbs, and then desorbs each compound in the sample, with the heavier molecular weight compounds being "detained" longer than the lighter compounds. In this manner, analytes exit or *elute* from the column in a predictable and reproducible manner, based upon the structure, molecular weight, and boiling point of the compound.

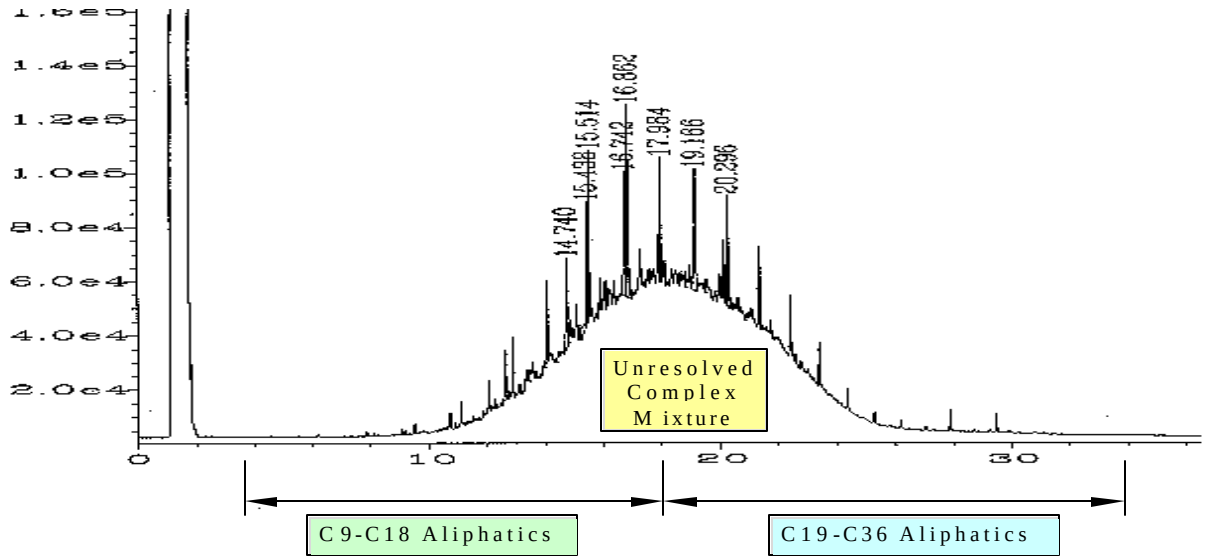
Once they elute from the column, analytes pass through a detector, where the presence of each compound produces a small electrical current, proportional to its mass. This current is then amplified and used to produce a chromatogram, which is simply a plot of electrical (detector) response over time. Each peak on a chromatogram represents one or more individual compounds. Compounds are identified based upon their *retention times*, which is the time (in minutes) it takes the compound to travel through the column. Compounds or ranges of interest are quantitated by an *integration* process that calculates the area beneath the chromatographic peak(s), for comparison to mass/area ratios derived from the injection of *calibration standards* of known mass or concentration.

To transfer the hydrocarbons within a sample medium into a gas chromatograph, and into a gaseous phase, various sample preparation techniques may be used. Volatiles within water samples are generally *purged* with an inert gas, which strips the dissolved volatile compounds from the aqueous phase into the gaseous phase, where they are initially retained on a *trap* containing an appropriate sorbent. This trap is then rapidly heated to desorb the analytes, and load them onto a chromatographic column. Volatiles within soils are first extracted with a solvent (e.g., methanol), then mixed with water and purged. Heavier non-volatile hydrocarbons in both water and soil samples are generally extracted with a solvent (e.g., methylene chloride); the extract is then injected into a gas chromatograph, where it is heated and vaporized into a gaseous state.

A key and novel requirement of the VPH/EPH approach is the need to separate or *fractionate* hydrocarbon mixtures into collective groupings of aliphatic and aromatic hydrocarbons. This fractionation is something that is not done in conventional TPH or Gasoline Range Organic analyses, or the EPA volatile/extractable methodologies detailed in SW-846. There are several different ways to accomplish this task, each with advantages and disadvantages. The recommended MADEP analytical methods use detector selectivity and a chemical exchange process to fractionate samples, but other techniques may also be acceptable and cost-effective.

An example of an EPH (GC/FID) chromatogram of the aliphatic portion of a weathered #2 Fuel Oil soil sample is provided in Figure 3-1.

Figure 3-1: Sample Chromatogram - #2 Fuel Oil



Note that the "x" axis is the retention time, in minutes, and the "y" axis is the detector signal strength. The retention time of some of the individual peaks are printed above those peaks. Note also the presence of a large chromatographic "hump" between 10 and 26 minutes, indicating the presence of an *Unresolved Complex Mixture (UCM);* this feature is an important issue discussed in more detail below.

3.2 MADEP Analytical Methodologies

MADEP has developed and published two analytical methodologies for the detection of Volatile Petroleum Hydrocarbons (VPH) and Extractable Petroleum Hydrocarbons (EPH) in soil and water. Both methods separate complex hydrocarbon

mixtures into collective fractions of aliphatic and aromatic hydrocarbons, and produce data that can be directly compared to MCP *Method 1* cleanup standards. MADEP has also issued a draft methodology for the detection of Air-Phase Petroleum Hydrocarbons (APH), to identify and quantitate collective ranges of aliphatic and aromatic hydrocarbons in air and soil gas.

The VPH, EPH, and APH methods were developed to allow a meaningful evaluation of the risks posed by hydrocarbon mixtures. Other procedures may also be available to fulfill this objective, or, perhaps more importantly, other data quality objectives. For example, it may be more cost-effective to use (or initially use) EPA Method TO-14 to evaluate indoor air quality, and establish whether a subsurface hydrocarbon transport pathway is present at a disposal site; if there is no pathway, there is no need to evaluate risks via the APH procedure.

3.2.1 Volatile Petroleum Hydrocarbons (VPH)

The MADEP VPH Method (1998) is a *Purge and Trap, GC/PID/FID* procedure. Using this method, the collective concentrations of C5-C8 Aliphatic, C9-C12 Aliphatic, and C9-C10 Aromatic Hydrocarbons can be quantitated in soil or water matrices. In addition to these fractional ranges, the VPH method may also be used to concurrently identify and quantitate individual concentrations of the *Target VPH Analytes* benzene, toluene, ethylbenzene, and xylenes (BTEX); Methyl-tertiary-butylether (MtBE); and naphthalene.

Samples are analyzed using a *purge-and-trap* sample preparation/concentration procedure. The gas chromatograph is temperature-programmed to facilitate separation of hydrocarbon compounds. Detection is achieved by a photoionization detector (PID) and flame ionization detector (FID) in series. The PID chromatogram is used to determine the individual concentrations of Target Analytes and the collective fractional concentration of aromatic hydrocarbons in the C9 through C10 range. The FID chromatogram is used to determine the collective fractional concentrations of aliphatic hydrocarbons within the C5 through C8 and C9 through C12 ranges. Individual "marker" compounds are used to establish the beginning and end of the hydrocarbon ranges of interest.

The MADEP VPH method relies upon the selectivity of the PID detector to differentiate aromatic hydrocarbons from aliphatic hydrocarbons. Specifically, the PID will preferentially respond to hydrocarbon compounds with *pi* or double carbon (C=C) bonds, but will not respond well to hydrocarbon compounds with single carbon (C-C) *sigma* bonds. Because aromatic compounds have at least one benzene ring with three double bonds, they respond well to a PID; straight, branched, and cyclic aliphatic compounds with single carbon bonds respond poorly. Conversely, the FID is more of a universal detector, and will respond equally well to both aliphatic and aromatic hydrocarbons.

Because the PID can detect sample analytes without destroying them, compounds eluting from the chromatographic column are first passed through the PID, and then through the FID, where they are combusted in a hydrogen flame. In theory, the FID will detect the total concentrations of all petroleum hydrocarbons in the sample, and the PID will detect only (or mostly) aromatic compounds. By subtracting the PID from the FID response, it would be possible to quantitate just the aliphatic compounds. However, reality deviates from this theoretical ideal in the following ways:

- *Pi* bonds are present in hydrocarbon compounds other than aromatics - most notably alkenes, which are present in gasoline. Therefore, alkenes will be quantitated as aromatics. However, this bias is not deemed to be a major methodological limitation, due to the fact that (a) alkenes are typically not found in high concentrations in most petroleum products, and (b) alkenes may be more toxicologically similar to aromatics than to aliphatics.

- A more problematic issue is the fact that aliphatic compounds will produce some measurable response on a PID, especially heavier-molecular-weight branched and cyclic alkanes. Collectively, this response can become significant if there are a lot of these types of aliphatic compounds present, and will result in a falsely inflated quantitation of aromatics. Since a good portion of the hydrocarbons in the C9-C12 range of gasoline are in fact substituted aromatic compounds, this analytical overquantitation is not a major problem. However, other products, like kerosene and Jet A fuel, contain predominately aliphatic compounds within this range, and therefore use of the PID/FID approach can lead to significant overquantitation of the aromatic fraction.

Steps can be taken to minimize overquantitation of the aromatic fraction. Using a low energy PID lamp (e.g., 9.5 eV) will further diminish aliphatic response. Where essential, other techniques, such as chemical fractionation and/or use of a GC/MS approach, may be used to ensure more accurate data in this regard.

3.2.2 Extractable Petroleum Hydrocarbons (EPH)

The MADEP EPH Method (1998) is a *solvent extraction/fractionation GC/FID* procedure. Using this method, the collective concentrations of C9-C18 Aliphatic, C19-C36 Aliphatic, and C11-C22 Aromatic Hydrocarbons can be quantitated in soil or water matrices. In addition to these fractional ranges, the EPH method may also be used to concurrently identify and quantitate individual concentrations of the 17 Polycyclic Aromatic Hydrocarbon (PAH) *Target EPH Analytes*.

Soil and water samples are extracted with methylene chloride, solvent exchanged into hexane, and loaded onto a silica gel cartridge or column. The silica gel cartridge/column is rinsed with hexane to strip aliphatic compounds, and the resultant extract is collected and labeled. The silica gel cartridge/column is then rinsed with methylene chloride, to strip aromatic compounds, and the resultant extract is collected and labeled. The two extracts are then analyzed separately by direct injection into a temperature-programmed GC/FID. Individual target PAH compounds are identified by GC/FID analysis of the aromatic extract.

There are two important methodological elements that should be considered when reviewing EPH data:

- The MADEP EPH method relies upon a solvent-exchange/silica-gel-fractionation process to differentiate aromatic hydrocarbons from aliphatic hydrocarbons. This fractionation process is a sensitive yet critical element of the analytical approach; small errors at this stage can result in significant over or underquantitation of aromatic and aliphatic ranges. For this reason, the method specifies use of *Fractionation Surrogates* to verify proper separation of the aliphatic and aromatic fractions.

- Like any GC/FID procedure, an *unresolved complex mixture (UCM) or "hump"* will typically be observed on the chromatogram of a heavier molecular weight petroleum product, particularly weathered products. (See Figure 3-1). A UCM is produced when many individual hydrocarbon compounds are eluting from the capillary column at the same time, overwhelming and preventing the detector signal from returning to baseline. Nevertheless, it is important that these compounds are included in the sample quantitation calculation, and for that reason the EPH method specifies the use of a *forced or projected baseline* when integrating chromatographic areas of fractional ranges. **If a laboratory does not takes steps to ensure this integration technique, resultant fractional range data may significantly under-report true hydrocarbon concentrations.**

The EPH method also contains an option to forego the solvent-exchange/silica-gel-fractionation process, to obtain a Total Petroleum Hydrocarbon (TPH) concentration. While this data will provide little information on the chemistry or toxicity of the petroleum mixture, it can provide a cost-effective analytical screening value, for comparison with TPH reporting and cleanup standards.

3.2.3 Air-Phase Petroleum Hydrocarbons (APH)

The draft MADEP APH method (2000) *is a GC/MS procedure*. Using this method, the collective concentrations of C5-C8 Aliphatic, C9-C12 Aliphatic, and C9-C10 Aromatic Hydrocarbons can be quantitated in air or soil gas matrices. In addition to these fractional ranges, the APH method may also be used to concurrently identify and quantitate individual vapor-phase concentrations of the *Target APH Analytes* 1,3-butadiene, benzene, toluene, ethylbenzene, and xylenes (BTEX); Methyl-tertiary-butylether (MtBE), naphthalene, and 2-methylnaphthalene.

Samples are collected in SUMMA ® passivated stainless steel canisters (other collection techniques are permissible and may be more appropriate for certain data quality objectives). A specified volume of sample is withdrawn from the canister through a mass flow controller using a vacuum pump. The sample is cryogenically concentrated to a volume of less than one mL in a nickel trap filled with nonsilanized glass beads. Following preconcentration, the sample is refocused at the head of a capillary column on a gas chromatograph using a cryofocusing accessory. This step further reduces the sample volume to less than one microliter for injection.

The sample is then injected into a gas chromatograph, which is used to separate the compounds and hydrocarbon fractions of interest. All compounds are detected using a mass spectrometer. Target APH Analytes are identified and quantitated using characteristic ions. Collective concentrations of C_9-C_{10} Aromatic Hydrocarbons are quantitated using extracted ions. Collective concentrations of aliphatic hydrocarbon fractions are quantitated using a total ion chromatogram, subtracting out Target APH Analytes and C_9-C_{10} Aromatic Hydrocarbons. It is important to note that the final APH method may contain modifications of the above procedures.

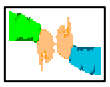
Air testing, whether by the APH procedure or other methodologies, is a specialty service that is not as widely available as soil and water analytical services. However, unlike the VPH and EPH methods, MADEP does not expect use of the APH method will be required at most petroleum contaminated sites, for the reasons listed below:

- Most releases of petroleum products do not result in an indoor air impact;
- For those sites where an indoor air impact is a potential concern, it is usually possible to evaluate and/or rule-out indoor air contamination problems using low-cost soil gas analytical screening techniques, as further detailed in Section 4.3.1; and
- Where indoor air sampling is required to evaluate a potential subsurface vapor transport pathway, traditional EPA procedures (e.g., EPA Method TO-14) may be used to determine if an impact is likely (based upon concentration of target analytes and qualitative presence of hydrocarbon peaks). The use of the APH (or similar) procedure would only be necessary if contamination is confirmed, and a quantitative risk assessment is required.

3.3 VPH/EPH Target Analytes

Although both the VPH and the EPH methods are capable of providing quantitation of Target Analytes (concurrent with the quantitation of aliphatic and aromatic ranges), because they are GC methods which identify analytes solely on the basis of retention times, they can produce "false positive" or over-inflated concentration data for these individual compounds. For example, the large peak eluting at 14.740 minutes in Figure 3-1 may be identified by the EPH method as hexadecane, because a hexadecane standard run as part of the calibration procedures eluted at this retention time. However, it is possible that hexadecane is not present in this sample at all, and some other (unknown) hydrocarbon compound is present which elutes at precisely this same time; or it is possible that hexadecane is indeed present, but that 2 or 3 other hydrocarbon compounds are *co-eluting* with hexadecane at precisely this time, which will lead to an overquantitation of the hexadecane concentration.

Although the sample-extract cleanup and fractionation procedures specified in the EPH method will tend to minimize interferences of this nature (by removing aliphatic compounds that may co-elute with the PAH Target Analytes), the only way to get positive identification and quantitation of these Target Analytes is to use a GC/MS analytical technique, like EPA Method 8270 for the PAHs, and EPA Method 8260 for BTEX/MtBE. For this reason, a laboratory may advise a client to use the VPH and EPH methods to quantitate the aliphatic/aromatic fractional ranges, but a GC/MS method to quantitate individual (Target) analytes. This approach is acceptable, although it may increase analytical costs.



To save money, it may be a worthwhile gamble to quantitate Target Analytes using the VPH/EPH Methods for samples that are believed to be relatively free from contamination - for example, when trying to confirm a "clean closure" at a tank removal site. If significant concentrations of Target Analytes are in fact found to be present, a re-analysis can be done using GC/MS, to provide a definitive determination in this regard (if the laboratory was instructed to retain the sample extract from the VPH/EPH samples, the cost for this re-analysis would be reduced).

3.4 Sampling Procedures and Requirements for the VPH/EPH Methods

Sample collection and preservation are critical elements in the VPH and EPH methodologies. A summary of requirements in this regard is provided in Table 3-1; detailed step-by-step sampling recommendations are provided in Appendix 1.

Sample preservation is essential**. VPH and EPH aqueous samples must be preserved in a manner that prevents biodegradation of hydrocarbons**. ***Simply cooling these samples is not sufficient.*** Biodegradation can be prevented by addition of acids (e.g., HCl to pH <2) or by the addition of bases (e.g., Trisodium Phosphate Dodecahydrate to pH > 11). *Note that acid preservation can significantly degrade levels of MtBE in aqueous samples (see Appendix 1).*

VPH soil samples must be preserved in a manner that (1) prevents sample losses due to volatilization, and (2) prevents sample losses due to biodegradation. There is now considerable evidence and data demonstrating substantial losses of volatile petroleum hydrocarbons from unpreserved sampling containers. The recommended preservation technique is to immerse VPH soil samples in methanol *at the time of collection*. Alternative techniques will be considered only if sufficient data are available to demonstrate the efficacy of sample preservation. Currently, only one alternative has been shown to provide acceptable preservation: the use of specially designed sealed-tube devices that obtain an air-tight soil sample.

Table 3-1: Sample Collection, Preservation, and Holding Times

Method	Matrix	Container	Preservation	Holding Time
VPH	Aqueous	40 mL VOC vial w/Teflon-lined septa screw caps; fill completely to zero headspace	pH <2 (add 3-4 drops of 1:1 HCl); cool to 4°C. Where MtBE is of concern, use 0.40– 0.44 grams TSP to raise pH > 11 (see Appendix 1)	14 days
	Soil	VOC vial or container; add 15g to 40mL vial; 25g to 60 mL vial	1 mL methanol per 1g soil (+/- 25%); cool to 4°C	28 days
EPH	Aqueous	1-Liter amber glass bottle with Teflon-lined screw cap	pH<2 (add 5 mL of 1:1 HCl); cool to 4°C	Extract within 14 days; analyze extract within 40 days
	Soil	4-oz (120 mL) +/- widemouth amber glass jar with Teflon-lined screw cap	cool to 4°C	Extract within 7 days; analyze extract within 40 days

Such devices have been shown to maintain sample integrity for 48 hours, by which time the sample must be extruded and preserved in methanol. Additional detail on the preservation of VPH aqueous and soil samples is provided in Appendix 1. Information and guidance on shipping methanol-preserved samples is contained in Appendix 2.

3.5 Modifications of the VPH/EPH/APH Methods

The MADEP VPH, EPH, and APH analytical techniques are "performance-based" methods, which means that modifications to specified procedures are allowable, as long as acceptable performance is demonstrated and documented.

The most common modification of the VPH and EPH methods involves the use of a GC/MS technique to identify and quantitate collective ranges of aliphatic and/or aromatic hydrocarbons. Under this approach, a mass spectrometer is used to break up the hydrocarbon molecules in a sample into fragments with certain masses and charges. A computer program is then used to search for specified fragments that are indicative of an aliphatic and/or aromatic hydrocarbon structure. Quantitation of a collective hydrocarbon range is accomplished by comparing the total mass of these selected fragments with the mass of fragments produced by calibration standards.

While MADEP believes that a GC/MS approach has promise, it has not yet issued guidelines or recommendations in this regard. Until such time as this occurs, all laboratories conducting such modifications must be able to provide complete documentation on their procedures, and must be able to demonstrate that their methodology is capable of generating data of a known level of accuracy and precision. Specific questions that a data user might want to address to laboratories include:

- *What "ions" (fragments) were used to quantitate specific aliphatic and/or aromatic hydrocarbon ranges? How were these ions chosen? Because hydrocarbon molecules fragment in different manners and proportions, how do the fragmentation patterns of the calibration standards correlate to the fragmentation patterns of the hydrocarbons likely contained in the sample?*

- *What studies did the laboratory do to validate the method? Were "neat" petroleum products analyzed? Fresh and/or "weathered"?*

- *Based upon the choice of quantitating ions and the results of the validation studies, under what (sample chemistry) conditions would a positive or negative identification and/or quantitating bias be expected?*

While MADEP encourages laboratories to develop "better mouse traps", ultimately, it is the responsibility of the data user to determine the validity and application of data obtained from modified methods. Parties unfamiliar with analytical chemistry and/or laboratory operations are advised to seek expert advice in such matters, and understand the nature, extent, and implication of all method modifications.

3.6 Data Quality and Report Content

Because the VPH and EPH methods are performance-based, and because MADEP does not (at this time) have a laboratory certification program for non-drinking/non-wastewater matrices, it is incumbent upon the laboratory and data users to take steps to ensure and document the quality of analytical data, consistent with the provisions and requirements of 310 CMR 40.0017.

The VPH and EPH methods have detailed and specific Quality Assurance and Quality Control (QA/QC) requirements, and a required data reporting content, which is provided in Appendix 3. The reporting content is designed to ensure that data users can easily ascertain (1) what is being reported, (2) basic sample and QA/QC information, (3) whether significant modifications were made to the recommended methods, (4) whether all recommended QA/QC steps were taken, and (5) whether all specified QA/QC and performance standards were met. *While it is not necessary to obtain and provide data in exactly the same form and order detailed on the reporting sheets provided in Appendix 3, data users should insist that all indicated information and statements be provided.*

Although a comprehensive review of all QA/QC information and data is beyond the ability and/or resources of most data users, there are several quick and easy steps that can and should be taken to help ensure the accuracy and reliability of VPH/EPH/APH data, by simply reviewing the information and data required in the data report:

- ◊ ***All sample information specified in Appendix 3 should be provided, describing the sample matrix, condition of containers, and sample preservation.*** VPH samples that were not preserved in the field with methanol (or sampled/preserved in an acceptable alternative manner) are highly suspect.

- ◊ ***The dates of sample collection, receipt by laboratory, extraction (EPH) and analyses should be provided.*** Samples held beyond the recommended holding times are suspect, especially EPH soil samples that are preserved only by refrigeration.

- ◊ ***A percent moisture value should be reported for all soil samples***, to ensure that such data have been adjusted to a "dry weight" reporting basis.

- ◊ ***The analytical units must be clearly indicated,*** and should be appropriate for the matrix under evaluation (i.e., µg/g, mg/kg, or µg/kg for soil; µg/L or mg/L for water; $\mu g/m^3$ or ppbv for air).

- ◊ ***Reporting Limits (RLs) should be specified for each aliphatic and aromatic range and each Target Analyte***. The VPH, EPH, and APH methods contain specific procedures and requirements on how to establish Reporting Limits, which are the minimum concentration values that a laboratory can discern and report with sufficient confidence. These values must be experimentally determined by each laboratory. Note that expected RLs for the aliphatic and aromatic ranges in water are between 50 and 100 µg/L; expected RLs for the aliphatic and aromatic ranges in soil are between 2 and 10 mg/kg; expected RLs for the aliphatic and aromatic fractions in air are between 25 and 100 $\mu g/m^3$.

- ◊ ***The percent recovery of sample surrogates should be provided, along with the acceptable range***. A surrogate is a (non-petroleum) chemical compound added ("spiked") into each VPH and EPH water and soil sample prior to extraction and analyses. The purpose of surrogate spiking is to determine the efficiency and accuracy of sample extraction (EPH), sample purging (VPH), and instrument analyses. Surrogate recovery is expressed in terms of percent recovery; for example, if 1000 µg of the surrogate compound ortho-terphenyl (OTP) is spiked onto a 10 gram soil sample that is to be analyzed by the EPH method (yielding a theoretical concentration of 100 µg/g), and the resultant analysis quantified OTP at 70 µg/g, the percent recovery would be 70%. Although sample data with surrogate recoveries outside of the stated acceptance range should be carefully evaluated, they need not be summarily dismissed or considered categorically unusable. For example, data associated with a surrogate recovery greater than specified limits may be appropriate to use as an "upper limit" value; data associated with a surrogate recovery lower than specified limits may be appropriate to use as a "lower limit", and would constitute knowledge of a release if exceeding Reportable Concentrations. Note that low recoveries are not uncommon (or unexpected) in clay/organic soil matrices. Also, low recoveries of sample surrogates may be observed in VPH soil samples with high moisture content.

- ◊ ***For the EPH Method, the percent recovery of Fractionation Surrogates should be provided, along with the acceptable range***. In the EPH method, a sample extract is loaded onto silica gel, followed by a hexane rinse, to

remove and collect aliphatics, and a methylene chloride rinse, to remove and collect aromatics. However, because of the weakly polar nature of naphthalene and substituted naphthalenes, they are easily "stripped" into the aliphatic fraction - an especially problematic occurrence in water samples, as the naphthalenes constitute a large percentage of the water-soluble fraction of fuel oils. To monitor whether this action is occurring, Fractionation Surrogates are added directly to the sample extract just prior to the silica gel fractionation step (as opposed to the sample surrogates, which are added to the soil and water samples prior to extraction, to evaluate extraction efficiency). The currently recommended Fractionation Surrogates are 2-Fluorobiphenyl and 2-Bromonaphthalene - two compounds that are not normally present in petroleum, and that have polarities similar to naphthalene. Both compounds should be detected in the aromatic fraction within the specified acceptable percent recovery ranges.

Note: Changes and refinements to the EPH Method may affect the use and selection of Fractionation Surrogates.

◊ ***The laboratory should clearly indicate whether the reported VPH/EPH/APH fractional range concentrations include or do not include the concentration of Target Analytes, and the range(s) in which the Target Analytes elute.*** By definition, these ranges exclude Target Analytes, which are evaluated separately. (Absent this exclusion, Target Analytes like BTEX and PAHs would be "double counted" - once in the collective range concentrations, and once in a separate Target Analyte evaluation). If the laboratory did not subtract out the concentrations of these Target Analytes (perhaps they only provided range data), the data user may make this adjustment. It is also permissible for a data user to adjust a range concentration value by excluding the concentration(s) of non-petroleum analytes eluting within that hydrocarbon range (e.g., TCE eluting within a C5-C8 Aliphatic Hydrocarbon range). Note that unadjusted data are also acceptable to MADEP - they are just overly conservative.

◊ ***The laboratory must clearly indicate whether significant modifications were made to MADEP VPH/EPH/APH methods, and if so, should detail the nature and extent of these modifications***. Examples of "significant modifications" are specifically listed in Section 11 of each method. Note that MADEP encourages innovation, where appropriate.

◊ ***The laboratory should clearly indicate whether it has followed and met the QA/QC program and performance standards specified by the MADEP VPH/EPH/APH Methods.*** Such an affirmation is contained in the required laboratory report content. Note that on some samples, it will not be possible to meet all QA/QC specifications, and that such data need not be summarily dismissed as unacceptable, as long as an appropriate explanation is provided, and as long as limitations inherent in the data are acceptable for the given application and use of the data.

◊ ***A report narrative should be provided, if necessary, to document and explain any deviations from the method, analytical problems, and/or QA/QC issues.*** Laboratories using modifications of the method should have on file a written Standard Operating Procedure, which should be referenced or provided as appropriate. While a failure to perform or meet the data reporting and performance standards specified above does not necessarily mean that the provided data are not of sufficient quality, it does place the burden on the data user to make this determination.

◊ ***The laboratory should certify under the pains and penalties of perjury that the information contained in the data report form is accurate and complete.*** This attestation should be done via the signature of a responsible laboratory representative.

While minimum standards are specified in the methods, to ensure a minimum level of quality for all data, there is an expectation that laboratories should be able to achieve better results on most samples. In selecting a laboratory, a data user should make sufficient inquiry into the experience of the laboratory performing these (and any other) analytical methods, and on the QA/QC program in operation to monitor, document, and improve analytical quality. In addition, the scope of laboratory services should be negotiated and clearly articulated "up front", to ensure that the data user is procuring (and the laboratory is receiving compensation for) all desired information and data (e.g., QA/QC data, narrative reports, data usability discussions, etc.).

Additional guidance and recommendations on data quality issues for the VPH/EPH methods (as wells as most other common EPA methods) can be downloaded from MADEP at: http://www.state.ma.us/dep/bwsc/files/data/QAQCDocs.htm

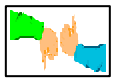
Analytical data and testing should not be viewed as a commodity, but as a highly technical and sophisticated professional service, requiring the same level of scrutiny and oversight as any other professional service that will be relied upon by a Licensed Site Professional in rendering a waste site cleanup opinion.

3.7 Other Hydrocarbon Testing Methods

The VPH and EPH methods were developed to provide data on the chemistry and toxicity of complex hydrocarbon mixtures, to facilitate risk evaluations and to complement MADEP Method 1 cleanup standards. However, in cases where the total concentrations of hydrocarbons are relatively low, use of these fractionation procedures may be "overkill", and a "total petroleum hydrocarbon" (and Target Analyte) evaluation may suffice. Moreover, risk characterization is not the only site assessment objective or concern at disposal sites; other characterization needs may include: petroleum product identification, petroleum source identification, and/or Remediation Waste characterization. In these cases, other analytical procedures may be more appropriate and cost-effective.

A summary of other possible analytical approaches and methodologies in this regard is provided in Table 3-2.

Table 3-2: Other Analytical Approaches



Objective	Analytical Approach	Conditions/Caveats/Comments
Characterization of Remediation Wastes	TPH, VOCs, and/or jar headspace screening. Metals, PCBs and/or TCLP often required	Need to check with disposal or recycling facility for requirements
Risk Assessment & Compliance with Cleanup Standards	TPH via an appropriate methodology. Characterize Target Analytes as needed with EPA SW-846 methodologies	Applicable for low levels of C9 and heavier hydrocarbons (i.e., when TPH concentrations will likely < TPH cleanup standards)
Determining Type of Petroleum Product	High resolution GC/FID; advanced GC/MS chemical fingerprinting	Also recommended to differentiate petrogenic vs. pyrogenic PAHs
Determining Source of Petroleum Product	High resolution GC/FID; advanced GC/MS chemical fingerprinting; quantitation of biomarkers	Not always definitive; requires interpretative expertise

3.7.1 Total Petroleum Hydrocarbons (TPH)

Though a widely used and conceptually-simple testing parameter, there is no universal definition of TPH, and the term is essentially defined by the analytical method chosen by the laboratory. To further complicate this matter, many laboratories use undefined and inconsistent "modifications" of published methodologies to detect and quantitate TPH concentration values (e.g., Modified EPA Method 8100). This situation has lead to a significant degree of confusion over the application, comparability, and quality of TPH data.

The MCP provides a definition of TPH at 310 CMR 40.0006:

> *Total Petroleum Hydrocarbons and TPH each mean the total or cumulative concentration of hydrocarbons with boiling points equal to or greater than 150°C [C_9] and associated with a petroleum product, as measured by standard analytical techniques and/or by procedures approved by the Department, excluding the individual compounds listed at 310 CMR 40.0974(2).*

This definition reflects the fact that the vast majority of "TPH" analyses traditionally conducted in Massachusetts involved the use of an extraction solvent (e.g., Method 418.1), which leads to the loss of lighter hydrocarbons (<C9) present in the sample. Based upon this definition, the following rules and recommendations would apply to parties electing to use a TPH analytical method to support a risk assessment or document compliance with an MCP Method 1 TPH cleanup standard:

- The TPH method and resultant data may only be used to characterize releases of petroleum products that consist of hydrocarbons primarily in the C9 to C36 range. In other words, it may only be used in lieu of an EPH procedure, not a VPH procedure. Guidance on when an EPH procedure is appropriate is contained in Table 4-6.

- In addition to the TPH analysis, all appropriate Target Analytes must also be addressed. Guidance in this regard is contained in Tables 4-3 and 4-5.

- For analytical procedures that utilize a GC/FID technique, the TPH quantitation value must be based upon the integration to baseline of all peak areas from n-Nonane (C9) to n-Hexatriacontane (C36).

- As the MCP specifically excludes "individual compounds listed at 310 CMR 40.0974(2)" from its definition of TPH, it is acceptable to adjust gross TPH values by subtracting out the collective concentrations of these individual compounds. Note that, for all intents and purposes, the "individual compounds listed at 310 CMR 40.0974(2)" are synonymous with the EPH Target Analytes listed in Tables 4-3 and 4-5.

While the MCP defines TPH to be C9 and heavier hydrocarbons, there are some TPH and/or "Gasoline Range Organics" methodologies that may collectively quantitate lighter hydrocarbons in the range of C5-C12. Typically, these methods involve the use of a purge-and-trap or headspace development technique, followed by a GC/FID analytical procedure. While these procedures may NOT be used to obtain TPH data for comparison to the MCP Method 1 cleanup standards (because of the definition of TPH at 40.0006), they can be used as a screening tool for VPH range contaminants. Specifically, if the TOTAL concentration of hydrocarbons within the C5-C12 range (excluding VPH Target Analytes) is less than the lowest VPH Method 1 standard (usually C9-C10 Aromatic Hydrocarbons), it would be safe to assume that hydrocarbon levels are within all fractional standards.

While use of TPH methods may offer certain advantages, it is the responsibility of the party using and submitting such data to ensure that the specific technique and procedure(s) used is appropriate for the disposal site in question, and that appropriate Quality Assurance and Quality Control (QA/QC) measures are taken to monitor and document the quality and usability of the generated data. In general, MADEP expects all such methods to achieve a level of QA/QC consistent with the VPH and EPH methods.

A tabulation of commonly and/or historically available TPH analytical techniques is provided in Table 3-3.

Table 3-3: Common/Available TPH Testing Methods

Method	Technique	Comments
MADEP EPH	Extraction with methylene chloride & GC/FID analysis	Use in the "TPH" screening mode by eliminating the fractionation step per Section 1.5 of EPH Method
EPA Method 1664	Extraction with n-hexane & gravimetric analyses	New method (1999) to replace Method 418.1 (Freon extraction with IR analyses)
Modified EPA Method 8100	Extraction with appropriate solvent & GC/FID analysis	Must ensure quantitation in C9-C36 range with forced baseline integration if data is used to support MCP TPH cleanup standard
Modified EPA Method 8015	Purge-and-trap or headspace sample preparation & GC/FID analysis	Must ensure quantitation in the C5-C12 range with forced baseline integration if data is to be used to screen samples for compliance with MCP VPH cleanup standards

3.7.2 Environmental Forensic Techniques

In conducting a characterization of a petroleum-contaminated site, it may be necessary and/or desirable to identify the types of petroleum product present and/or the source of their release to the environment. In recent years, new analytical testing techniques have evolved to facilitate evaluations of this nature, and support an evolving specialization known as "environmental forensics".

In order to identify the types and/or source of petroleum products that were detected at a site, (up to) a three-step analytical regiment is recommended:

- Initially, samples should be analyzed by a high-resolution gas chromatography/flame ionization detection (GC/FID) methodology. Such techniques have been utilized for many years, and are a useful "first cut" to help identify the boiling-point range of the hydrocarbon mixtures present in the sample, which can then be used to make judgments on the type(s) of petroleum product(s) released at the site (e.g., #2 fuel oil vs. #6 fuel oil). In some cases, the data obtained in this manner is sufficiently conclusive to satisfy site characterization objectives.

In other cases, however, the contamination is highly weathered, and/or intermingled with hydrocarbons of pyrogenic origin (e.g., coal ash, soot, engine emissions).

- In situations where a GC/FID evaluation is inconclusive, additional analytical characterization by a gas chromatography/mass spectrometry (GC/MS) "advanced chemical fingerprinting" technique may be advisable. These methodologies focus on the identification and quantitation of polycyclic aromatic hydrocarbons (PAHs). Although most people are familiar with the 17 priority pollutant PAH compounds quantitated by the MADEP EPH method and EPA Method 8270, there are in fact many more PAH compounds present in petroleum products. Using a GC/MS technique and sophisticated quantitation algorithm, it is possible to identify and quantitate collective groupings of these PAH compounds based upon their structure, e.g., naphthalene with a side chain containing 1 carbon atom; naphthalene with a side chain containing 2 carbon atoms, etc. The presence and distribution of these side chains can then be used to help establish the type of petroleum product(s) present at the site. Moreover, this same information – often plotted as histograms – may also be used to differentiate petroleum-derived (petrogenic) hydrocarbons from combustion-derived (pyrogenic) hydrocarbons (given that the latter are predominated by the parent PAH compound, while the former are predominated by the alkylated side chain PAH compounds).

- Data on the distribution of alkylated PAHs can often provide definitive information on the type(s) of petroleum products present at a site, and even some evidence on the specific source(s) of release. However, in order to obtain more definitive proof of the source of a petroleum release, one additional analytical tool should be considered: the identification and quantitation of biomarkers. Biomarkers are chemical compounds present in petroleum products that are the remnants of the biological life (e.g., algae, plants, bacteria) that help create the parent crude oil. While certain biomarkers are identifiable using a GC/FID methodology (e.g., pristane and phytane), the most useful compounds in this regard (e.g., terpanes and steranes) are identified using a GC/MS technique in a selected ion monitoring (SIM) mode. Because each crude oil source has a distinct "fingerprint" of biomarkers, it is often possible to identify the specific source of a release of petroleum at a site using this approach (e.g., using a statistical/multivariate component analyses), though weathering processes may sometimes decrease confidence in such conclusions.

At the present time, advanced chemical fingerprinting is an innovative technology used by only a small number of laboratories. Given this status, and given the sophistication, complexity, and professional judgment inherent in these approaches, it is essential that data users seek out facilities and personnel with the appropriate expertise and experience.

3.8 Analytical Screening Techniques

The use of analytical screening techniques is encouraged, to provide timely and cost-effective data. As the sophistication and reliability of so-called "field" methods continue to increase, the distinction between conventional laboratory and analytical screening techniques becomes less defined, and less important. However, with this increased capability and performance comes an increased need to demonstrate and document a commensurate level of quality assurance/quality control (QA/QC), consistent with the provisions and requirements of 310 CMR 40.0017.

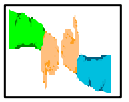
Various levels/approaches are possible:

◊ Screening techniques may be used solely to direct remedial actions and/or sampling programs for conventional VPH/EPH testing. Because such screening data will not be used in a "stand alone" capacity, QA/QC requirements are not as critical.

◊ Screening techniques may also be employed to obtain data that will be used, in whole or in part, to assess risks and/or determine compliance with cleanup standards, and/or to support the representativeness of ("lab") data used in the risk assessment process. While it is understood that such screening methodologies may lack the qualitative or quantitative accuracy of conventional VPH/EPH testing, *the same level of QA/QC will be expected, within the limits and bounds of the stated application of the data*.

The use of screening techniques depends upon, or may be enhanced by, the use of assumptions and conditions. This approach is acceptable, as long as conservative assumptions are made, and the use of such methods and assumptions are appropriate, given contaminant chemistry, site conditions, and area receptors. A tabulation of commonly used screening techniques, and recommended applications and *Rules of Thumb*, are provided in Table 3-4.

Table 3-4
VPH/EPH Analytical Screening Techniques



Technique	Description	Range	Applications	Limitations	Recommendations
PID/FID Headspace	Soil or water sample is placed in sealed container & headspace is allowed to develop. PID and/or FID meter is then used to test the headspace for total volatile organic compounds (VOCs). Reference: Recommended DEP jar headspace procedure	VPH	Excellent screening tool for gasoline; good tool for kerosene, jet fuel and fresh fuel oil. Best used to direct remedial operations, and provide first-cut site characterization data. PID preferentially responds to the more toxic aromatic compounds.	Not appropriate for heavy mineral/ lube/fuel oils or weathered diesel/#2 fuel oil. PID can be non-linear and/or erratic for gasoline headspace vapors > 150 ppmv. PID response lessened by high humidity/ moisture (instrument dependent). Additional confirmatory analyses usually required.	For gasoline, excluding clays & organic soils, headspace readings less than 100 ppmv usually means that all VPH fractions are below 100 µg/g. Confirmatory analyses needed.
PID/FID Soil Gas	Soil gas is extracted from a probe and analyzed with a PID and/or FID meter. Reference: see Section 4.3.1.1	VPH & EPH	Use to investigate soil gas/indoor air pathways, and evaluate sites with g.w. concentrations > GW-2 Method 1 standards. PID preferentially responds to the more toxic aromatic compounds.	Instrument response is flow-dependent; must ensure adequate flow rates. PID response affected by high moisture & high petroleum vapor concentrations (>150 ppmv). FID will respond to pipeline/naturally-occurring methane.	See recommendations in Section 4.3.1.1 and Table 4-9.
UV Fluorescence & Absorbance	The absorbance or fluorescence of a UV light source is used to directly quantitate the aromatic content of soil sample. Extraction solvent, such as methanol or Isopropyl alcohol, must be used. Reference: ASTM 5831-95	VPH & EPH	Good screening tool for petroleum products with significant aromatic content (e.g., diesel/#2 fuel oil and gasoline). UV Fluorescence has lower detection limits than absorbance, but is not as linear. UV methods target the more toxic aromatic fractions.	Does not respond to aliphatics; not appropriate for petroleum products that are primarily aliphatics (mineral oils or dielectric fluids). May pick up naturally occurring humic acids - calcium oxide can be used to decrease interference.	Calibrate with aromatic standard, like C11-C22 EPH standard, for direct measurement of aromatic hydrocarbons. For diesel/#2 fuel oil, assume aliphatic content is twice aromatic. This approach may significantly over-predict aliphatic content of highly weathered diesel/#2 fuel oil. Confirmatory analysis recommended for representative/worst-case samples.
Emulsion-Based TPH Methods	Hydrocarbons are extracted from a soil sample with a solvent (e.g. methanol), and a surfactant is added to create an emulsion. Optical sensor is used to measure extract turbidity	EPH	Gives "TPH" screening values, quantitating both aromatic and aliphatic hydrocarbons. Best correlation shown with diesel/#2 fuel oil.	Does not discriminate between aliphatics and aromatics. Interference possible in organic-rich and clay soils. Not recommend for gasoline.	For diesel/#2 fuel oil, assume 60% C11-C22 Aromatics and 40% C9-C18 Aliphatics.
Immunoassay Test Kits	Soil or water samples analyzed by antibody-antigen reaction. Enzyme conjugates used to allow colorimetric analysis of antigen (contaminant) conc. Soil extraction with methanol. Reference: EPA 4030/4035	VPH & EPH	Can be used to detect specific compounds or groups of compounds (e.g., BTEX and PAHs). "TPH" methods usually target naphthalene, and assume correlation to TPH.	Because antibodies bind with specific antigens (contaminants), cannot directly quantitate collective aliphatic/aromatic fractions or total hydrocarbons. Not effective for lube/hydraulic oils.	No general assumptions can be made. Each kit and application has to be individually evaluated.
Fiber-Optic Chemical Sensors	Probe with hydrophobic/organo-phyllic optical fiber is lowered into a well. Change in refraction index used to est. hydrocarbon conc. in groundwater	VPH & EPH	Allows in-situ measurements of volatile and semi-volatile dissolved hydrocarbons. Results calibrated to a p-xylene response. In-situ vapor measurement also possible.	Response decreases with increasing solubility; response to benzene 10 times less than p-xylene. Significant calibration/cleaning requirements between uses.	Insufficient information available to offer general recommendations.

3.8.1 Principles of Operation, Biases, and Calibration

All screening techniques and instruments are predicated upon certain principles of operation, detection, and calibration. Many have limitations and biases that need to be understood and accommodated. For example, an immunoassay "TPH" test method may be designed to detect the presence of naphthalene, and then extrapolate a TPH concentration based upon an assumption on the percentage of naphthalene in fresh fuel oil. Thus, two important assumptions and biases are present: (a) the concentration of a single compound (naphthalene) can be used to determine the concentration of a product which is made up of numerous (perhaps hundreds of) hydrocarbon compounds, and (b) the chemistry of a fresh fuel oil standard can be used to estimate the chemistry of a field sample. As such, a highly weathered fuel oil sample, or a fuel product low in naphthalene (e.g., mineral oils) may not yield reliable results.

To effectively use analytical/screening techniques, especially for risk and cleanup decisions, it is incumbent upon the data user to:

1. understand the application and limitations of the screening method(s) of interest;

2. consider site-specific contaminant/mixture chemistry and fate/transport processes; and

3. determine the precision and accuracy boundaries of the generated data, to see if they meet the desired data quality objectives and site characterization needs (e.g., if data can be considered accurate at 100 µg/g +/- 300%, and the cleanup standard is 500 µg/g, it may be acceptable).

In general, the following recommendations are offered:

◊ Techniques that detect a structural class and/or range of compounds are preferred, as opposed to methods that rely upon one specific indicator compound. Techniques that detect a range of compounds include PID/FID headspace techniques, UV absorbance/fluorescence, and emulsion-based TPH techniques. Procedures that target a single indicator compound require sufficient site-specific correlative and confirmatory data.

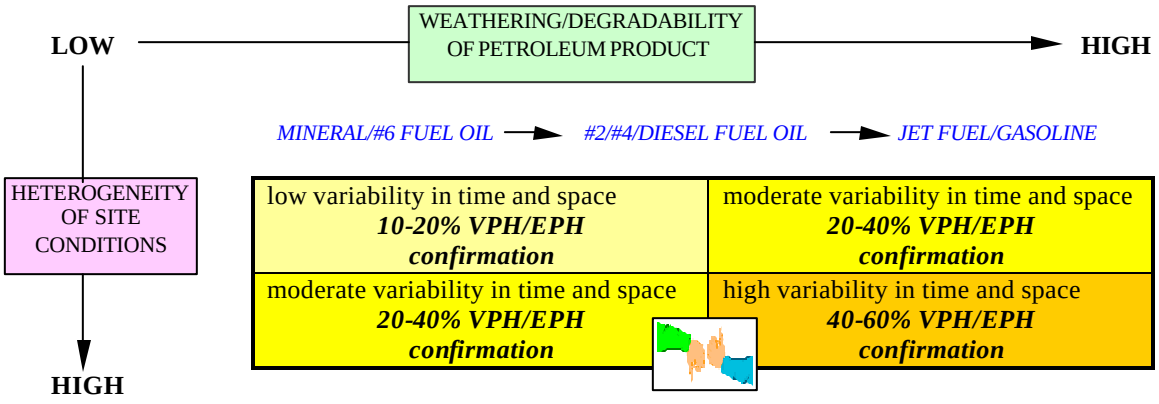
◊ Techniques that target aromatic hydrocarbons are preferred, as opposed to methods that target aliphatic compounds, due to the fact that aromatic hydrocarbons are, as a class, more toxic and mobile than aliphatic hydrocarbons. *On the whole, it is better to be able to accurately quantitate collective aromatic hydrocarbons, and estimate aliphatics, than to accurately quantitate collective aliphatic hydrocarbons, and estimate aromatics*. Techniques that target aromatics include PID headspace and UV absorbance/fluorescence.

◊ Techniques that involve a quick "shake out" extraction technique for soil analyses may not be sufficient for clay or organic-rich soils, due to partitioning efficiencies.

3.8.2 Recommended Approach

For small sites, such as residential underground storage tank (UST) excavations, screening techniques are perhaps best used to direct soil removal operations, identify areas for assessment and/or confirmatory VPH/EPH laboratory analysis, and/or provide a database to support the representativeness of decision-quality data. For larger sites, the use of screening data as a substitute and complement for VPH/EPH laboratory data may provide a better and less expensive approach to site characterization. For example, for the price of a single EPH test (approximately $200), it may be possible to perform 4 to 10 field screening analyses. So, for a sampling and analytical budget of $2000, it may make sense to take 8 EPH samples, and 8 to 20 field-screening samples, rather than (just) 10 EPH samples. The minimum number of VPH/EPH laboratory samples needed to understand contaminant chemistry, and provide confidence in screening data, is necessarily site-specific. The key variables are the heterogeneity of site conditions (stratigraphic/microbiological), source vs. migration areas, and the degradability of the petroleum product(s). Generalized *Rules of Thumb* in this regard are provided in Table 3-5. Note that additional confirmatory sampling would be indicated if sufficient correlation could not be established between the VPH/EPH values and screening/TPH values.

Table 3-5: Recommended Minimum VPH/EPH Laboratory Confirmation Data Needed to Support Analytical Screening



3.9 Drinking Water Testing Methods

When testing a potable drinking water supply, the use of the VPH/EPH analytical methods should be limited to quantitation of hydrocarbon ranges of interest; specific analytes of interest should be quantitated using the appropriate EPA "500" series drinking water methods.

4.0 CLEANUP STANDARDS

The Massachusetts Contingency Plan (MCP) provides three methods to assess risks and determine *how clean is clean enough*:

- ◊ Method 1 - generic cleanup standards in soil and groundwater
- ◊ Method 2 - site-specific modification of generic cleanup standards
- ◊ Method 3 - completely site-specific risk assessment

The easiest approach is Method 1, in that cleanup standards have already been established by MADEP. In support of the VPH/EPH approach, 6 generic standards have been developed and promulgated for the aliphatic and aromatic fractions of interest. A conservative TPH standard has also been retained, to allow continued use of such methods. *Note that it is not necessary to meet a TPH cleanup standard (or Reportable Concentration) if all 3 EPH fractional standards are achieved [see 310 CMR 40.0973(7) and 40.0360(2)].*

Because the Method 1 standards are generic, and were calculated assuming conservative site conditions, they can overestimate risk at some sites. In such cases, use of a Method 2 or 3 alternative approach may be advisable and cost effective. Guidance and recommendations in this regard are provided in Table 4-1.

For complete information and guidance on the use of the MCP risk assessment methods, consult the Massachusetts Contingency Plan at 310 CMR 40.0900, and MADEP's *Guidance for Disposal Site Risk Characterization in Support of the Massachusetts Contingency Plan*, available at http://www.state.ma.us/dep/ors/orspubs.htm .

Attachment 3: Summary of Air Toxics MA-APH carbon range analysis method for soil gas and air samples.

15.0 AIR PHASE PETROLEUM HYDROCARBONS (MA APH)

The MADEP APH method describes techniques for the analysis of air-phase petroleum hydrocarbons (APH) collected as whole air samples in stainless steel canisters. Up to 0.5 Liters of air is withdrawn from the canister through a mass flow controller and is concentrated using a multisorbent trap which also serves as a hydrophobic dryer for moisture removal. The focused air sample is then flash heated through the hydrophobic drying system which removes the water from the sample stream prior to analysis by full scan GC/MS. Air Toxics Ltd. performs this analysis without taking modifications to the MADEP APH method. The standard target analyte list, Limit of Quantitation, QC criteria, and QC summary can be found in the following tables.

Table 15.1 APH Target Compound List

Analyte	Reporting Limit (ug/m3)	*Acceptance Criteria*	
		Accuracy Limits (%R)	Precision Limits (RPD)
1,3-Butadiene*	2.0	70 - 130	± 25
Methyl-tert-butyl ether (MTBE)*	2.0	70 - 130	± 25
Benzene*	2.0	70 - 130	± 25
Toluene*	2.0	70 - 130	± 25
Ethyl benzene*	2.0	70 - 130	± 25
m/p-Xylene*	2.0	70 - 130	± 25
o-Xylene*	2.0	70 - 130	± 25
Naphthalene	2.0	60 - 140	± 25

*Compounds comprise the LCS/2nd Source Standard.

Table 15.2 Aliphatics & Aromatics Hydrocarbon Ranges

Analyte	Reporting Limit ($\mu g/m^3$)	*Acceptance Criteria*	
		Accuracy Limits (%R)	Precision Limits (RPD)
C_5-C_8 Aliphatics	12	70 - 130	± 25
C_9-C_{12} Aliphatics	12	70 - 130	± 25
C_9-C_{10} Aromatics	10	70 - 130	± 25

Table 15.3 Internal Standards

Analyte	Accuracy Limits (%)
Bromochloromethane	50 to 200
1,4-Difluorobenzene	50 to 200
Chlorobenzene-d_5	50 to 200

Table 15.4 Surrogates

Analyte	Accuracy Limits (%R)
1,2-Dichloroethane-d_4	70 – 130
Toluene-d_8	70 – 130
4-Bromofluorobenzene	70 – 130

Table 15.5 Summary of Calibration and QC Procedures

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Tuning Criteria	Every 24 hours.	Compendium of Methods for Toxic Organic Air Pollutants, Method TO-14A, January 1999.	Correct problem then repeat tune.
5 Point Calibration	Prior to sample Analysis.	%RSD ≤30% for APH Target Analyte or hydrocarbon range. Naphthalene is ≤40%.	Correct problem then repeat initial calibration curve.
LCS (Subset of Target Compounds)	After each initial calibration curve, daily prior to sample analysis.	Recoveries for the APH target compounds and hydrocarbon ranges must be ±30%. If recovery of any compound is above 130%. Analyze samples as long as compound is not detected.	Check the system and re-analyze the standard. Re-prepare the standard if necessary. Re-calibrate the instrument if the criteria cannot be met.
Continuing Calibration Verification (CCV)	At the beginning of each day.	%D ≤ 30% for APH target compounds and hydrocarbon ranges. One compound is allowed to be out as long as it is ≤ 50%D. Target compound Naphthalene allowed %D ≤ 40%. If recovery of any compound is above 150%. Instrument must be re-calibrated.	Perform maintenance and repeat test. If the CCV still fails, perform maintenance and a new 5-7 point calibration curve.
Laboratory Blank	After the CCV/LCS.	Results less than the laboratory RL (Tables 15.1 and 15.2). Naphthalene and C12 are allowed to be 2X the RL.	Inspect the system and re-analyze the blank.

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Internal Standard (IS)	As each standard, Blank, and sample is being loaded.	Retention time (RT) for the blanks and samples must be within ±0.33 min of the RT in the CCV. The IS area must be within -50 to 200% of the CCV's IS area for the blanks and samples.	**For blanks:** inspect the system and re-analyze the blank; **For samples:** If there is not obvious interference with the internal standard, re-analyze the sample. If the ISs are within limits in the re-analysis, report the second analysis. Dilution of the sample to get IS areas within limits may be used if the RL is being obtained.
Surrogates	As each standard, blank, and sample is being loaded.	70 – 130% R.	**For blanks:** inspect the system and re-analyze the blank; **For samples:** re-analyze sample unless obvious matrix interference is documented. If the %R is within limits in the re-analysis, report the 2nd analysis. If %R is out-of-limits a 2nd time, report data from 1st analysis and narrate.
Laboratory Control SpikeDuplicate (LCSD)	i 1 dup/analytical batch.	RPD ≤ 30% .	Inspect the system and re-analyze; if out again, narrate.

Table Elution/retention times for targeted VOCs and chemical markers use to define carbon ranges.

Target Chemical/ Carbon Range	Marker Chemical(s) on Chromatogram	Elution/Retention Time (minutes)	
		TO-15	TO-17
C5 aliphatics	Isopentane	7.445	3.302
C9 aliphatics	Nonane	20.240	11.121
C13 aliphatics	Dodecane	23.134	15.457
C18 aliphatics	Octadecane	NA	21.037
C24 aliphatics	Tetracosane	NA	24.991
C9 aromatics	o-Xylene	20.238	10.844
C11 aromatics	Naphthalene	23.060	14.978
C16 aromatics	Octadecane	NA	21.037
Benzene	“”	14.779	5.565
Ethylbenzene	“”	19.704	10.128
Toluene	“”	17.997	8.022
Xylenes	“”	M/P :19.816 O :20.138	M/P :10.321 O :10.744
Naphthalene	“”	23.160	15.078
1-Methylnaphthalene	“”	NA	16.549
2-Methylnaphthalene	“”	NA	16.370
TPHg (C5-C12)	Isopentane & Nonane	7.445 to 23.134	3.302 to 11.121
TPHg (C5-C24)	Isopentane & Tetracosane	NA	3.302 to 24.991
[1]TPHd (C5-C24)	Isopentane & Tetracosane	NA	3.302 to 24.991
[2]TPHd (C10-C24)	Nonane & Tetracosane	NA	12.671 to 24.991

1. Request lab to report TPHd as C5 to C24 to ensure inclusion of C5-C8 aliphatics.
2. Not recommended, excludes potential C5-C8 aliphatics in diesel and other middle distillate vapors.

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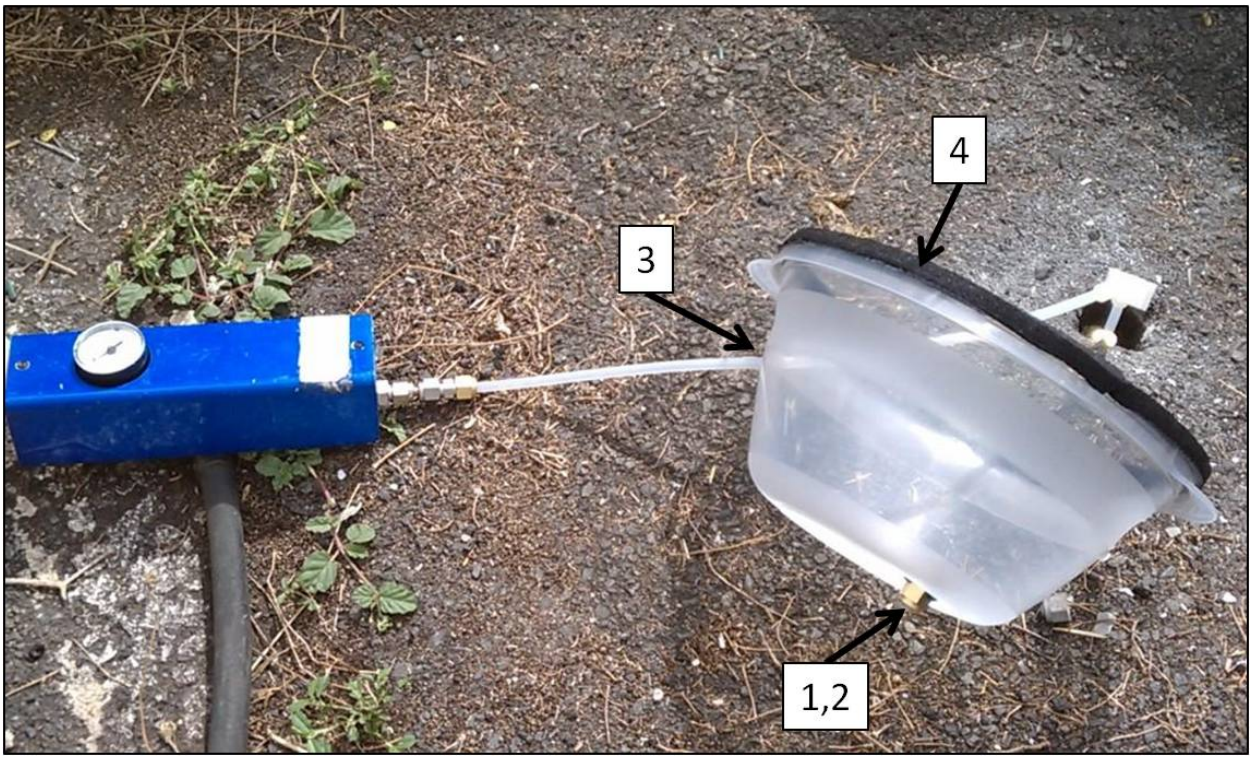
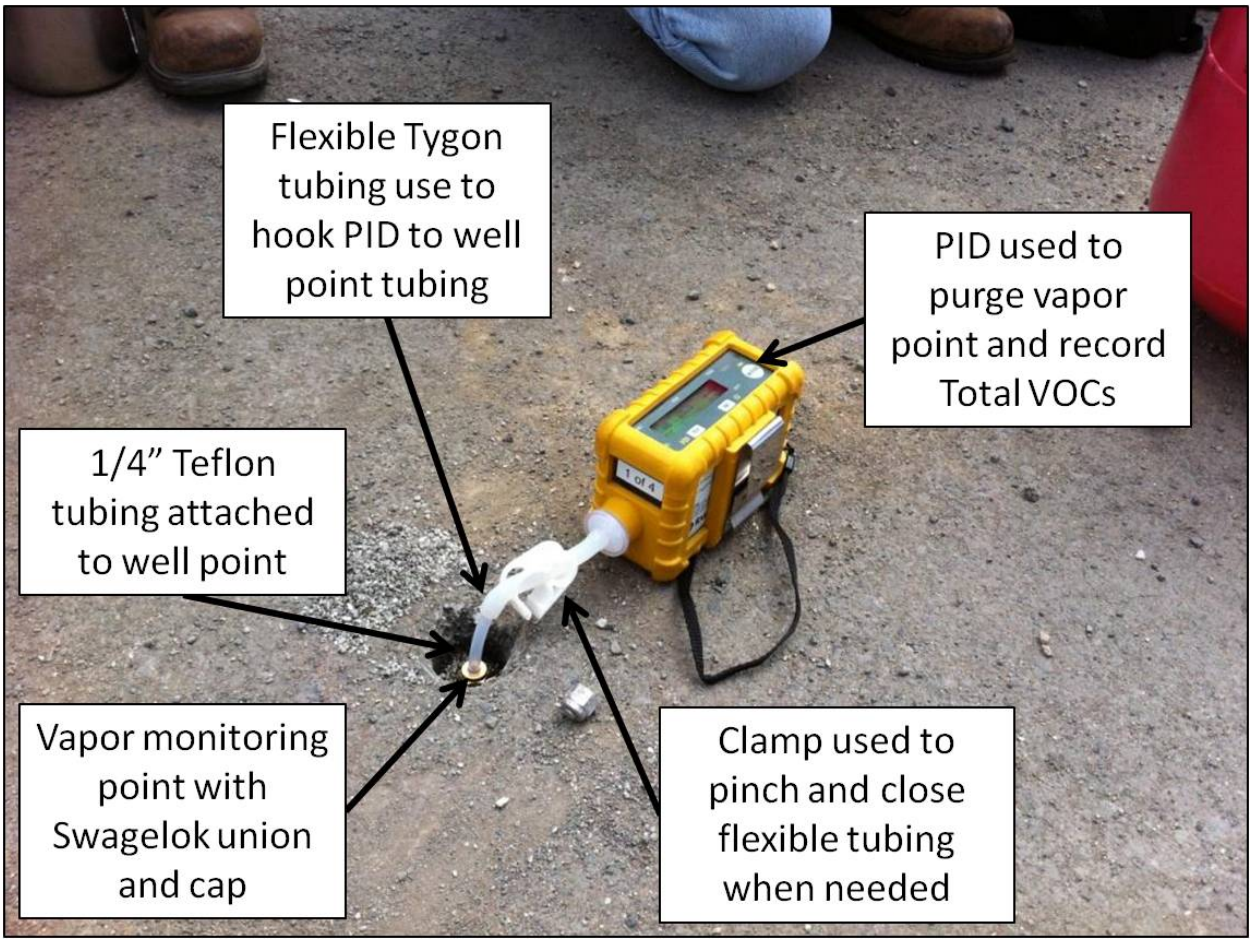
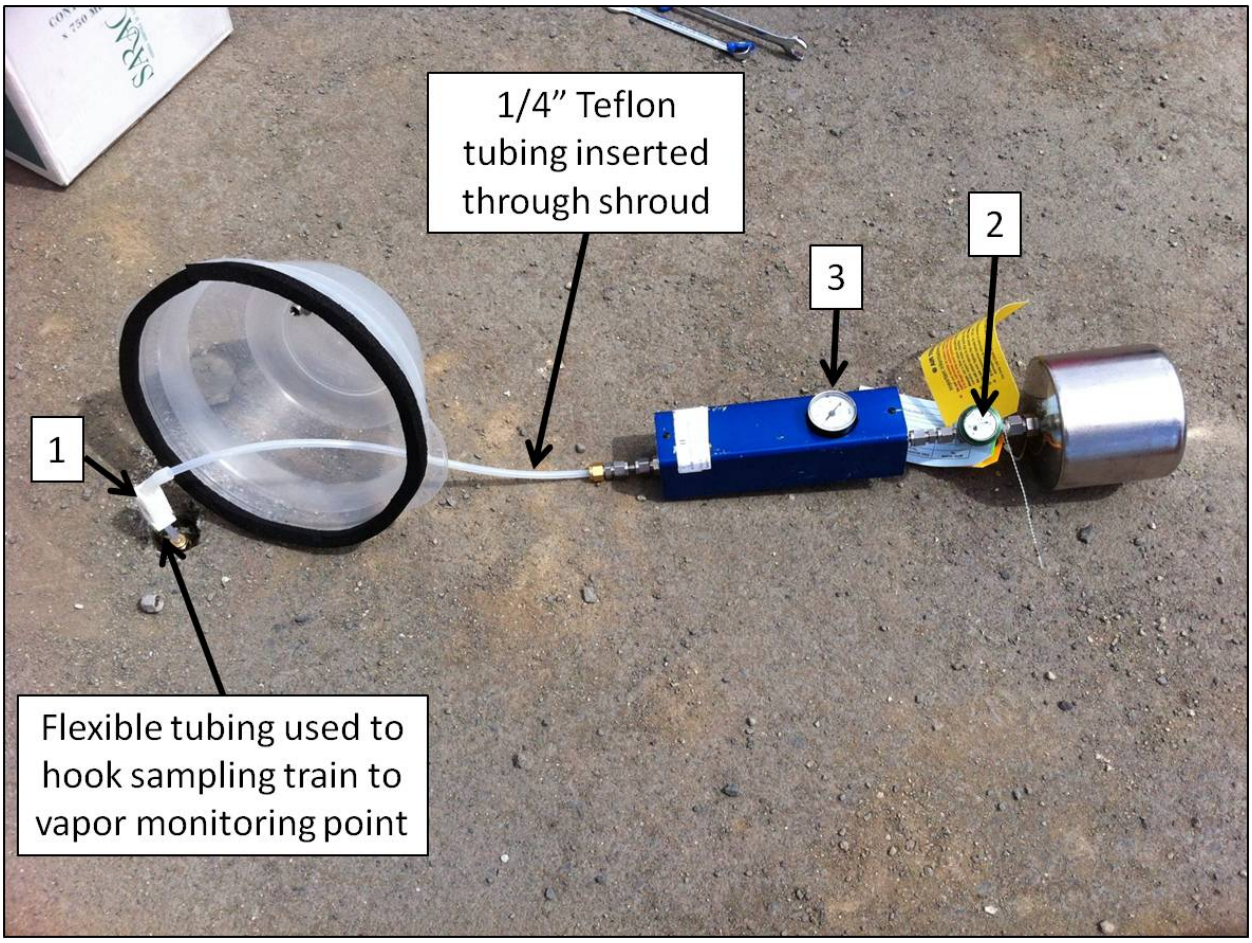
Attachment 4: Soil Gas Leak Detection Using a Tupperware Shroud



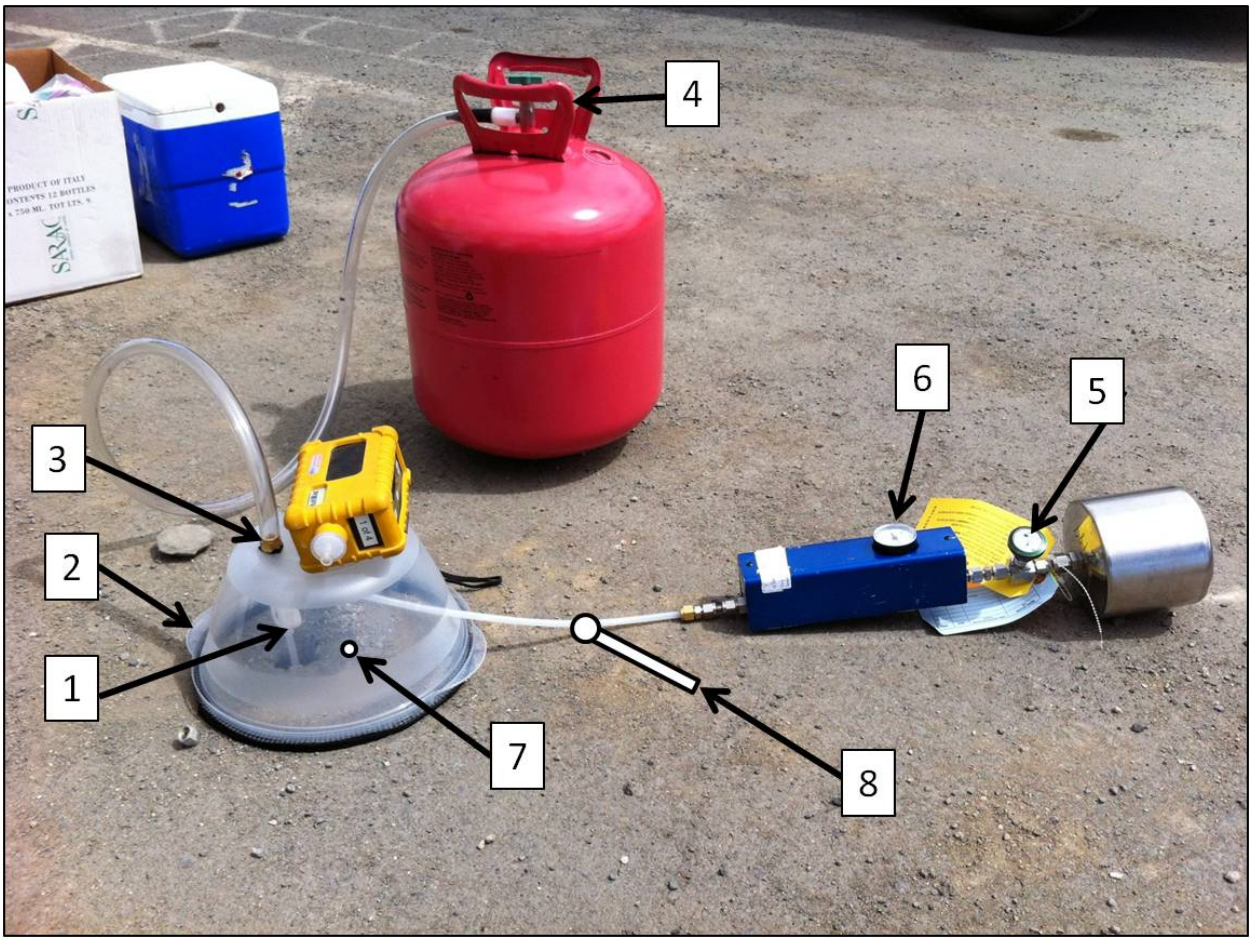
Step 1. To prepare shroud: A) Cut ½" hole on top for helium port; B) Insert Swagelok union into helium port from inside and fasten to Tupperware from the outside with a Swagelok on the top (or something similar, see Step 4); C) Cut ¼" hole on side for tubing from vapor point to flow controller; and D) Place door weather stripping around base.



Step 2. Purge vapor monitoring point and record PID reading for total VOCs and other parameters as needed. PID readings can also be recorded after sample collection.



Step 3. Prepare Summa canister sampling train. Insert tubing from flow controller through shroud and hook to well point. Include short length of flexible, Tygon (or similar) tubing at well point. Tygon tubing can absorb VOCs and its use should be minimized. For initial leak test: 1) Pinch flexible tubing shut (or close well point valve, if installed), 2) Open valve on Summa canister, and 3) Monitor vacuum gauge on flow controller for 60 seconds. If the vacuum does not drop over 60 seconds then it can be safely assumed that the sampling train is not leaking up to the well point itself.



Step 4. Test for leaks at vapor monitoring point hookup using helium, while soil gas sample is being collected: 1) Open clamp on flexible tubing; 2) Place shroud around vapor point (PID used to add weight for better seal in photo); 3) Hook tubing from helium tank to shroud, 4) Fill shroud with helium; 5) Open valve on Summa canister; 6) Monitor vacuum gauge and close valve at target vacuum level (usually around -5mm Hg); 7) Optional third port added to the shroud to monitor helium levels in the field (not shown); and 8) Optional bypass connector added to test for helium in the field and check for leaks around the vapor point annulus (not shown) . Target for a minimum of 20-30+% helium (usually accomplished with a 10-15 second burst of helium). Request that lab test for helium in sample (e.g., using ASTM-D 1945). If helium is identified in the sample then this suggests that the well point was leaking and the data should be flagged. Attempting to quantify the exact volume of ambient air that leaked into the Summa canister and adjust soil gas data accordingly is usually not practical.

Attachment 5: TO-15 and TO-17 Chromatograms for Key Samples.

TO-15 Chromatograms for Key Samples (carbon ranges marked)

Data File: /chem/msd2.i/30aug11.b/2083020.d

Date : 30-AUG-2011 21:37

Client ID:

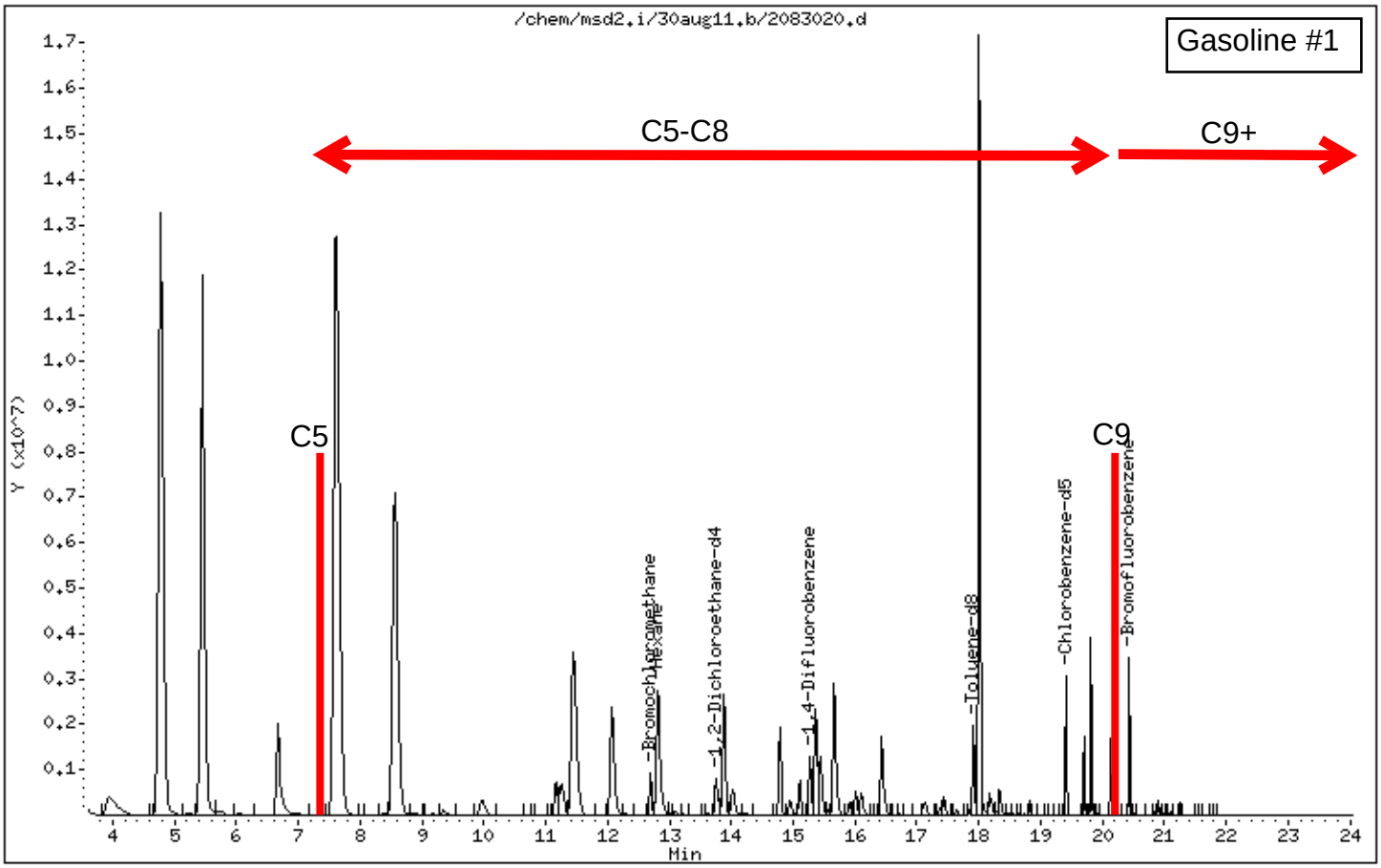
Instrument: msd2.i

Sample Info: 5.0ml #20777

Operator: srs

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/25oct11.b/2102512.d

Page 1

Date : 25-OCT-2011 13:45

Client ID:

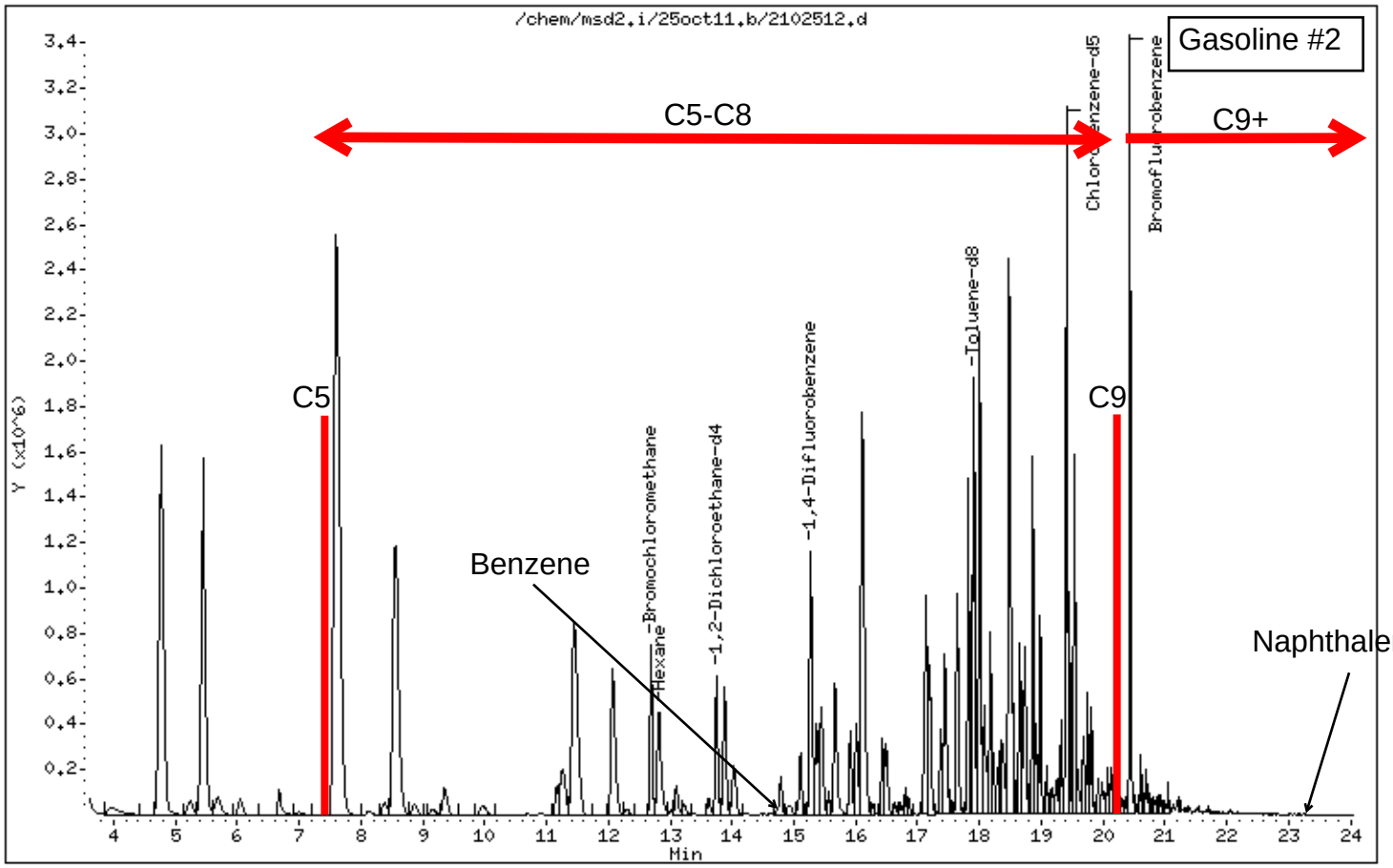
Instrument: msd2.i

Sample Info: 6.0ml #12035

Operator: mtw

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/15jun11.b/2061512.d

Page 1

Date : 15-JUN-2011 15:12

Client ID:

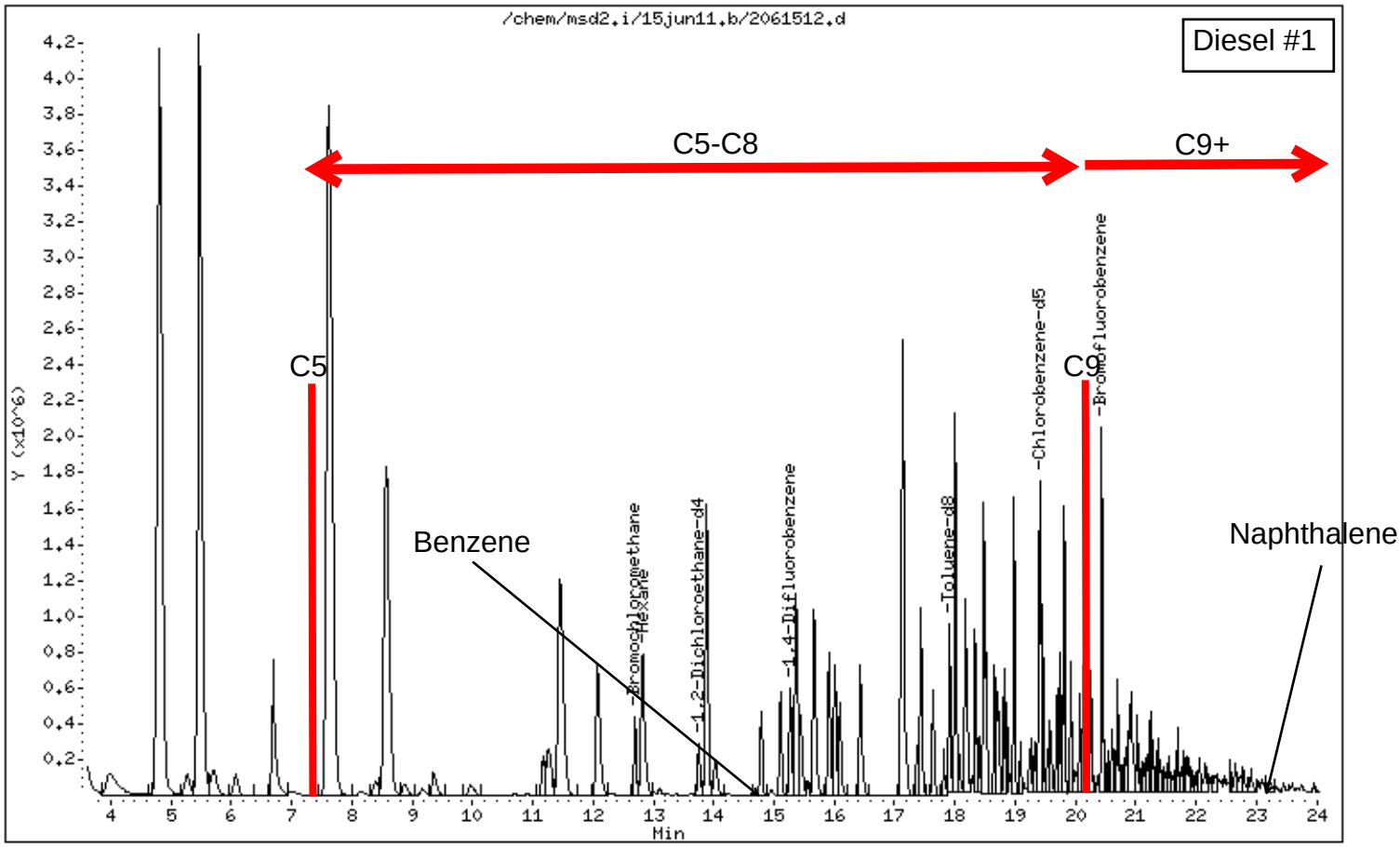
Instrument: msd2.i

Sample Info: 2.0ml #36491

Operator: JP

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/30aug11.b/2083021.d

Page 1

Date : 30-AUG-2011 23:16

Client ID:

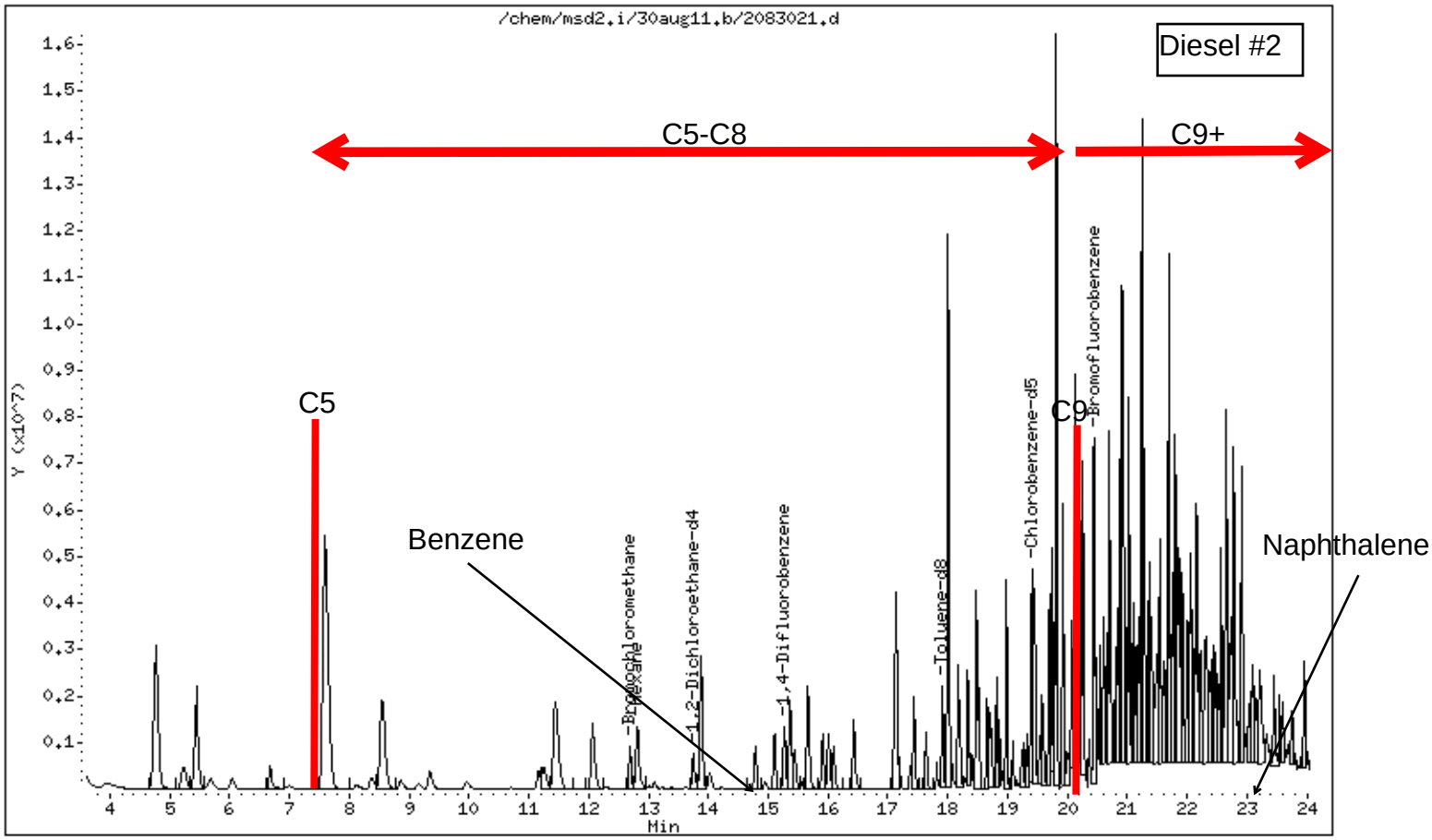
Instrument: msd2.i

Sample Info: 8.0ml #36432

Operator: srs

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/24oct11.b/2102412.d

Page 1

Date : 24-OCT-2011 14:04

Client ID:

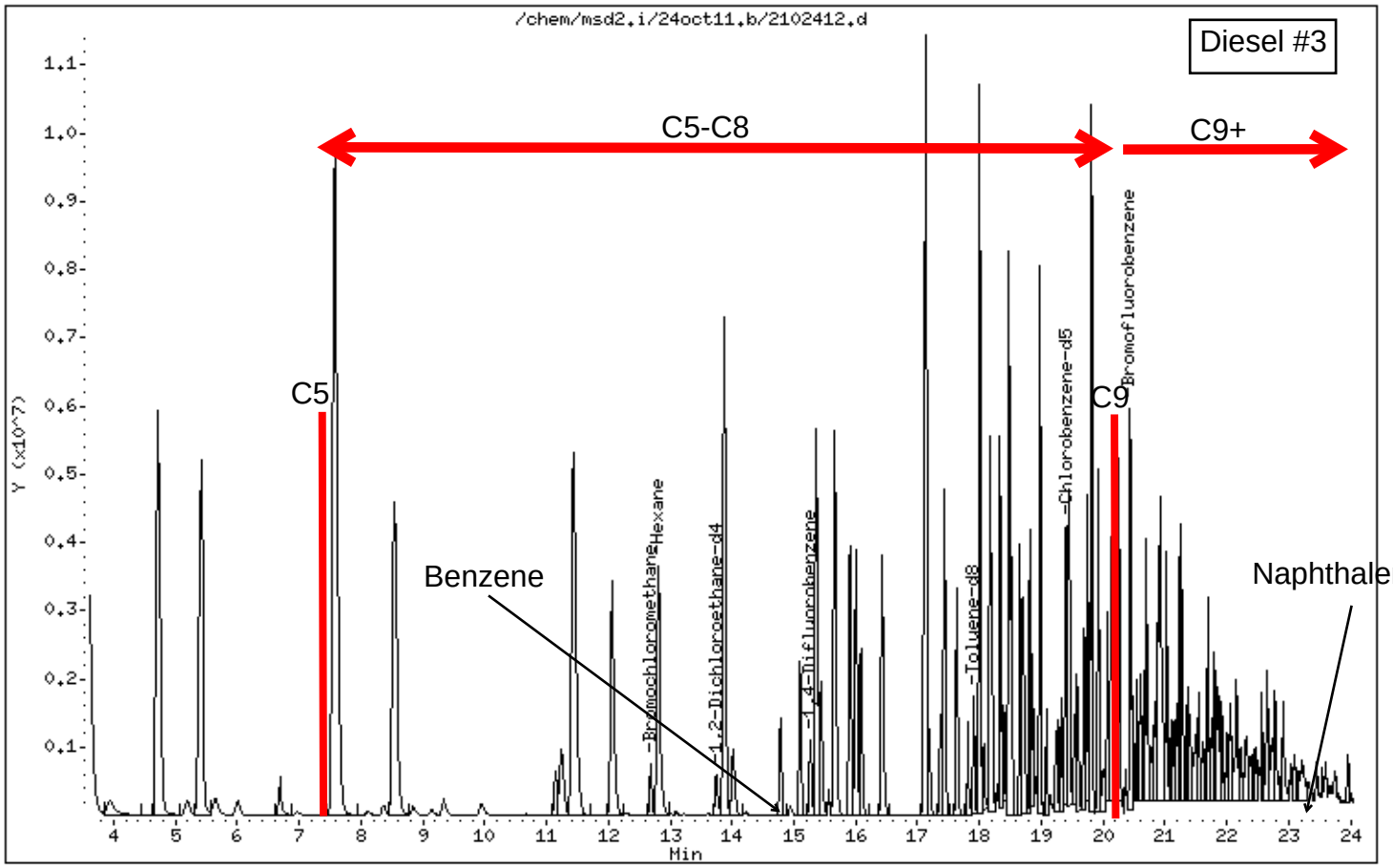
Instrument: msd2.i

Sample Info: 30ml #37711

Operator: mtw

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/12oct11.b/2101220.d

Page 1

Date : 12-OCT-2011 18:55

Client ID:

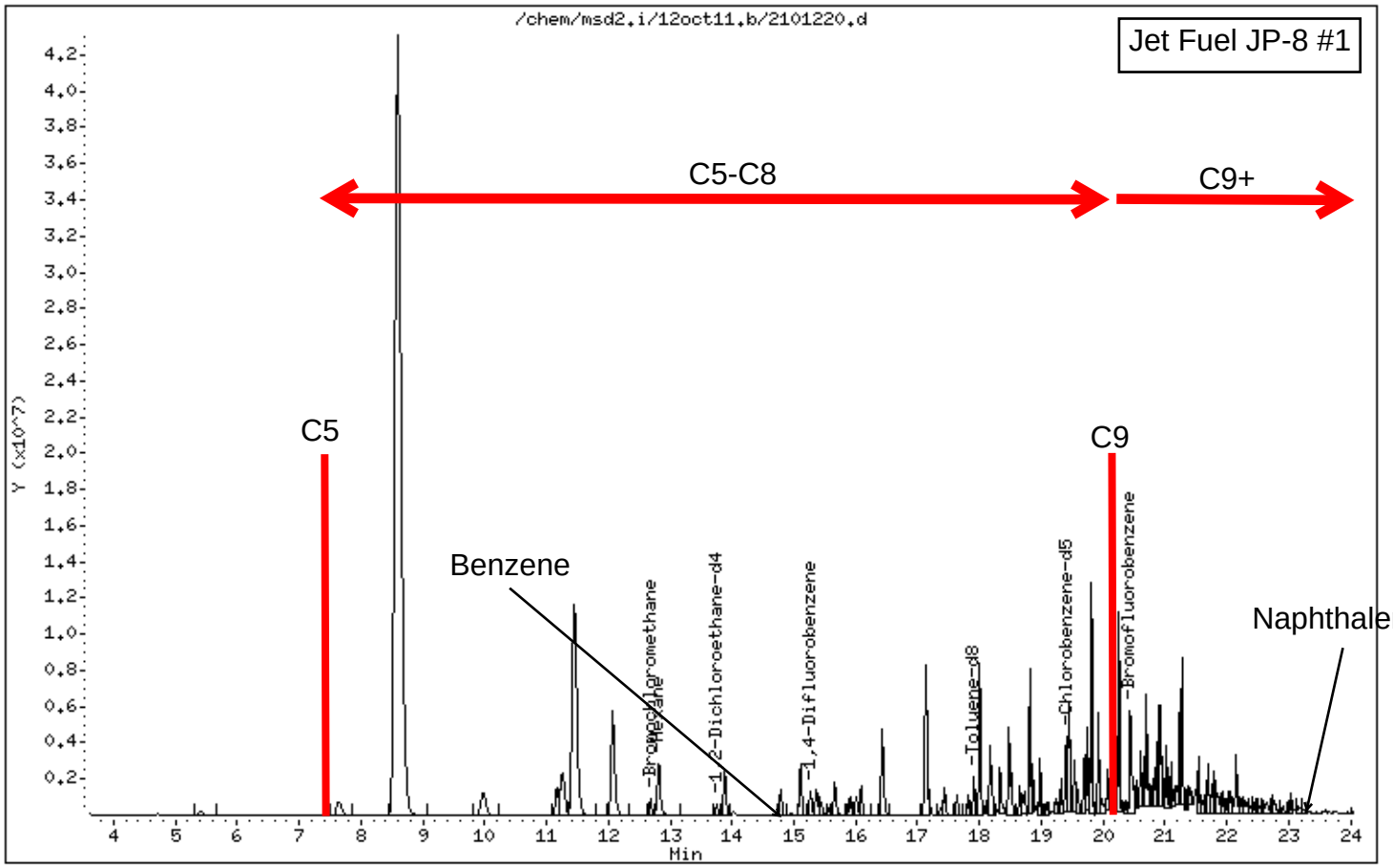
Instrument: msd2.i

Sample Info: 2.0ml #34656

Operator: EA

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/28jun11.b/2062817.d

Page 1

Date : 29-JUN-2011 06:53

Client ID:

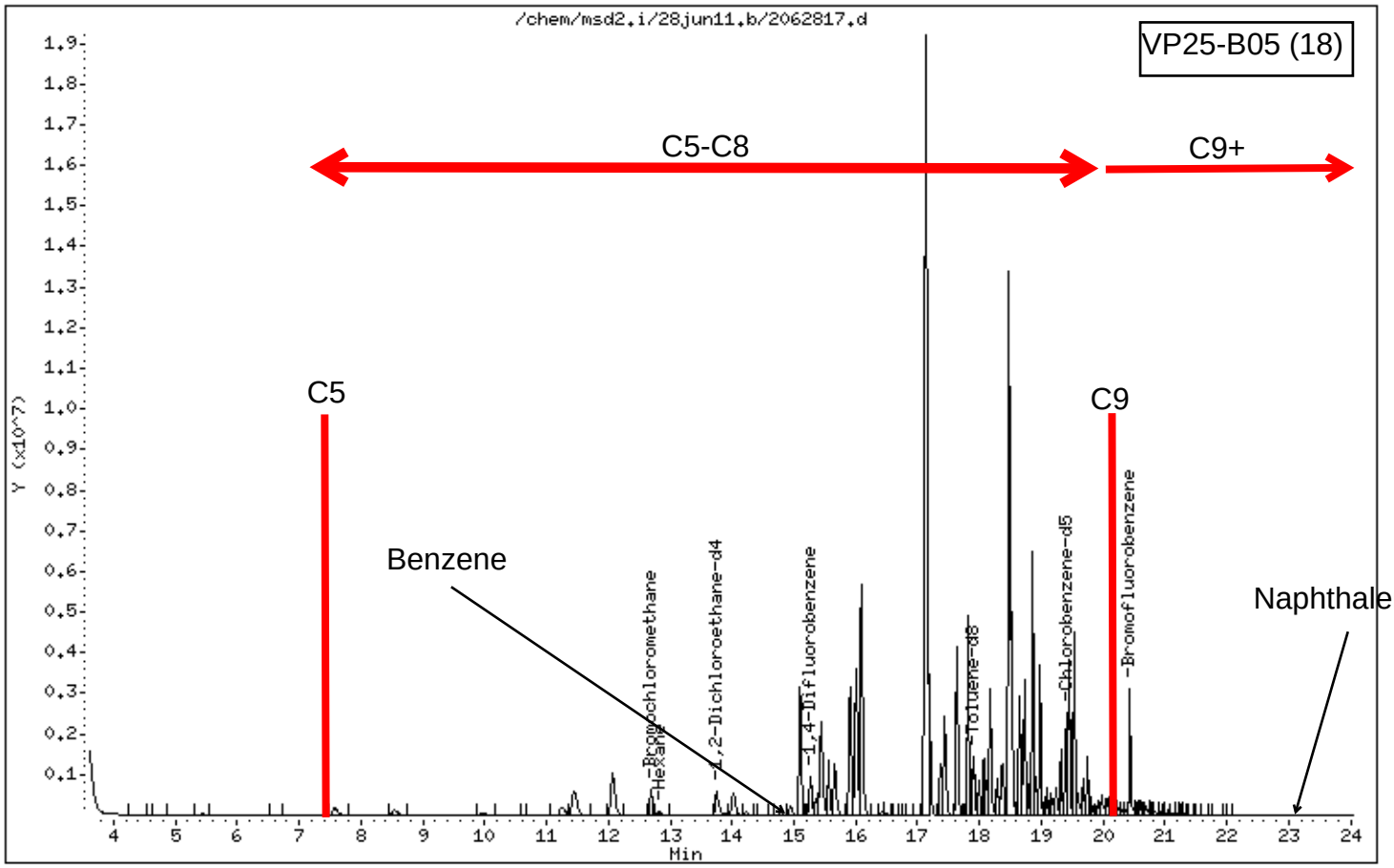
Instrument: msd2.i

Sample Info: 100mL #36428

Operator: mtw

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/28jun11.b/2062820.d

Page 1

Date : 29-JUN-2011 09:09

Client ID:

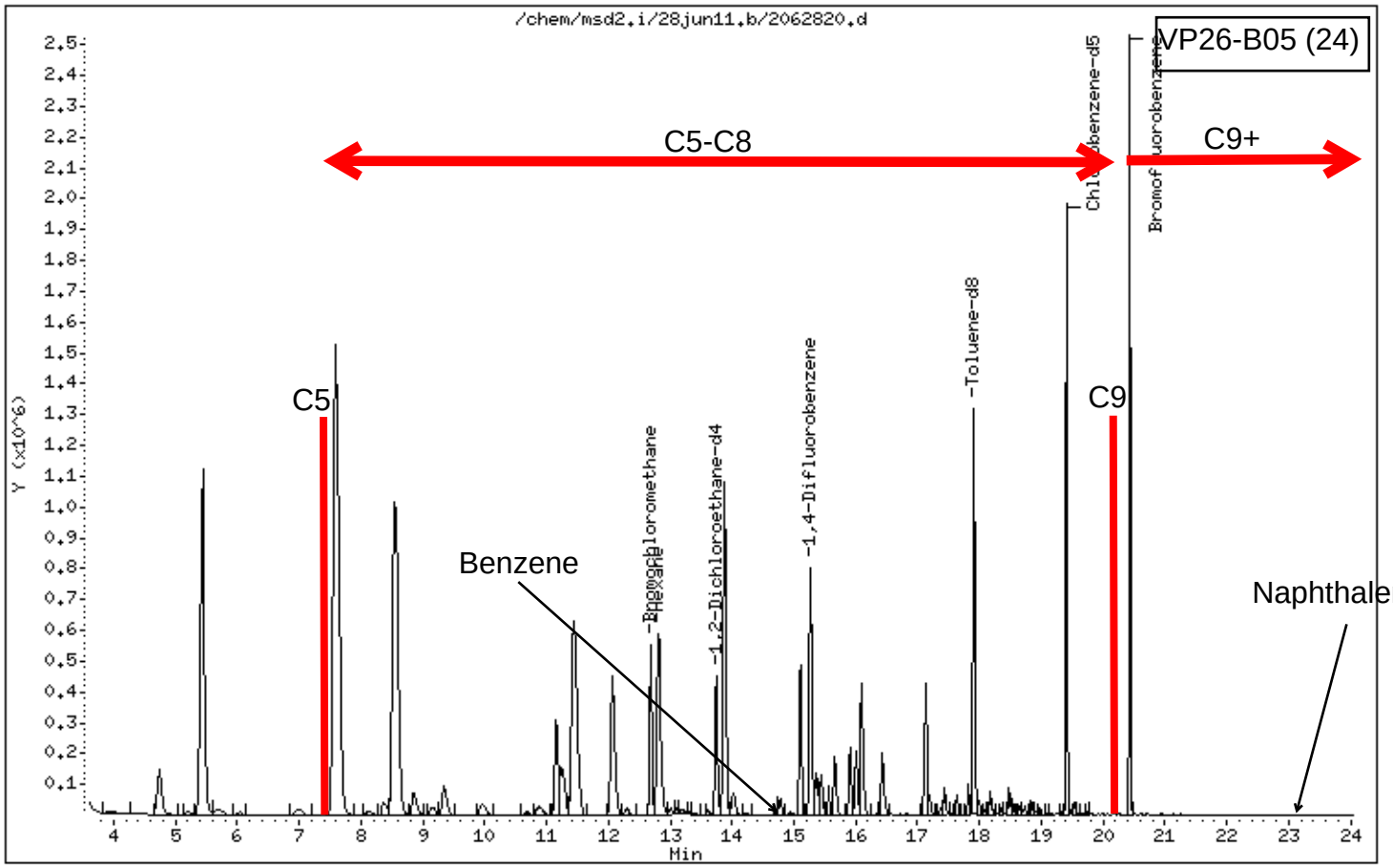
Instrument: msd2.i

Sample Info: 2.0mL #35610

Operator: mtw

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/28jun11.b/2062823.d

Page 1

Date : 29-JUN-2011 10:46

Client ID:

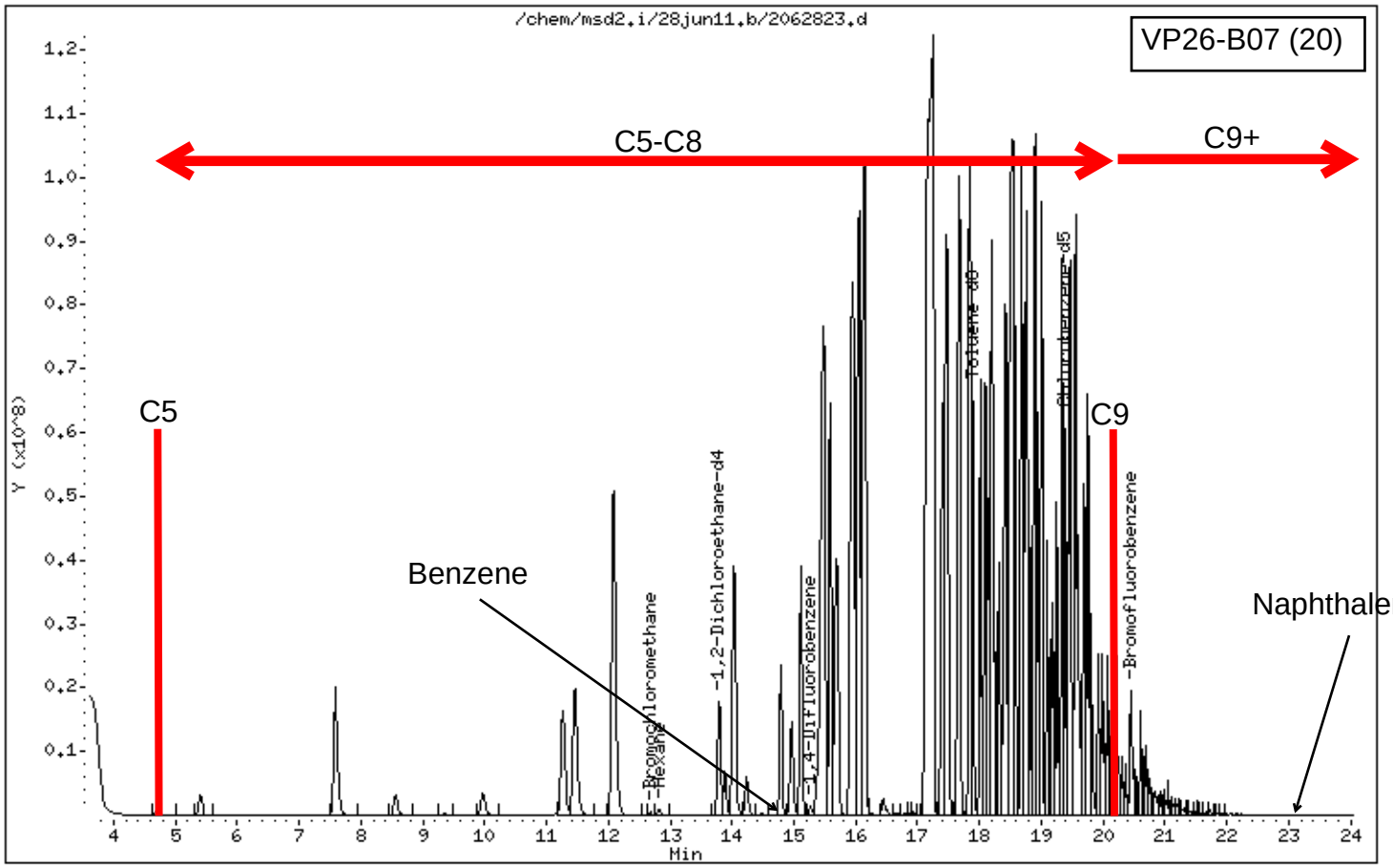
Instrument: msd2.i

Sample Info: 15mL #34177

Operator: mtw

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/28jun11.b/2062822.d

Page 1

Date : 29-JUN-2011 10:17

Client ID:

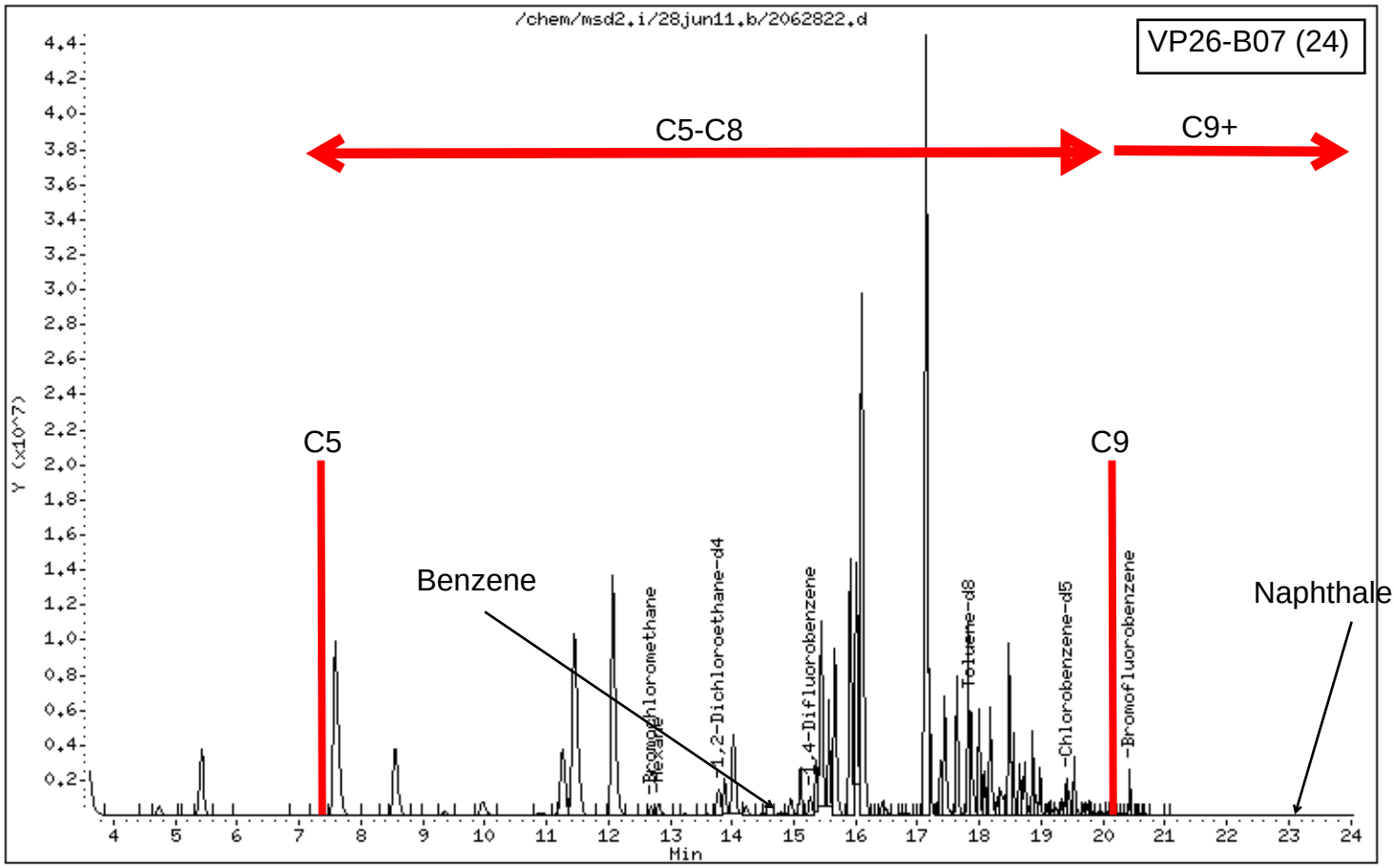
Instrument: msd2.i

Sample Info: 100mL #35682

Operator: mtw

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/19aug11.b/2081916.d

Page 1

Date : 19-AUG-2011 14:38

Client ID:

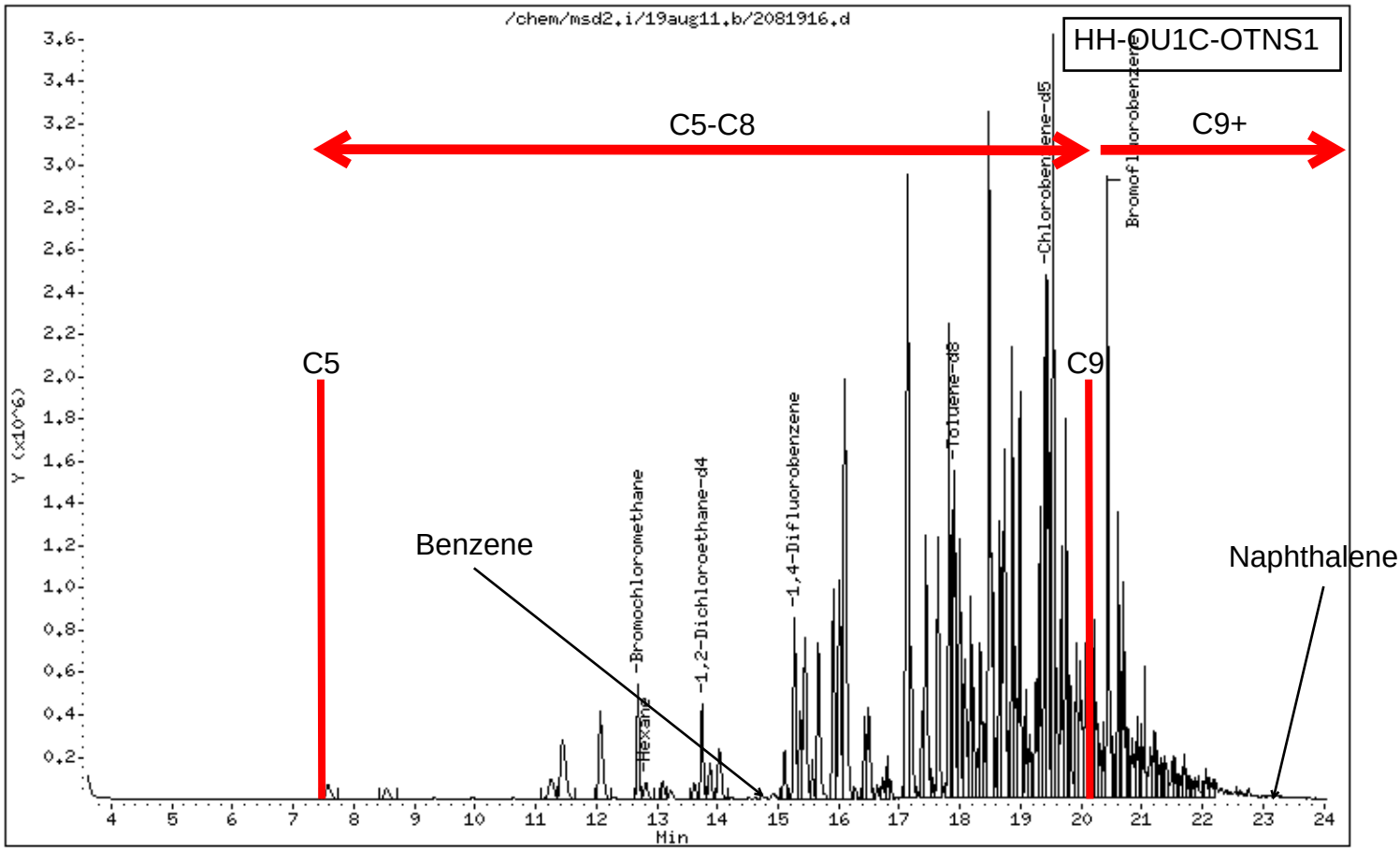
Instrument: msd2.i

Sample Info: 3.0mL #34117

Operator: JP

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/19aug11.b/2081927.d

Page 1

Date : 19-AUG-2011 23:20

Client ID:

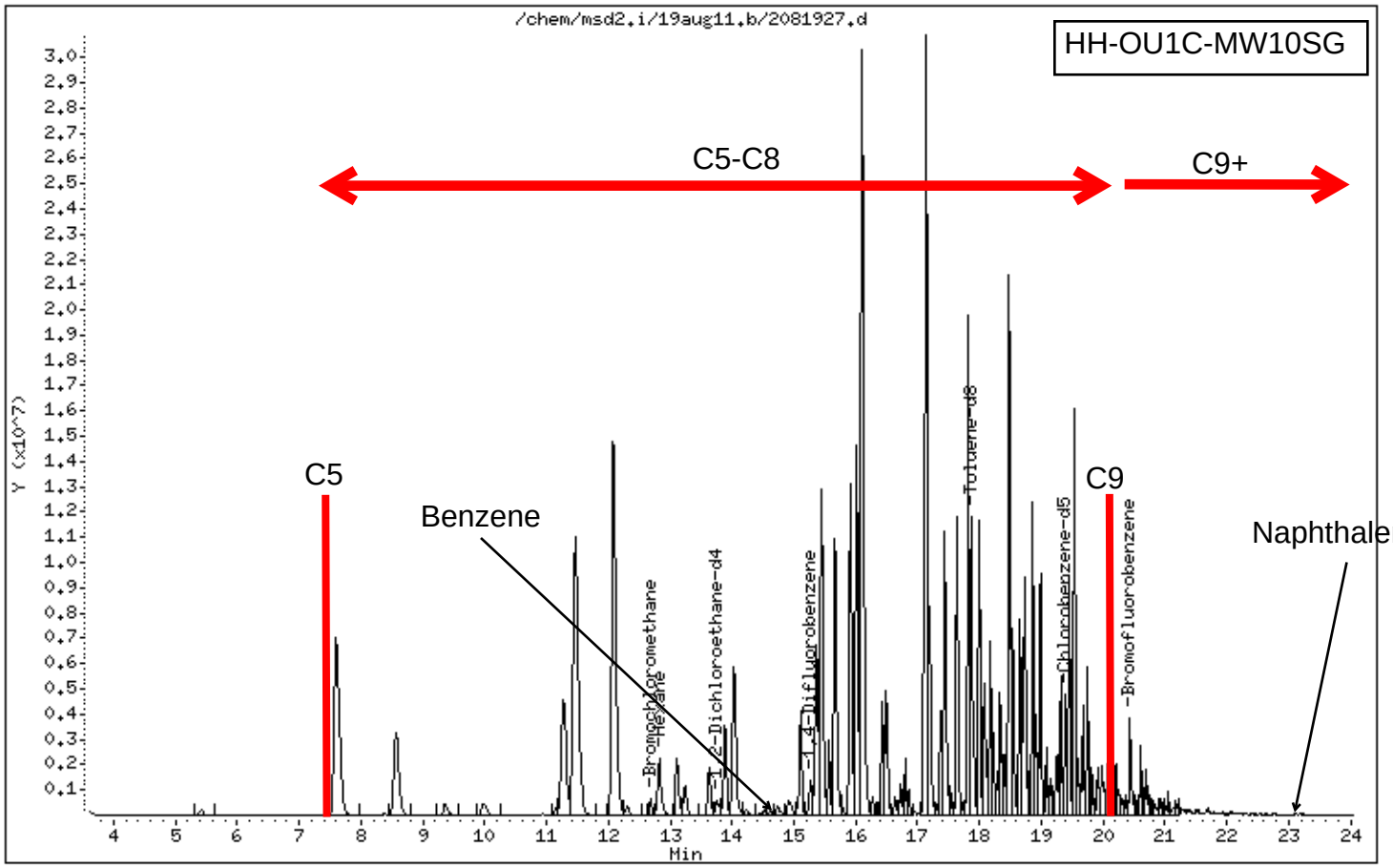
Instrument: msd2.i

Sample Info: 0.3mL #31790

Operator: srs

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/19aug11.b/2081917.d

Page 1

Date : 19-AUG-2011 15:18

Client ID:

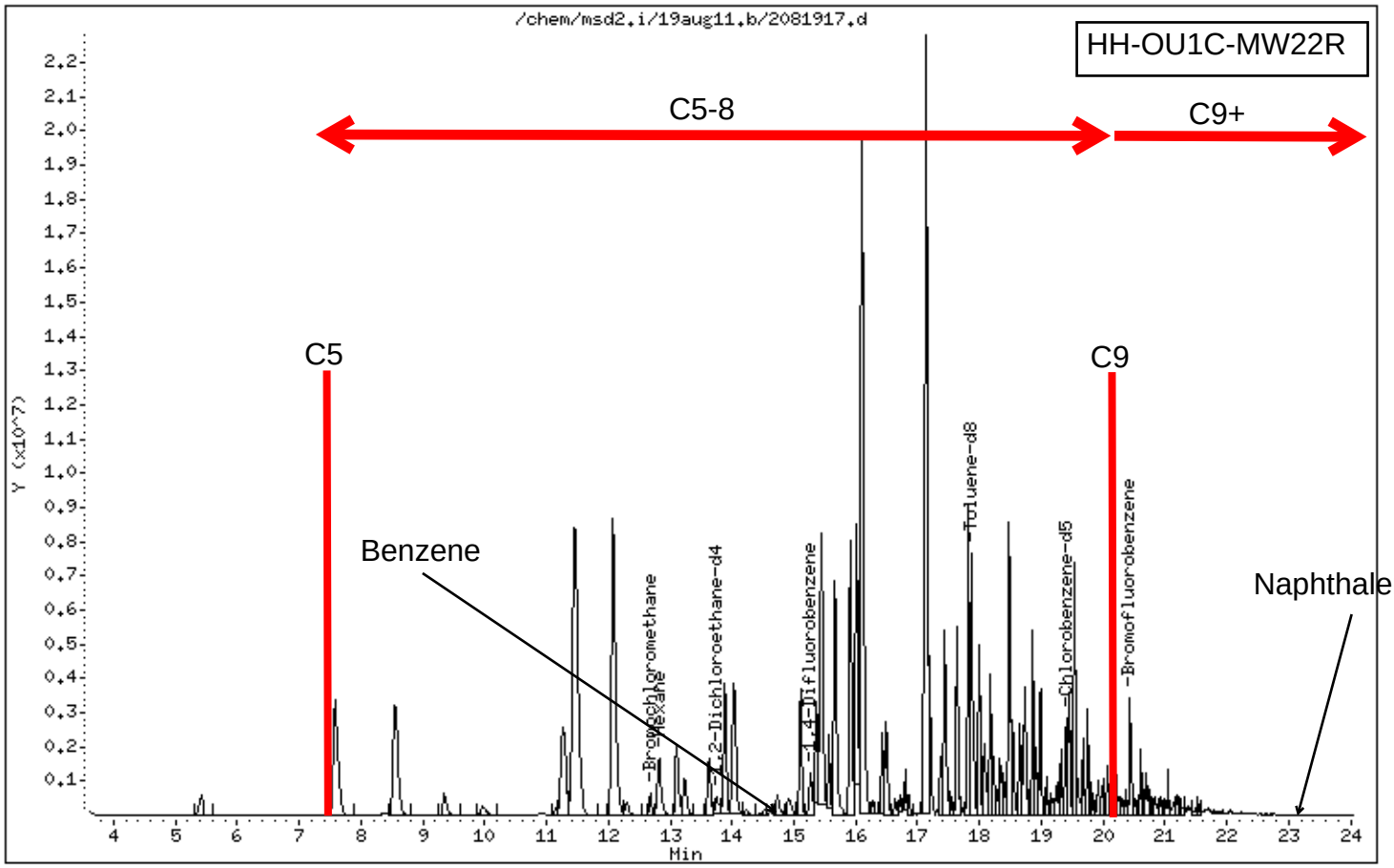
Instrument: msd2.i

Sample Info: 0.5mL #2133

Operator: JP

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/12oct11.b/2101216.d

Page 1

Date : 12-OCT-2011 16:09

Client ID:

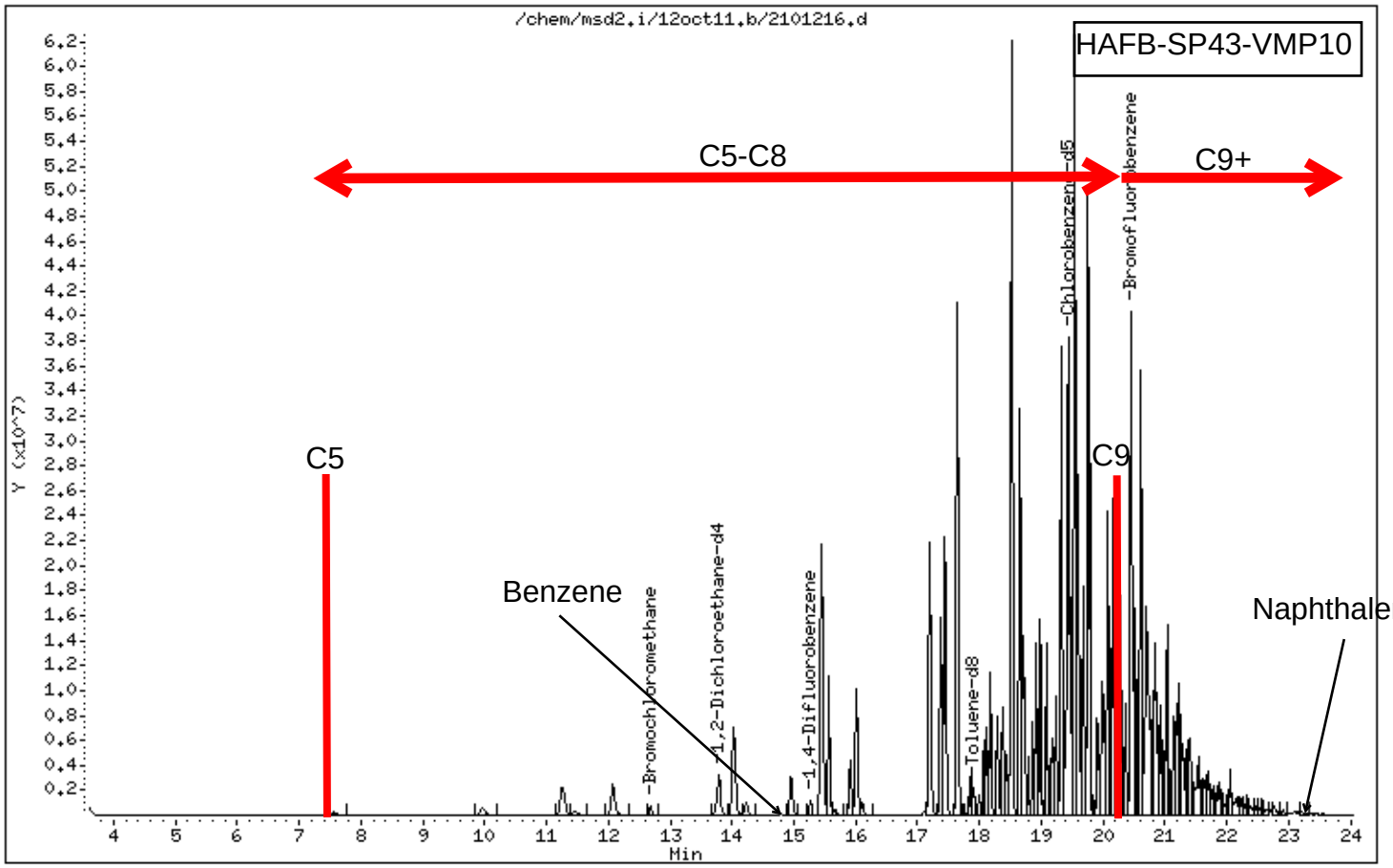
Instrument: msd2.i

Sample Info: 2.0ml #37672

Operator: dfm

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/12oct11.b/2101218.d

Page 1

Date : 12-OCT-2011 17:31

Client ID:

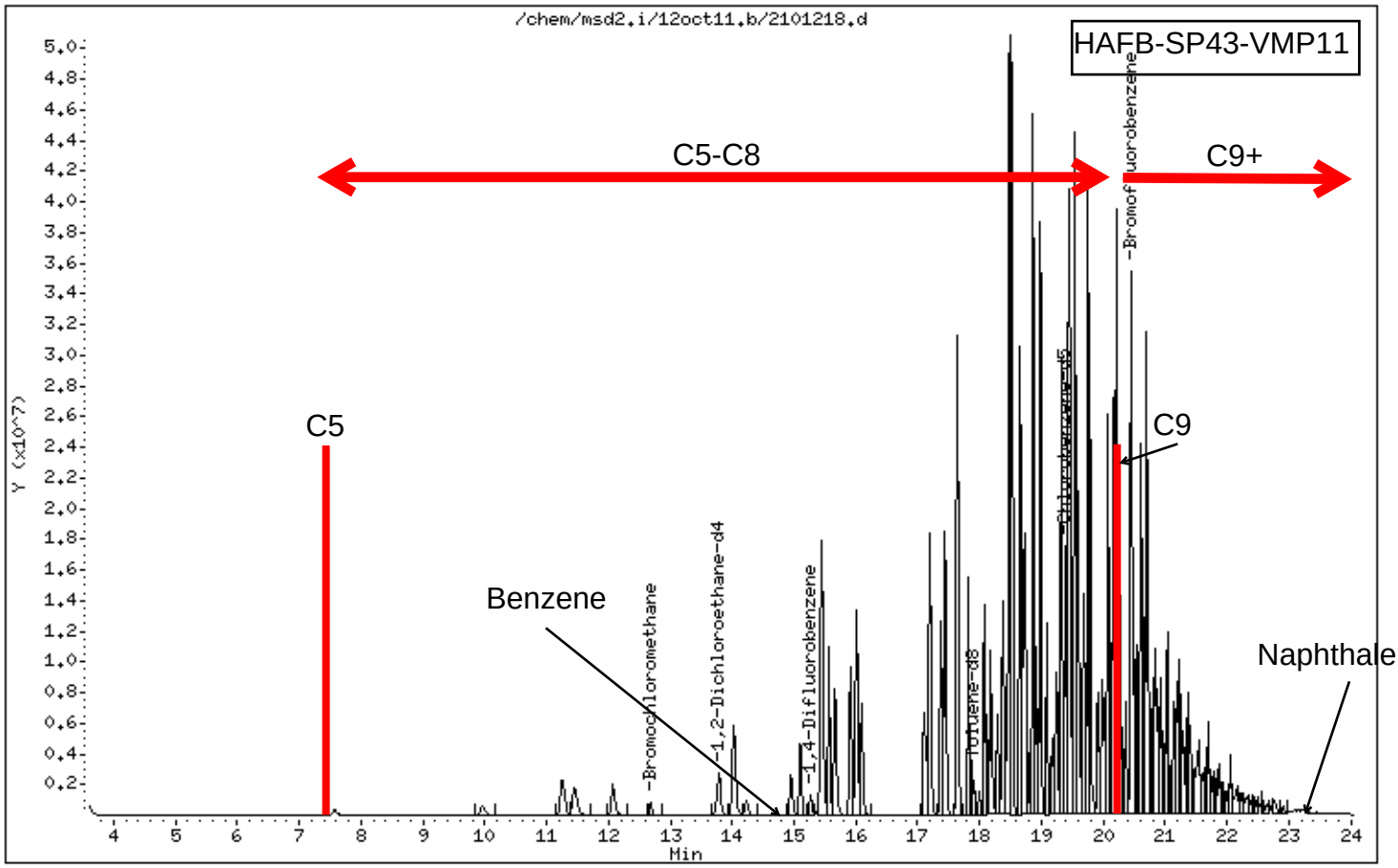
Instrument: msd2.i

Sample Info: 2.0ml #36517

Operator: EA

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/12oct11.b/2101222.d

Page 1

Date : 12-OCT-2011 20:39

Client ID:

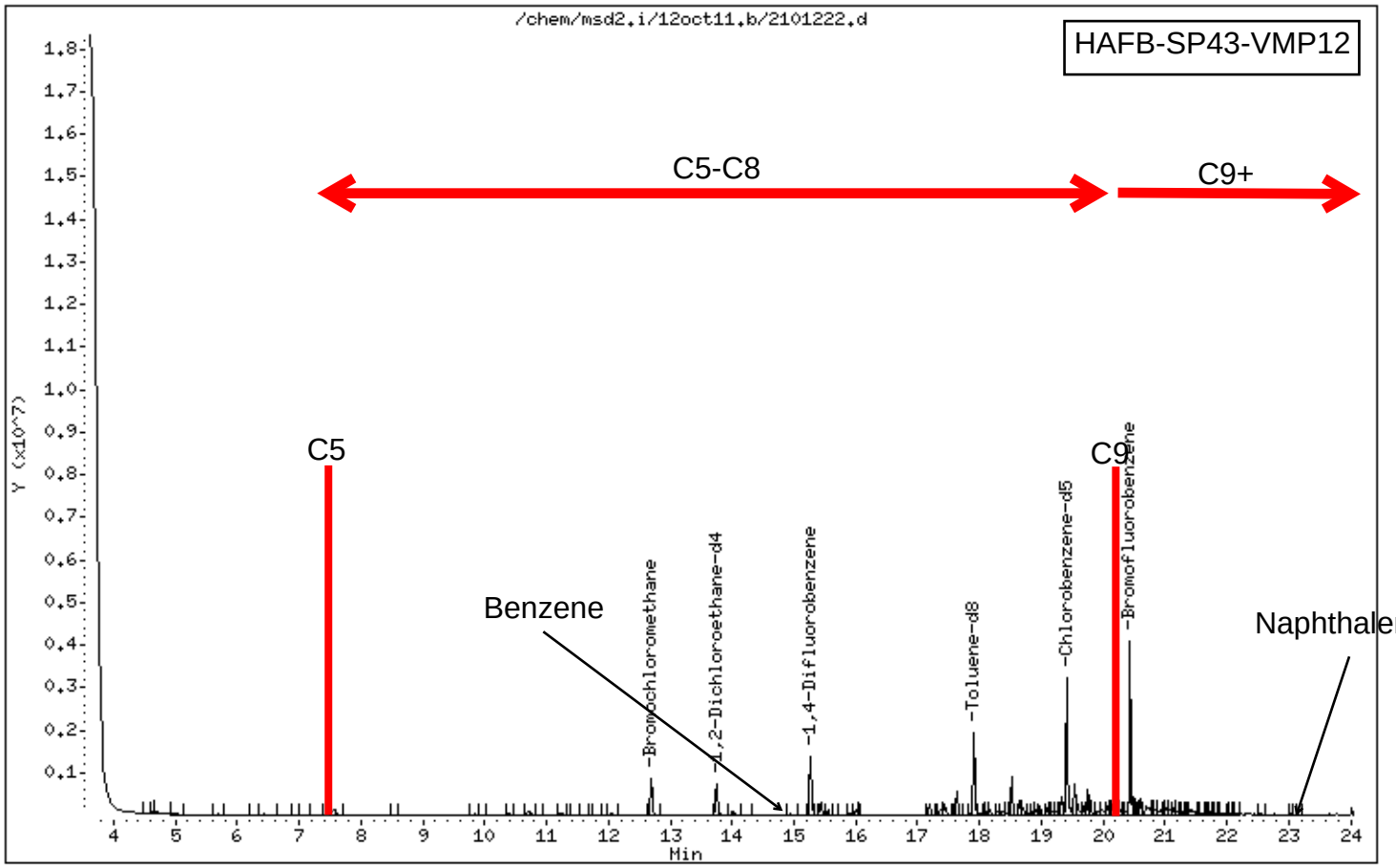
Instrument: msd2.i

Sample Info: 200ML #34179

Operator: EA

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/12oct11.b/2101219.d

Page 1

Date : 12-OCT-2011 18:13

Client ID:

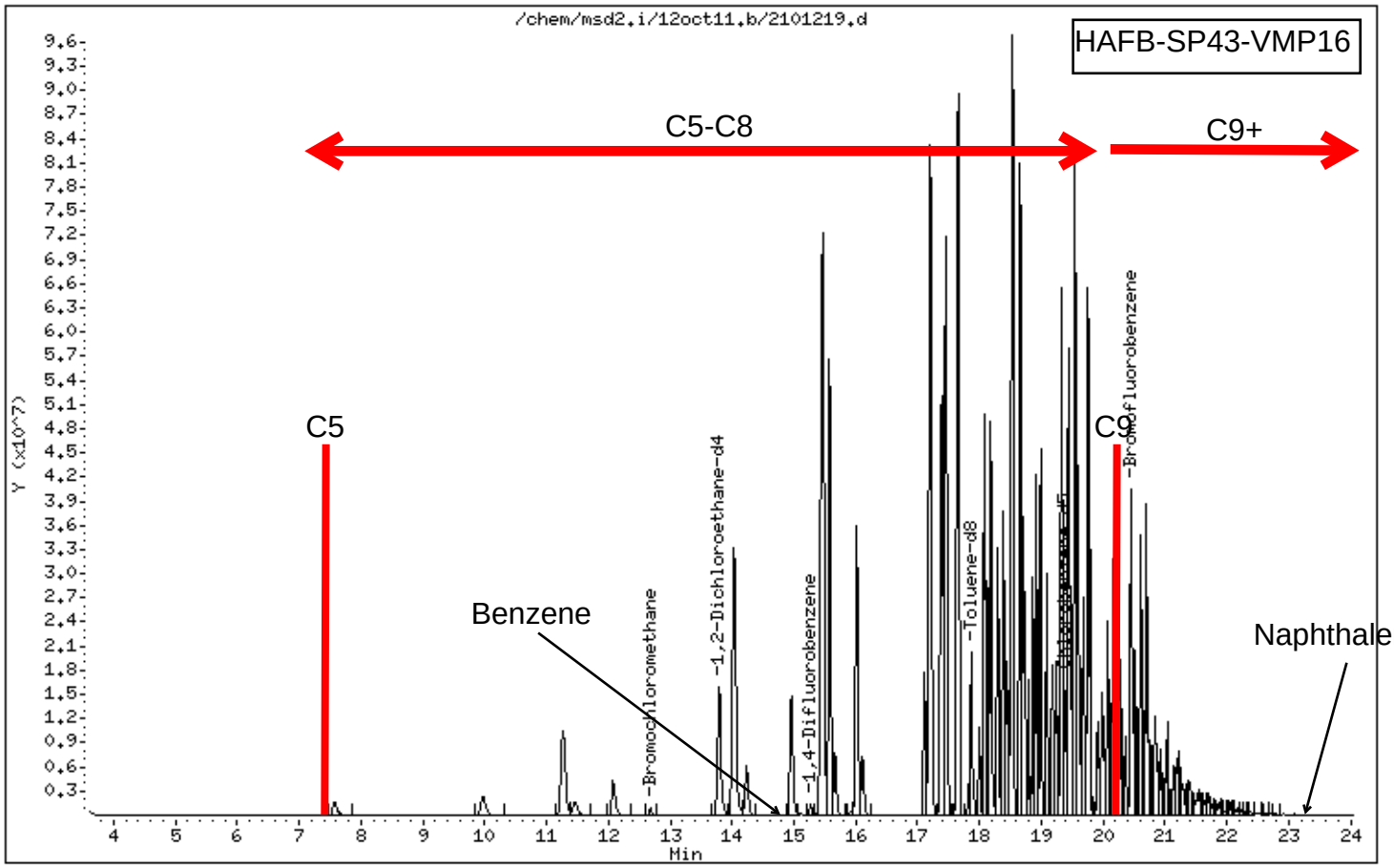
Instrument: msd2.i

Sample Info: 2.0ml #3011

Operator: EA

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/12oct11.b/2101214.d

Page 1

Date : 12-OCT-2011 13:43

Client ID:

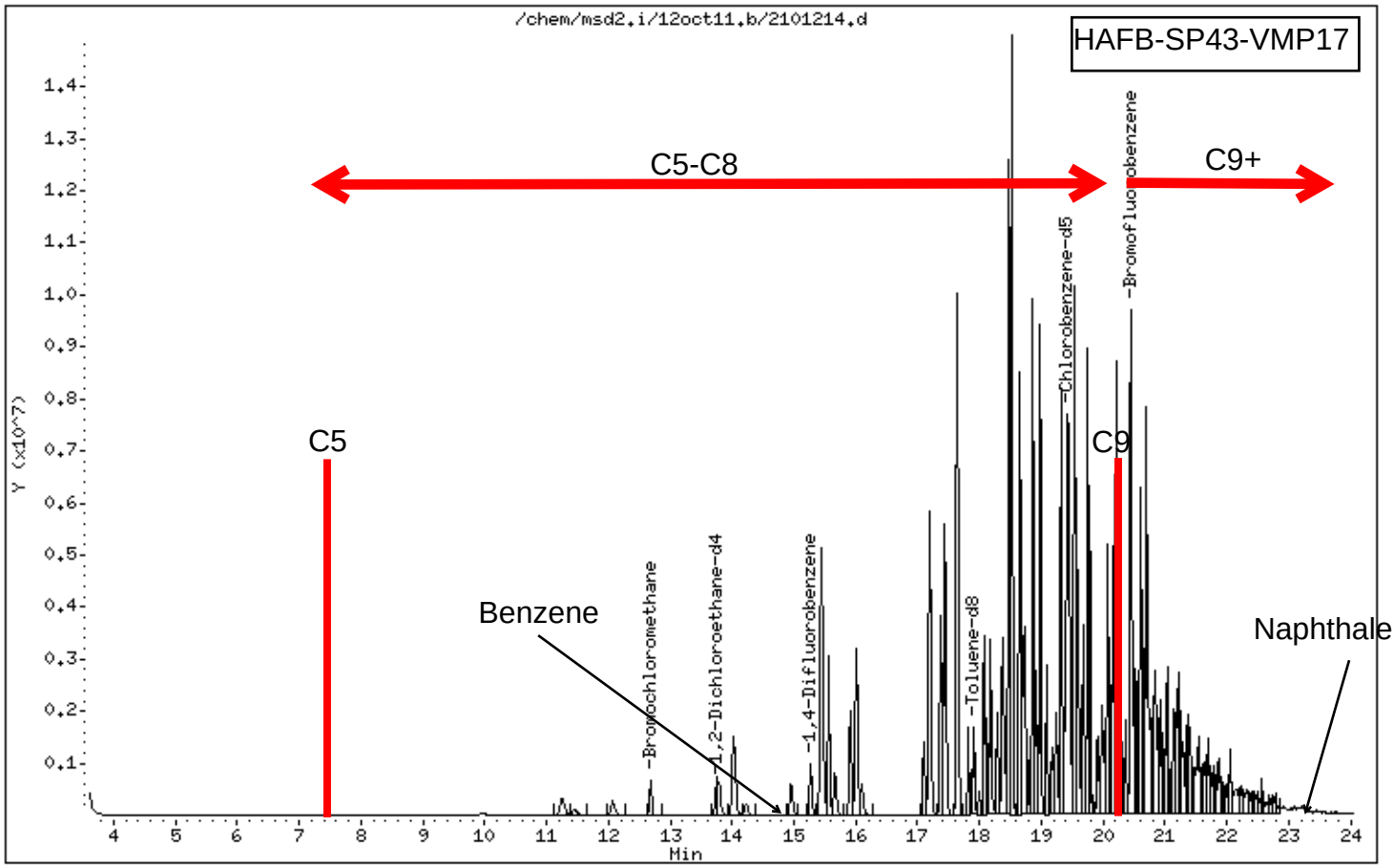
Instrument: msd2.i

Sample Info: 2.0ml #31799

Operator: dfm

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/21jul11.b/2072127.d

Page 1

Date : 21-JUL-2011 21:52

Client ID:

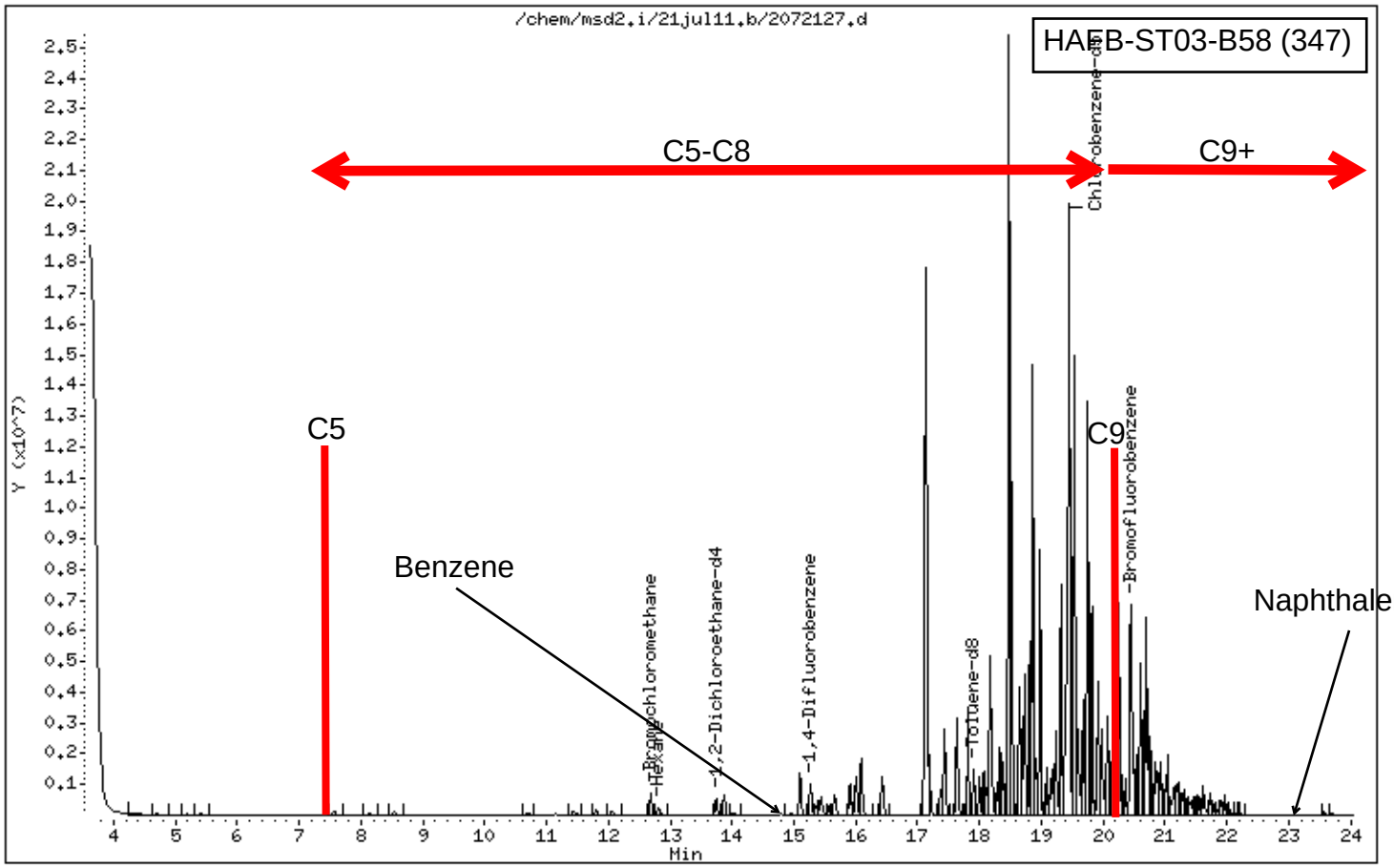
Instrument: msd2.i

Sample Info: 50mL #1354

Operator: dfm

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/21jul11.b/2072128.d

Page 1

Date : 21-JUL-2011 22:21

Client ID:

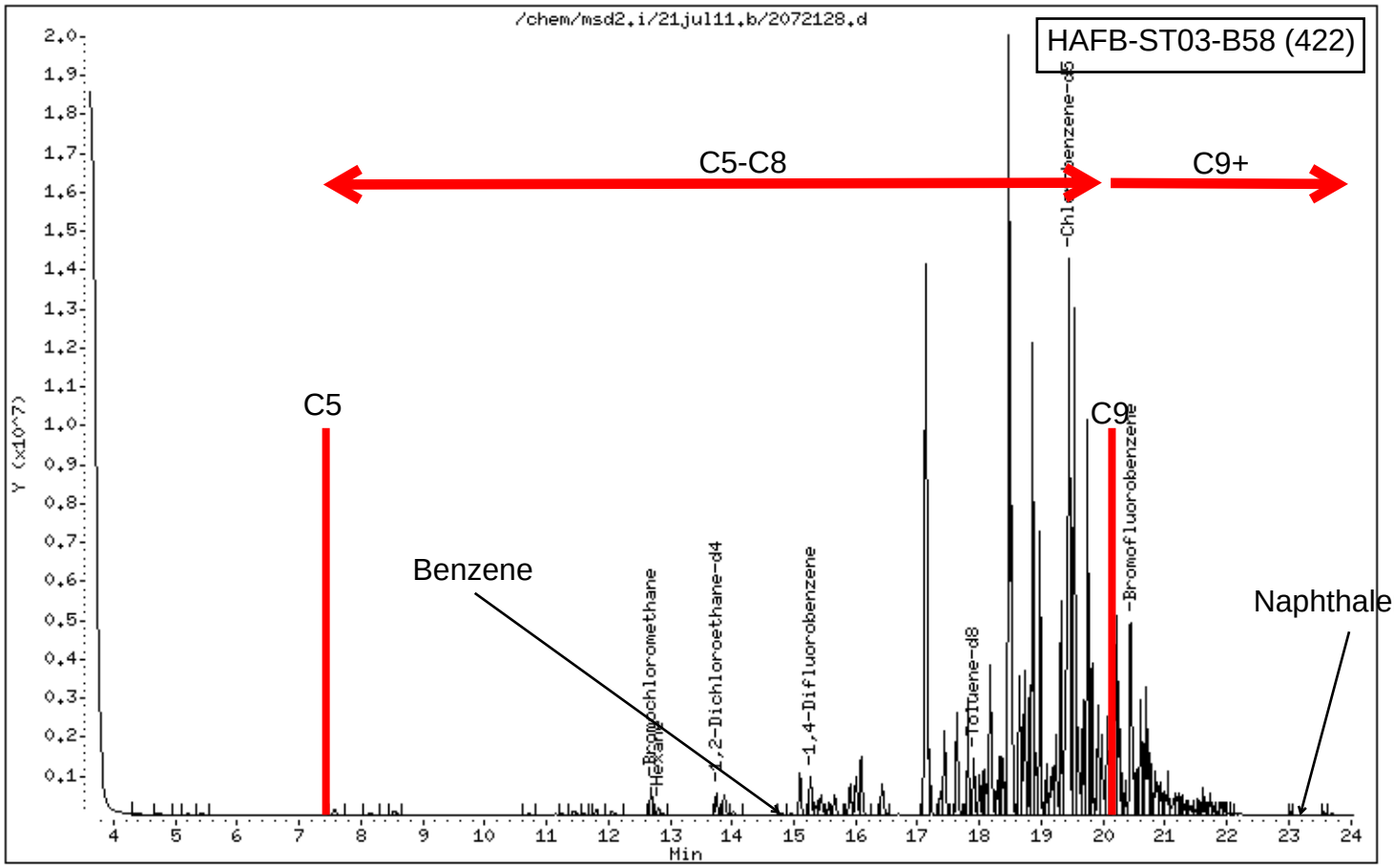
Instrument: msd2.i

Sample Info: 75mL #3036

Operator: dfm

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/21jul11.b/2072125.d

Page 1

Date : 21-JUL-2011 20:53

Client ID:

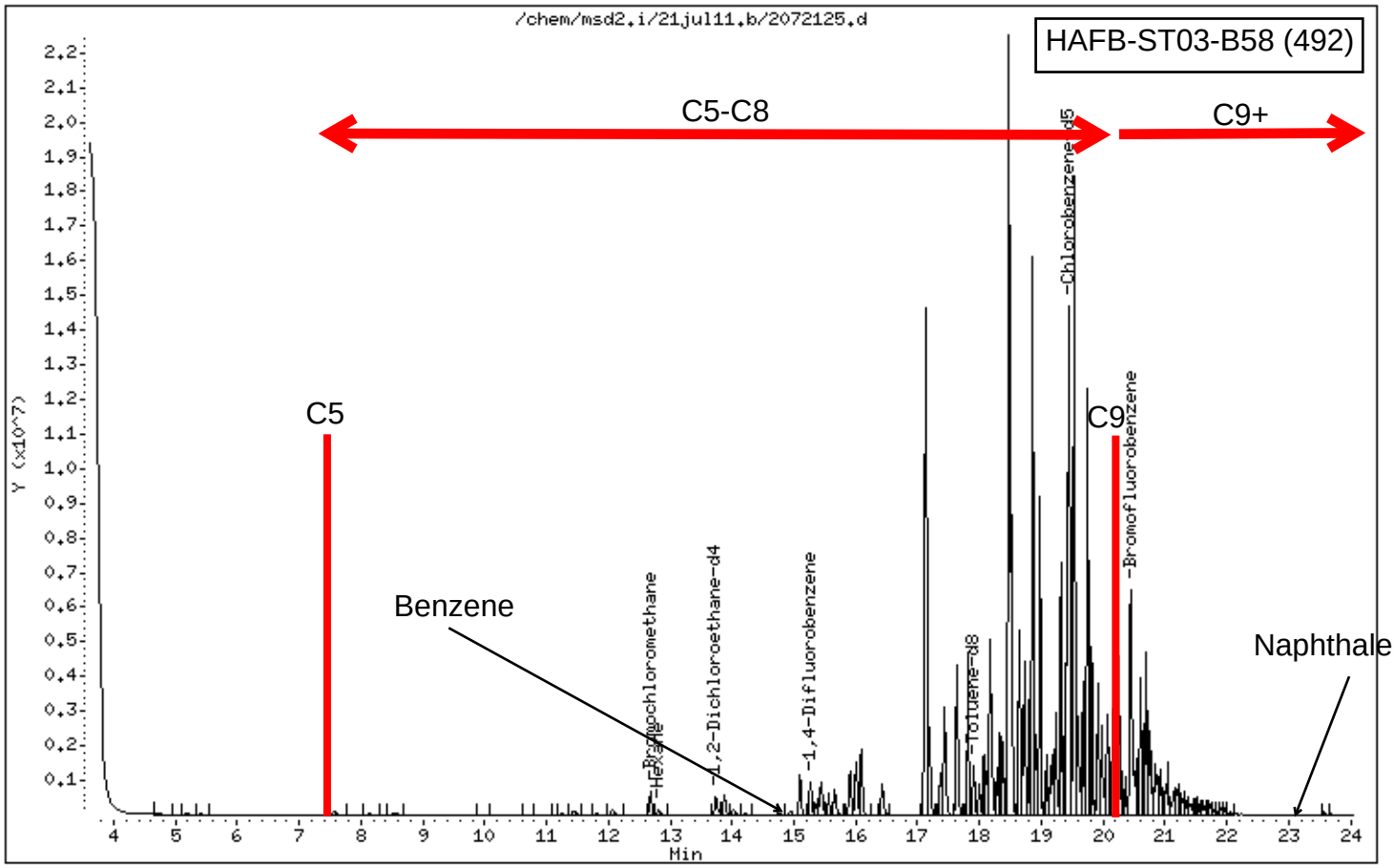
Instrument: msd2.i

Sample Info: 15mL #35667

Operator: dfm

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/21jul11.b/2072126.d

Page 1

Date : 21-JUL-2011 21:21

Client ID:

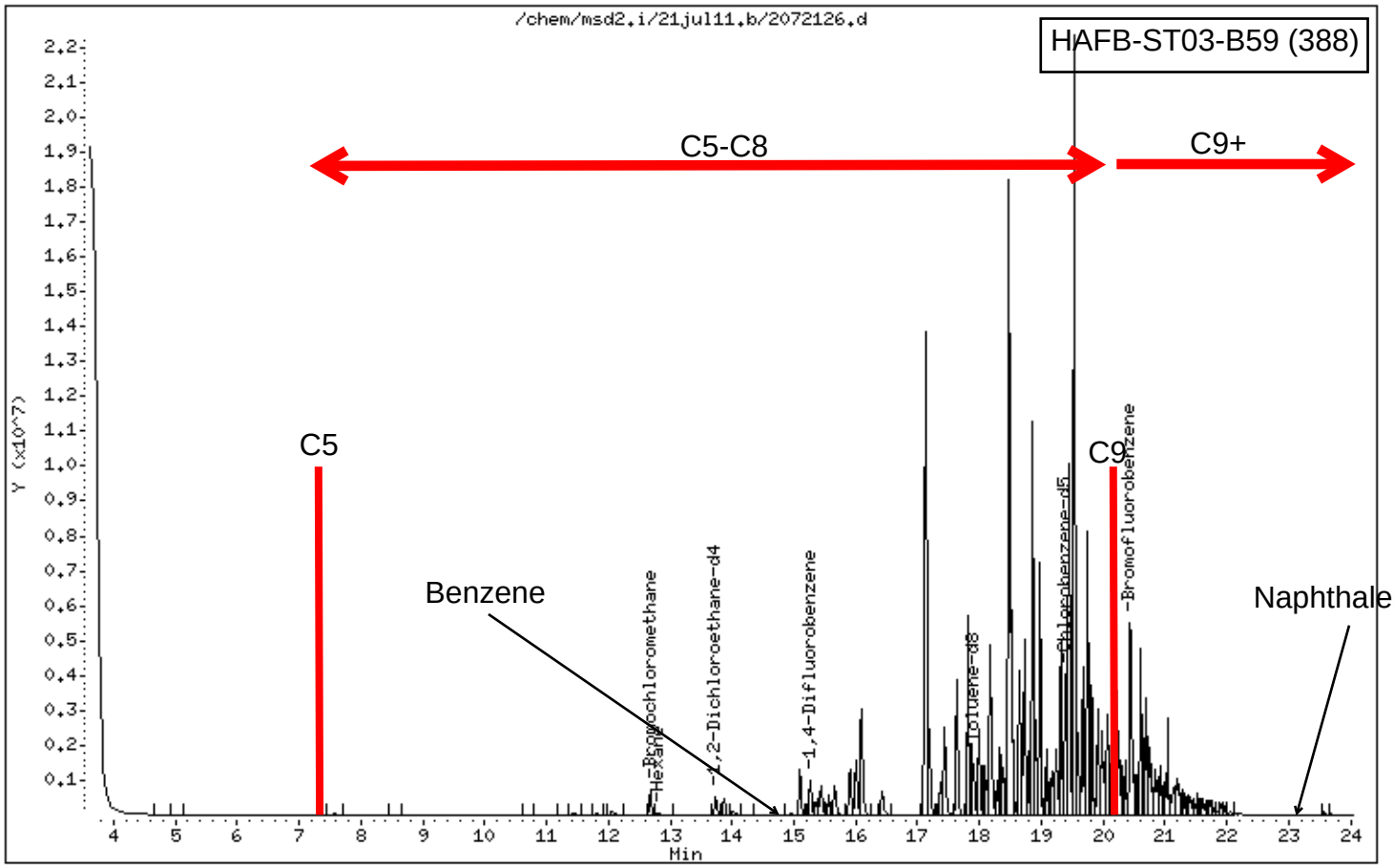
Instrument: msd2.i

Sample Info: 15mL #34669

Operator: dfm

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/02jun11.b/2060214.d

Page 1

Date : 02-JUN-2011 14:42

Client ID:

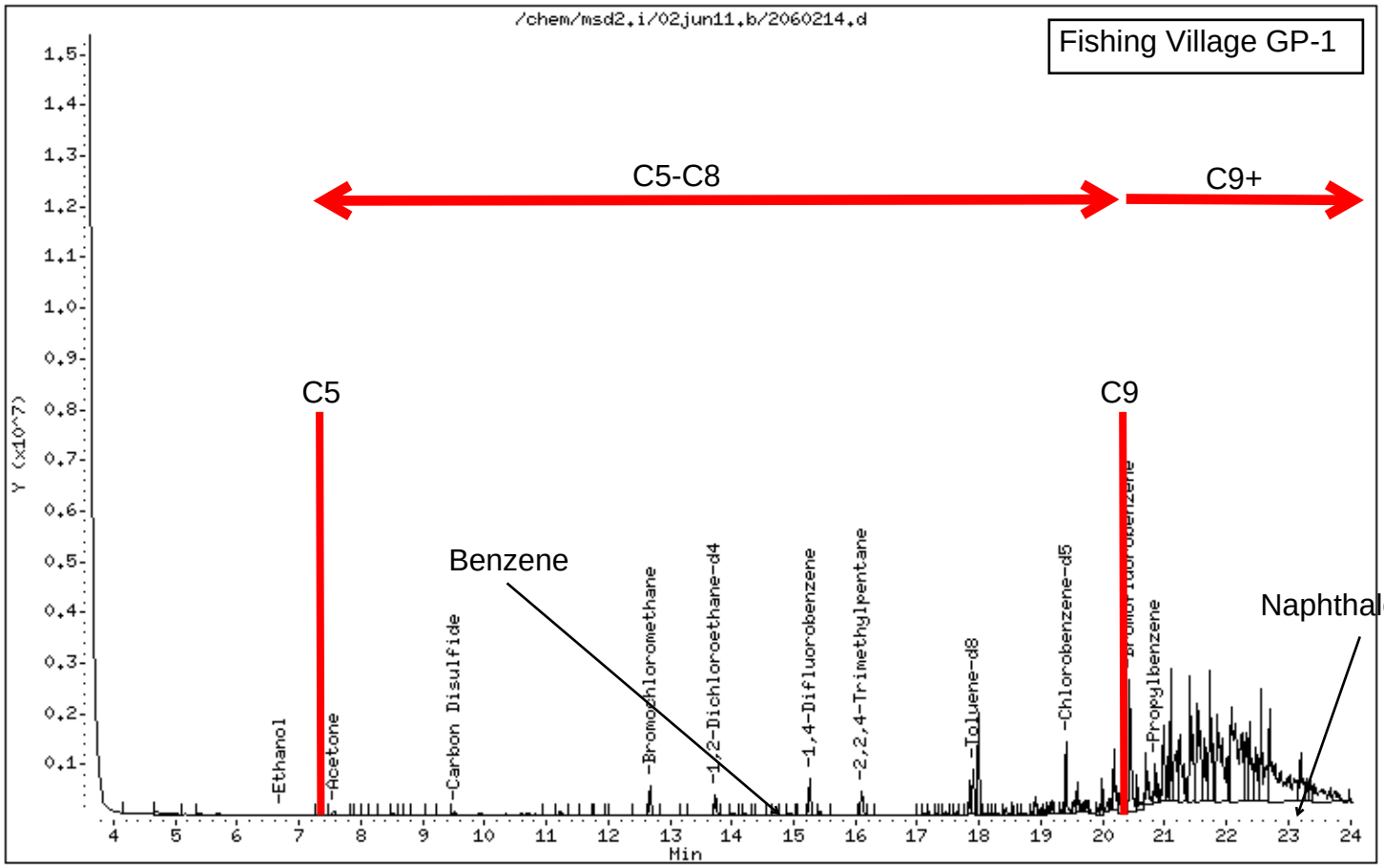
Instrument: msd2.i

Sample Info: 35ml #34100

Operator: JP

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/02jun11.b/2060217.d

Page 1

Date : 02-JUN-2011 16:25

Client ID:

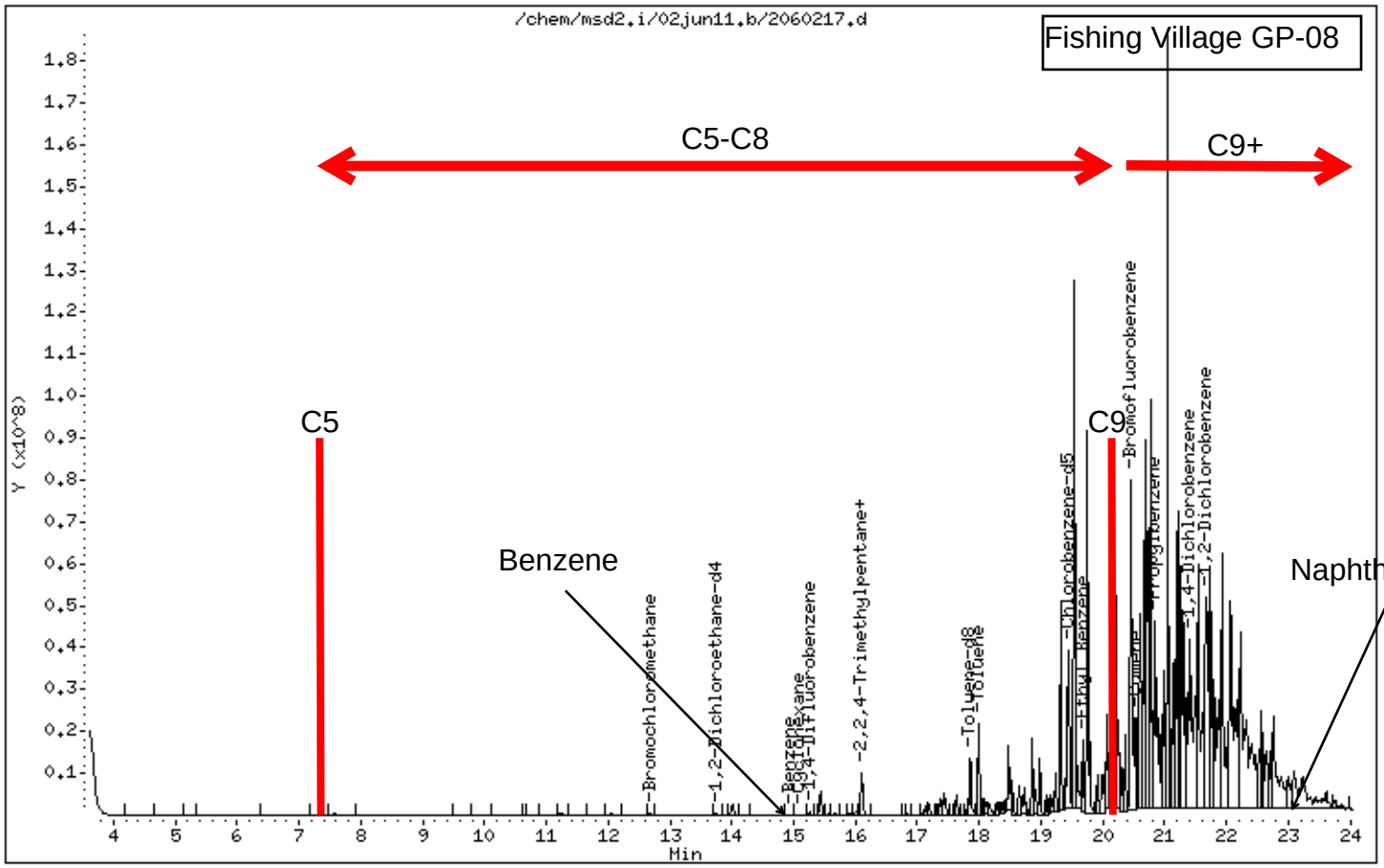
Instrument: msd2.i

Sample Info: 23ml #23832

Operator: JP

Column phase: RTx-624

Column diameter: 0.32



Data File: /chem/msd2.i/02jun11.b/2060219.d

Page 1

Date : 02-JUN-2011 17:45

Client ID:

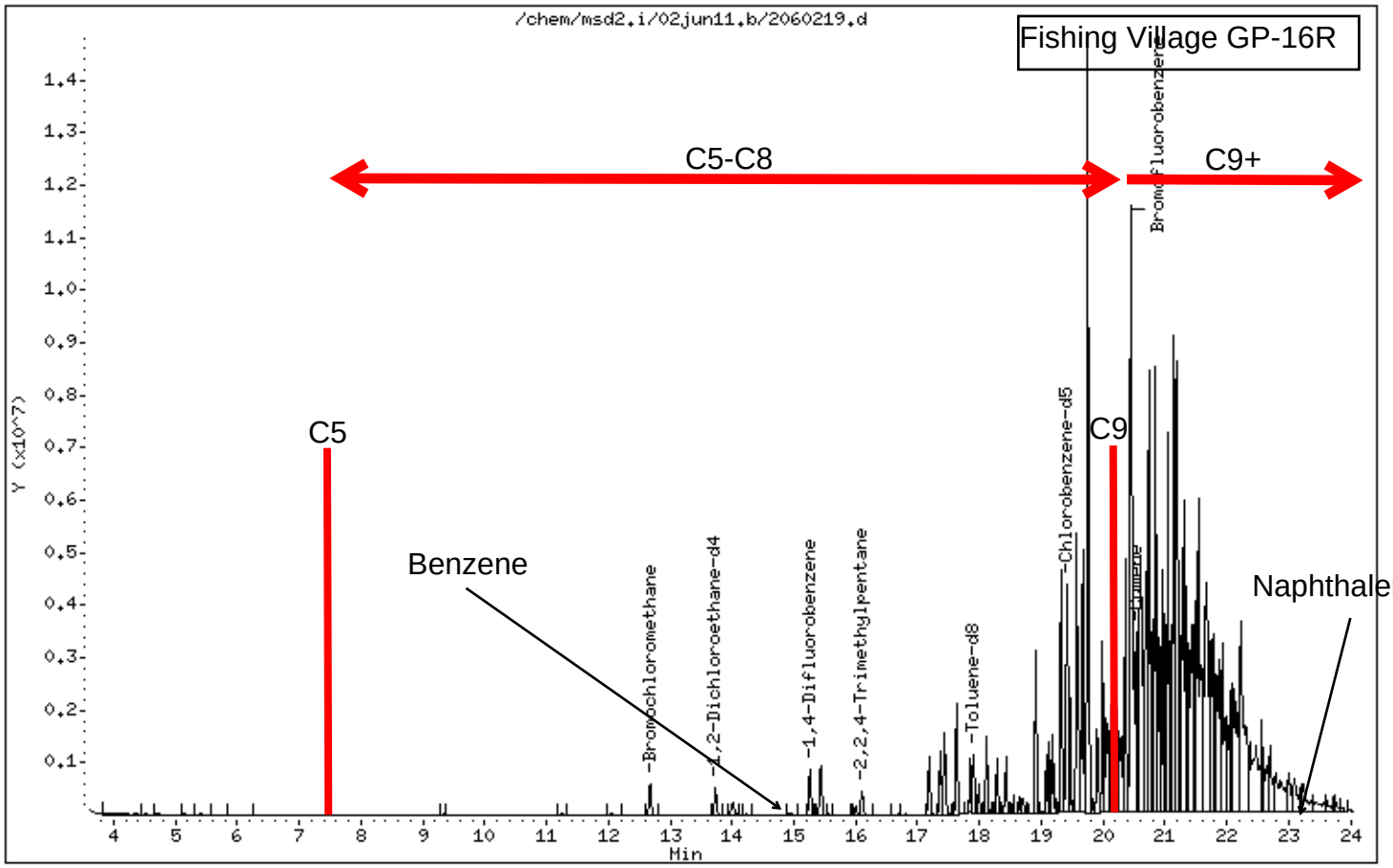
Instrument: msd2.i

Sample Info: 2.0ml #33710

Operator: ea

Column phase: RTx-624

Column diameter: 0.32



TO-17 Chromatograms for Key Samples (carbon ranges not marked)

Data File: /chem/msdj.i/28oct11.b/j102821.d
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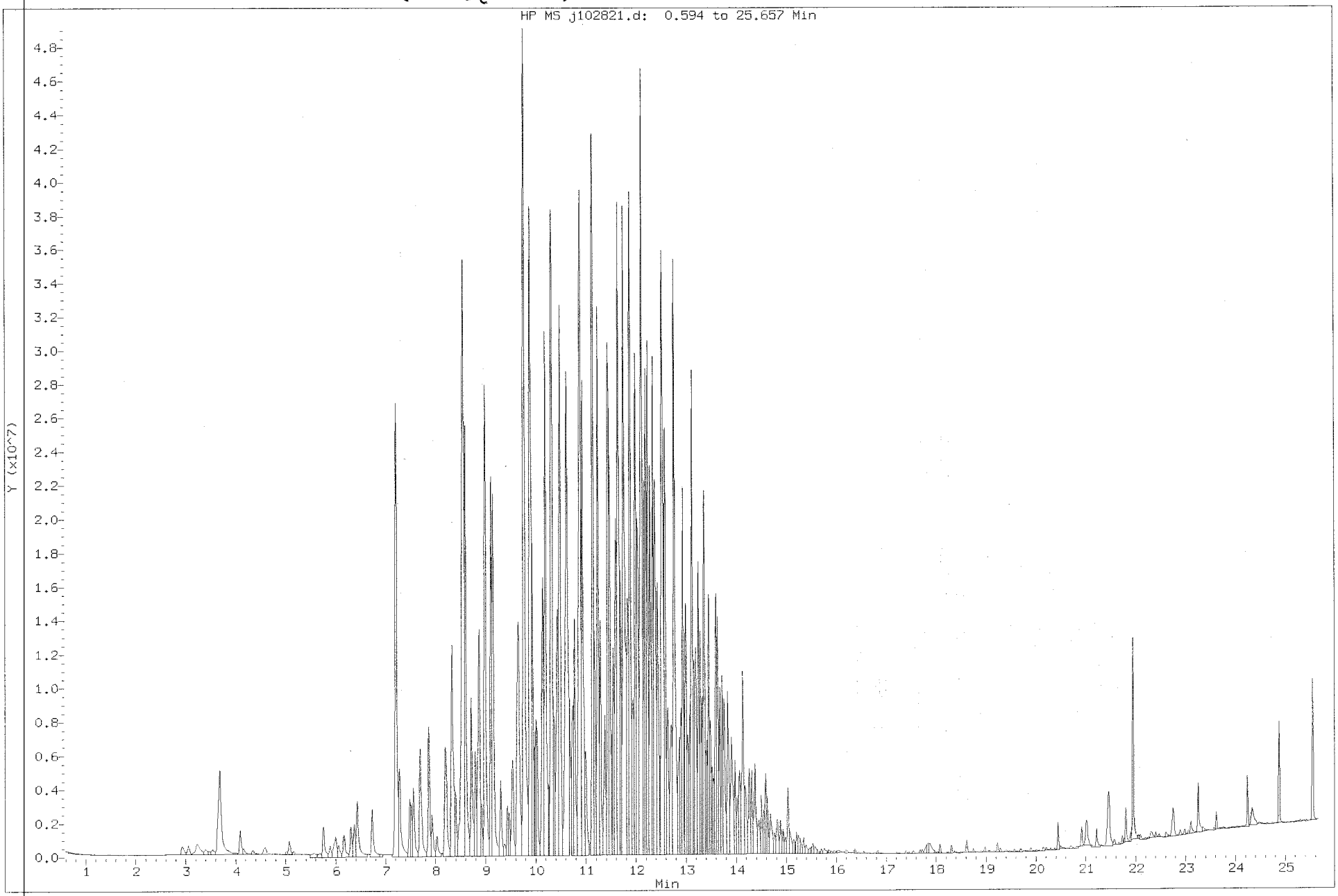
Instrument: msdj.i
Client Sample ID: HAFB-ST03-B58(4ZZ)(T017A)



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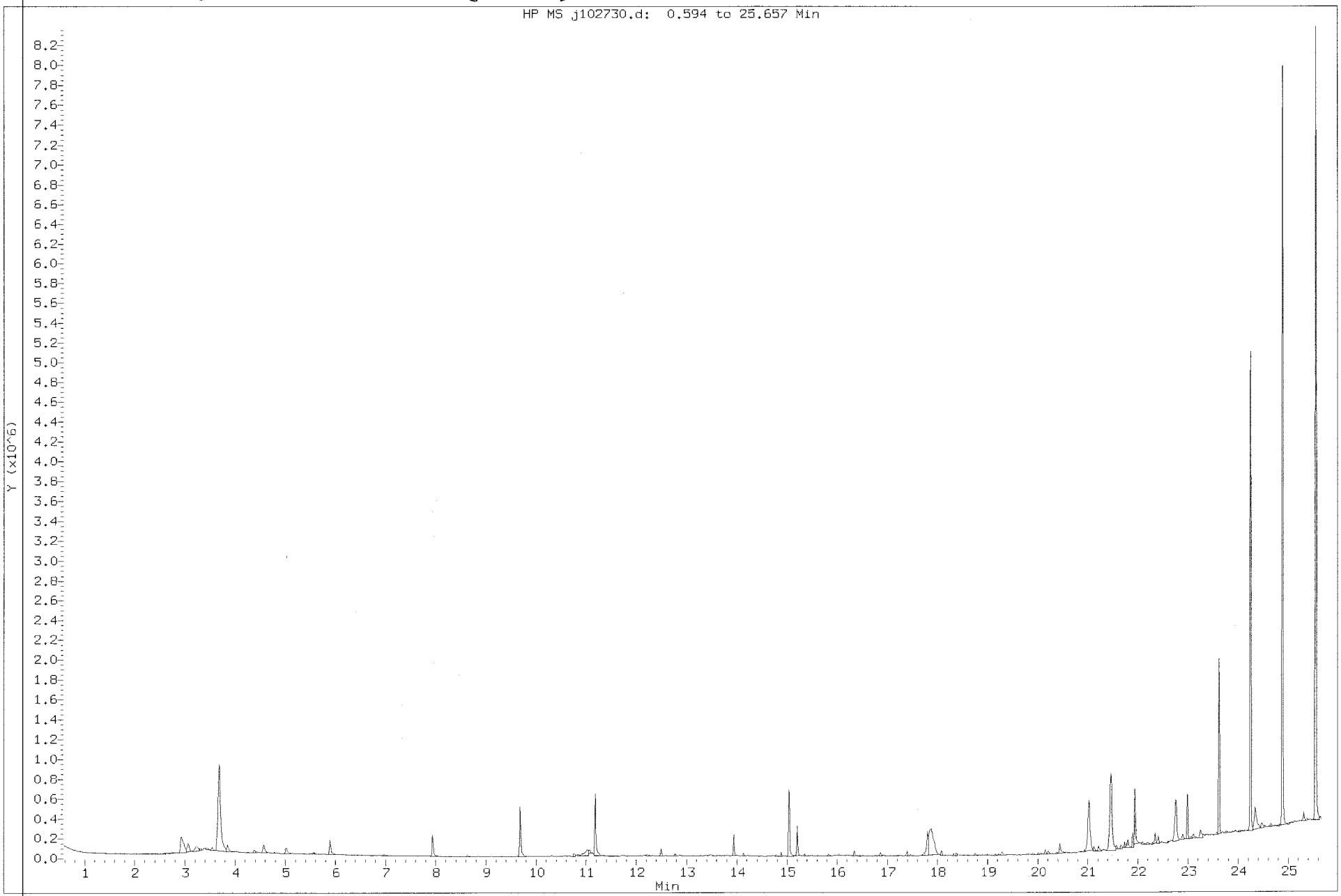
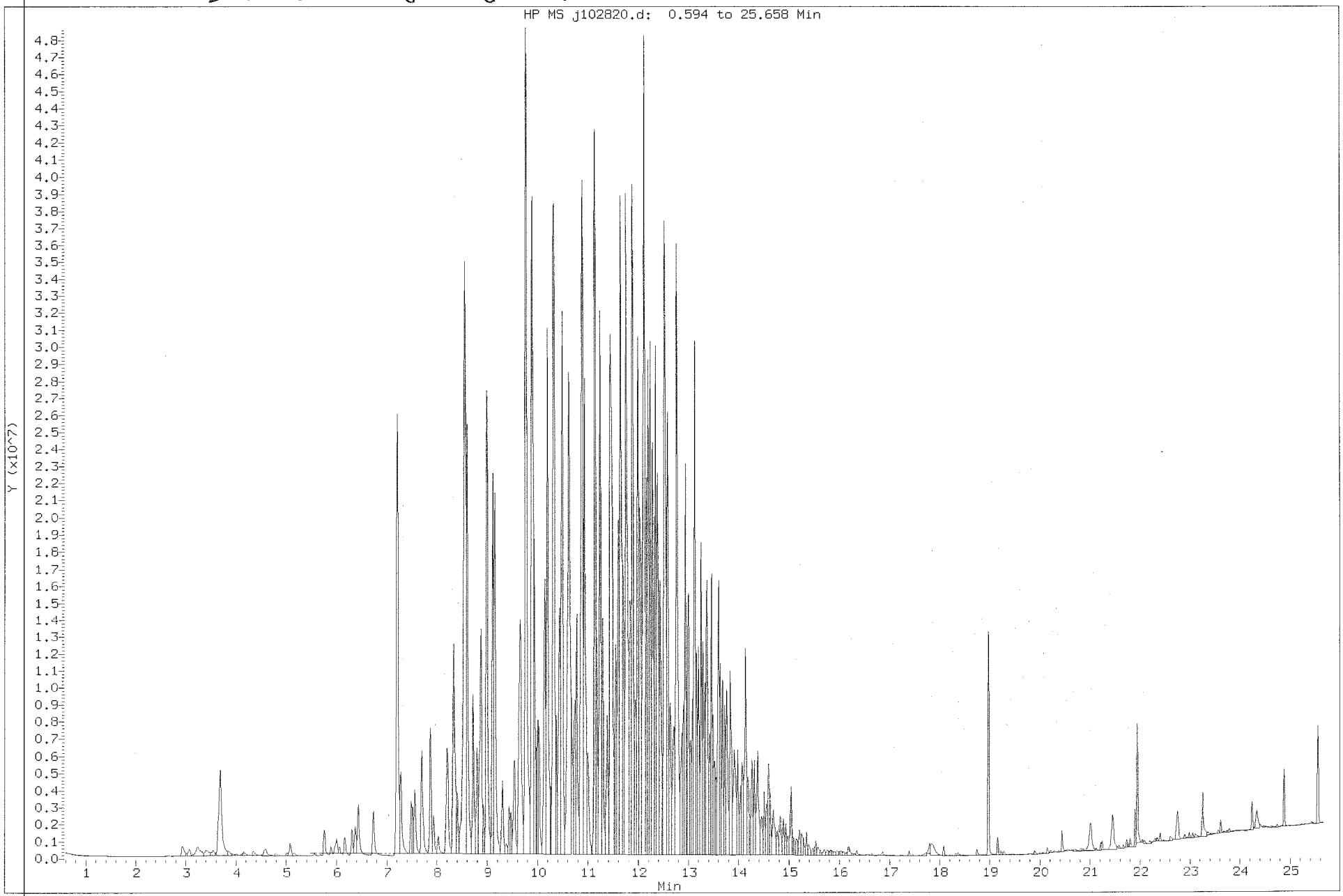
Injection Date: 28-OCT-2011 03:23
Instrument: msdj.i
Client Sample ID: HAFB-ST03-B58 (HZZ)(T017B)



Data File: /chem/msdj.i/28oct11.b/j102820.d
Injection Date: 28-OCT-2011 20:26
Instrument: msdj.i
Client Sample ID: HAFB-ST03-B56 (492) (T017A)



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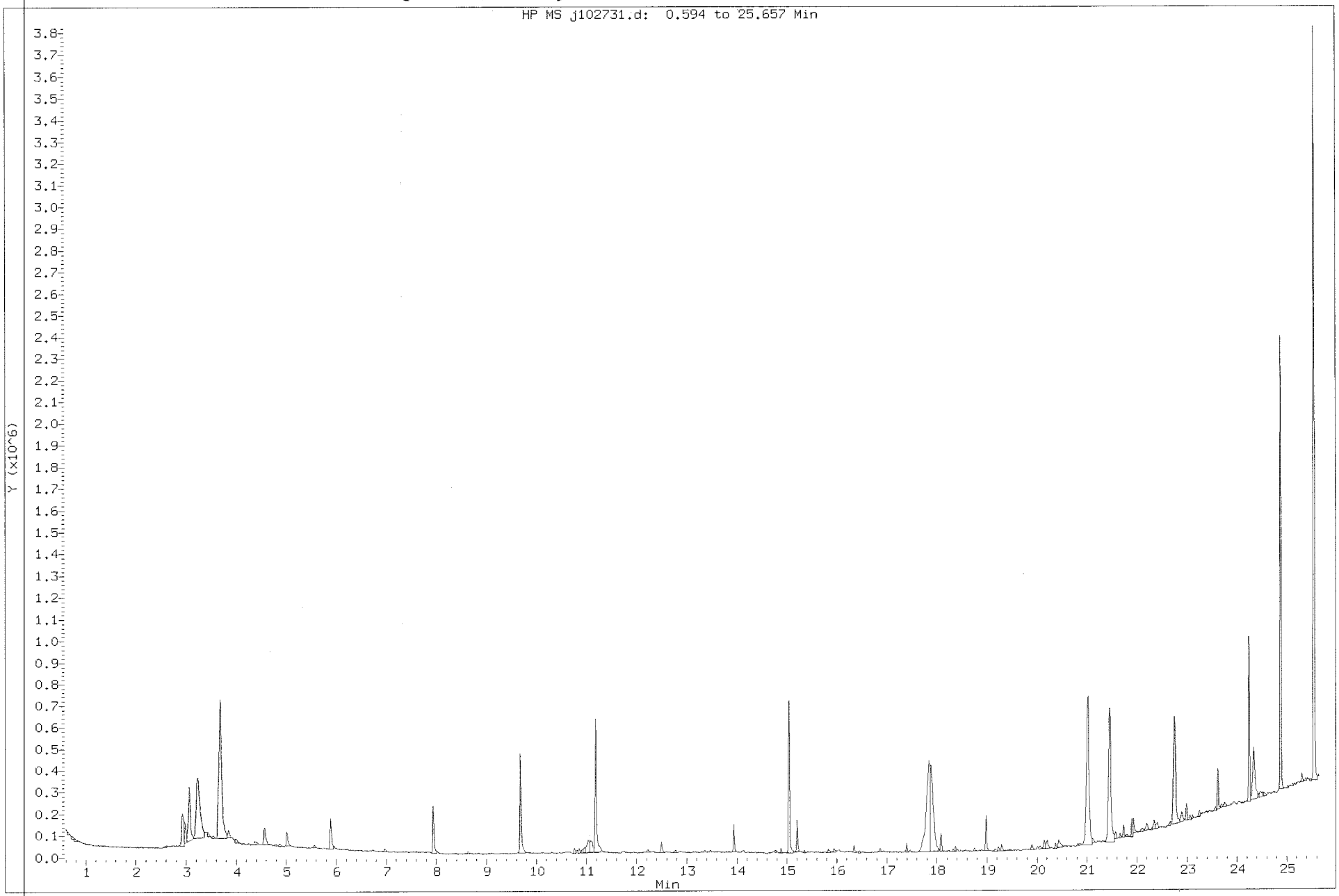
Instrument: msdj.i
Client Sample ID: HAFB-ST03-B58 (492) (T017B)



Data File: /chem/msdj.i/28oct11.b/j102819.d
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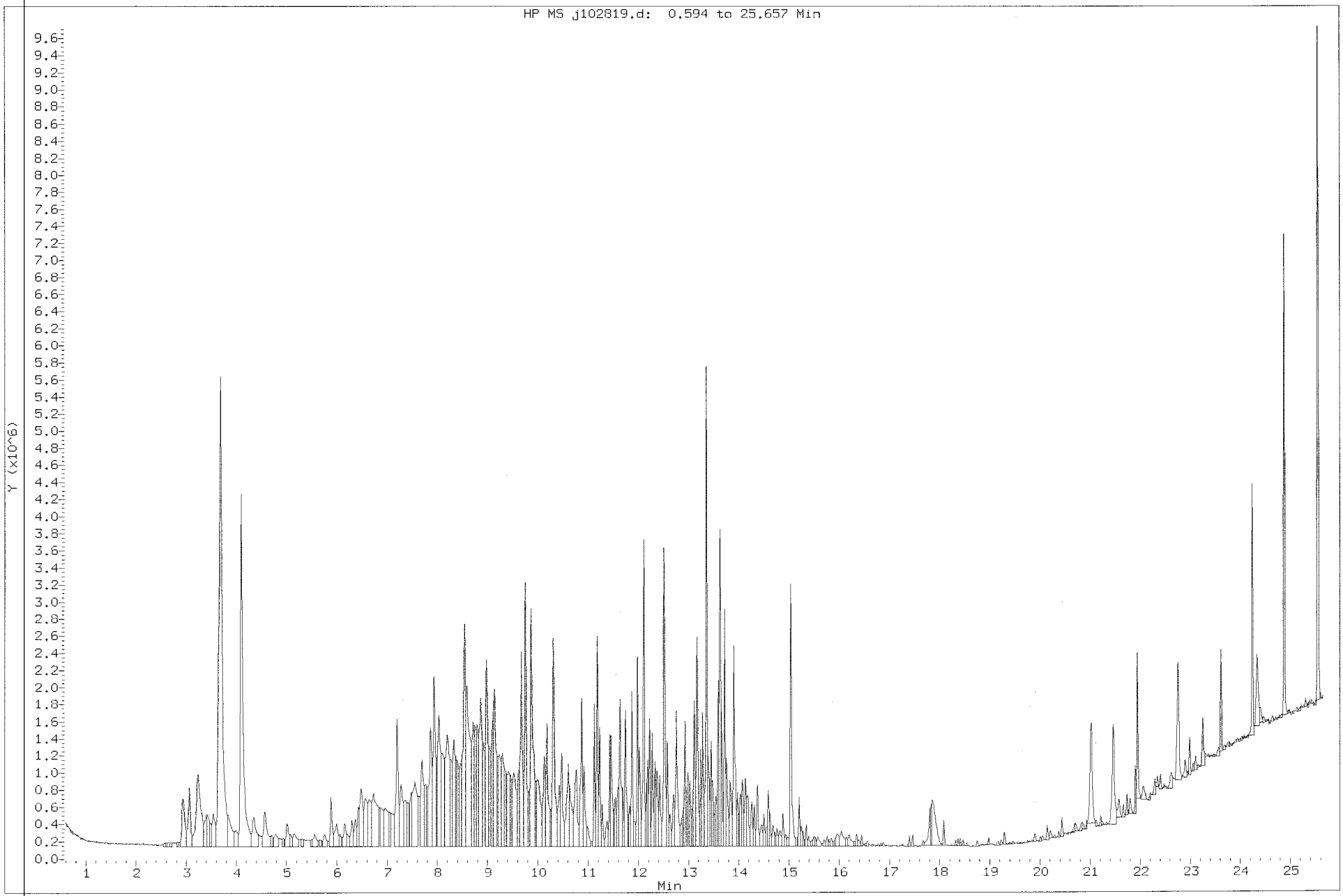
Instrument: msdj.i
Client Sample ID: HAFB-ST03-B59(380)(T017A)



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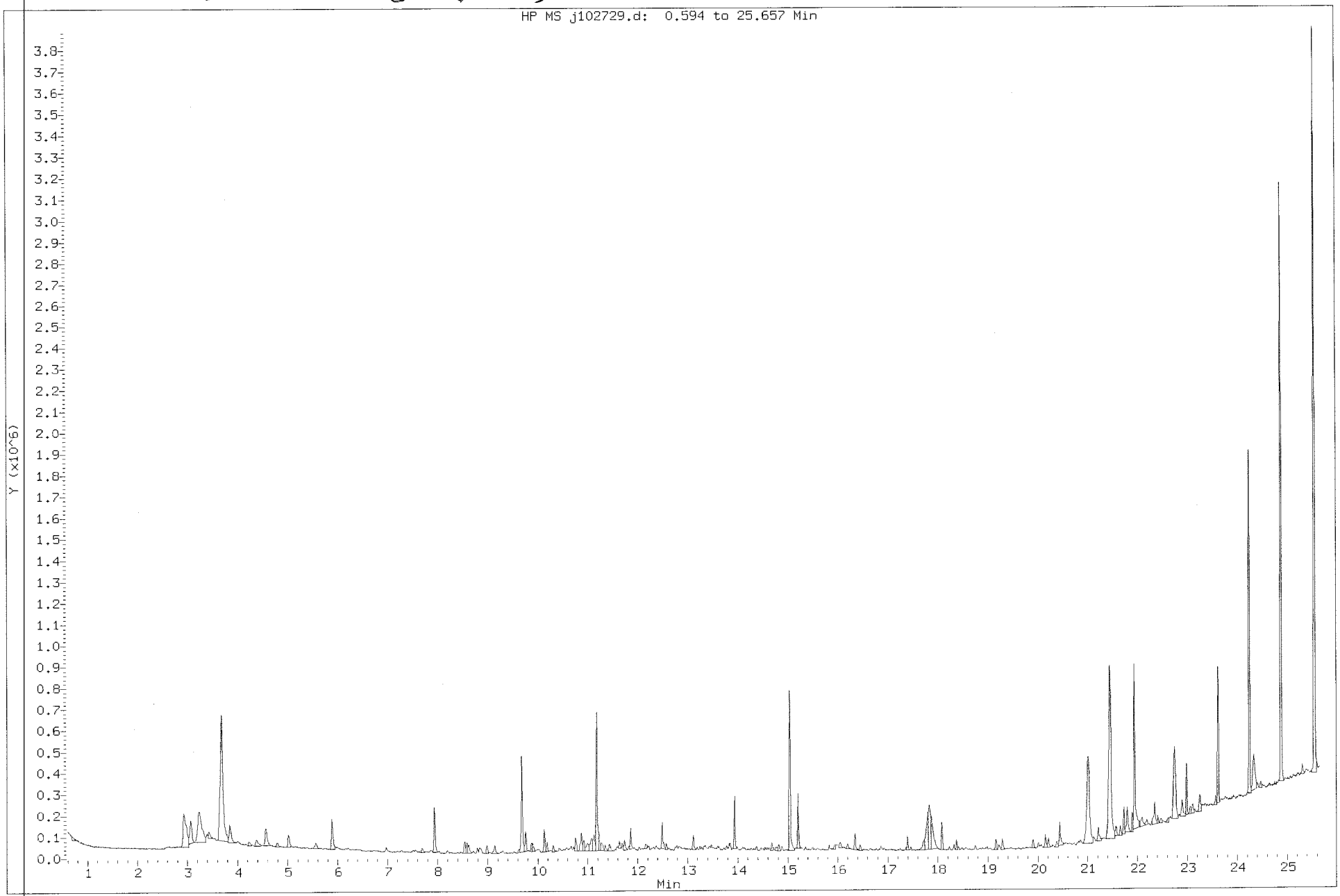
Instrument: msdj.i
Client Sample ID: HAFB-ST03-BS9 (B88) (T01-TB)



Data File: /chem/msdj.i/31oct11.b/j103129.d
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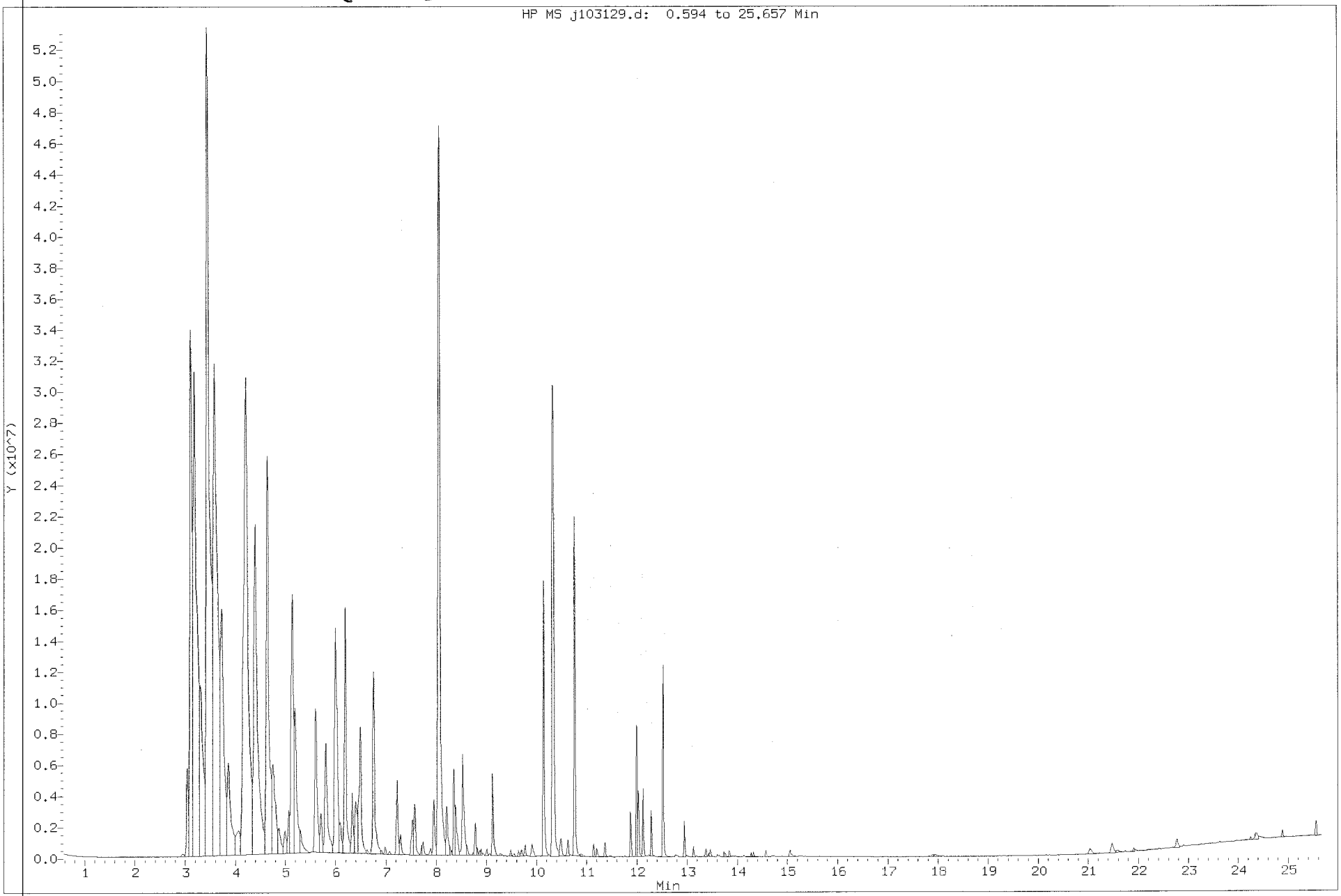
Client Sample ID: GASOLINE #2 (T017A)



Data File: /chem/msdj.i/27oct11.b/j102732.d
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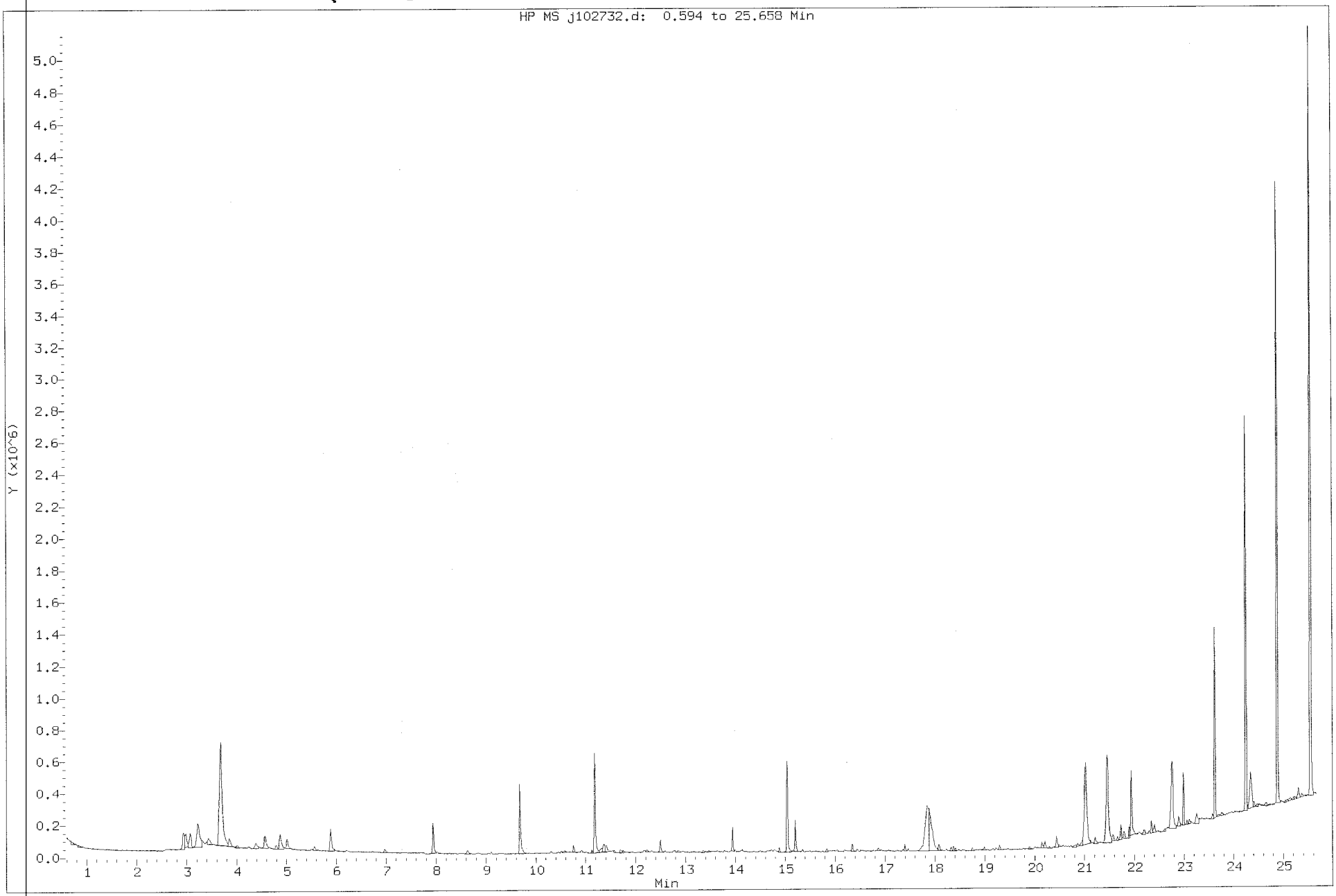
Client Sample ID: GASOLINE #2 (TOTB)



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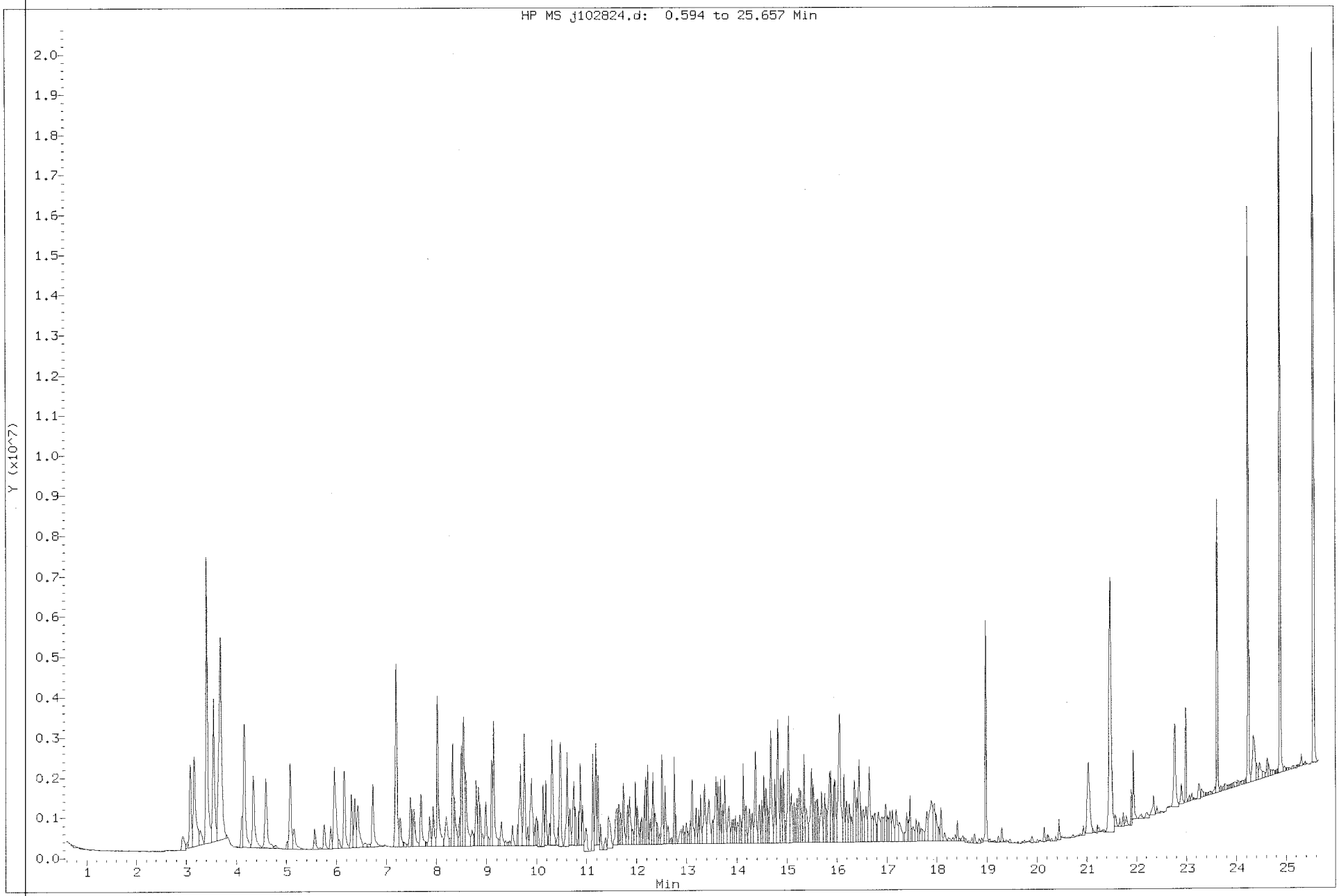
Instrument: msdj.i
Client Sample ID: DIESEL #3 (TO17A)



Data File: /chem/msdj.i/27oct11.b/j102733.d
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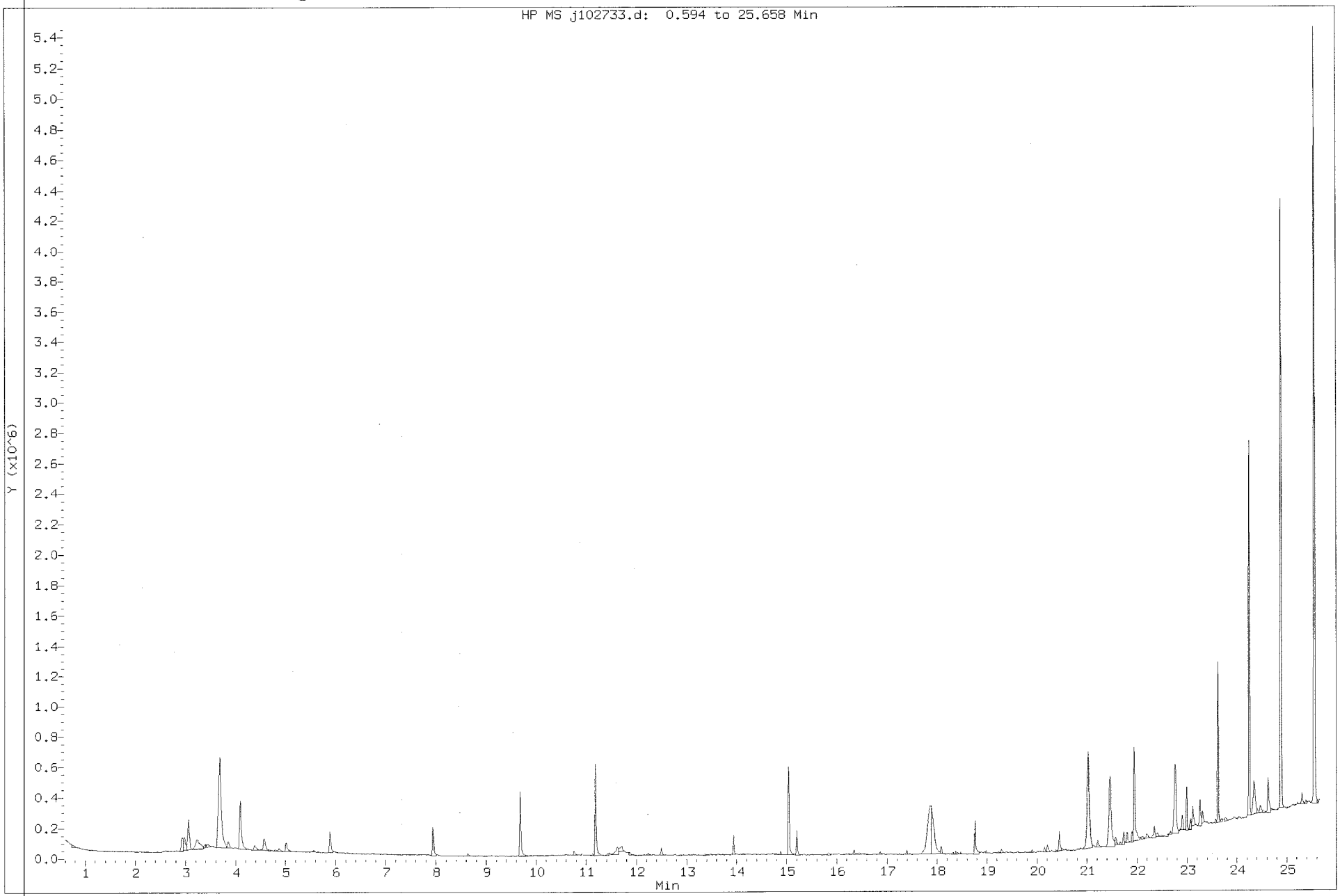
Instrument: msdj.i
Client Sample ID: DIESEL #3 (TO1 TB)



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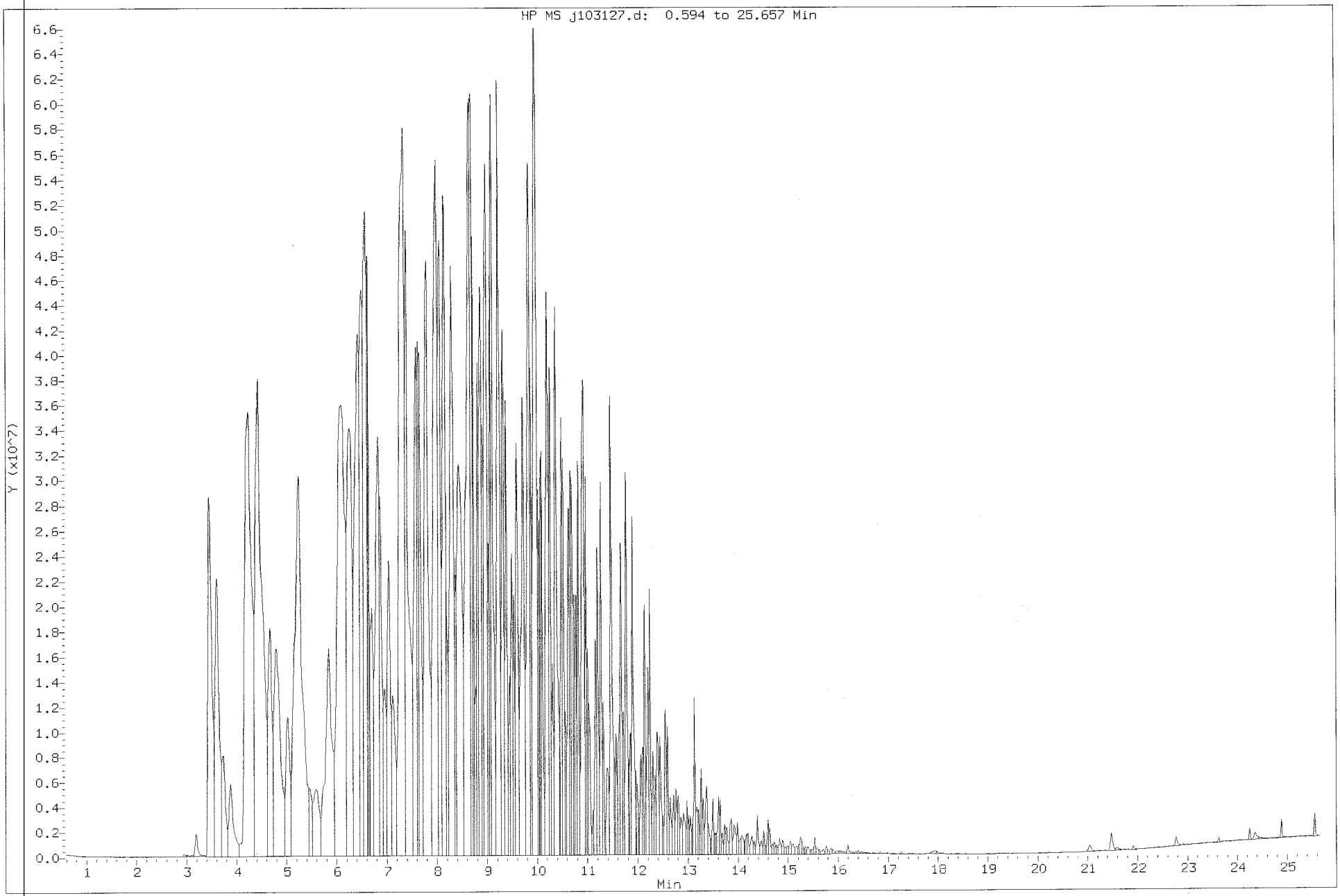

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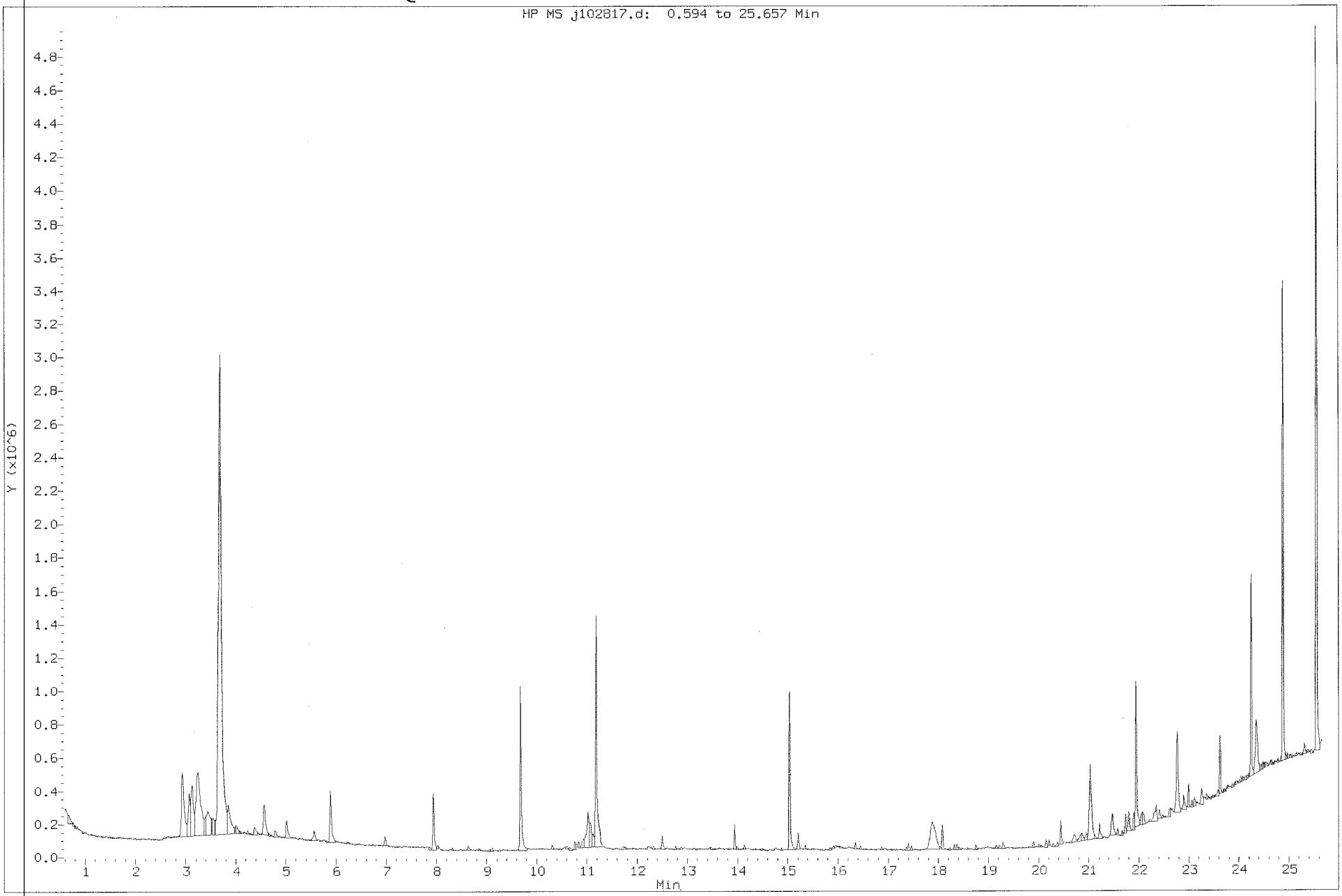

Data File: /chem/msdj.i/28oct11.b/j102816.d
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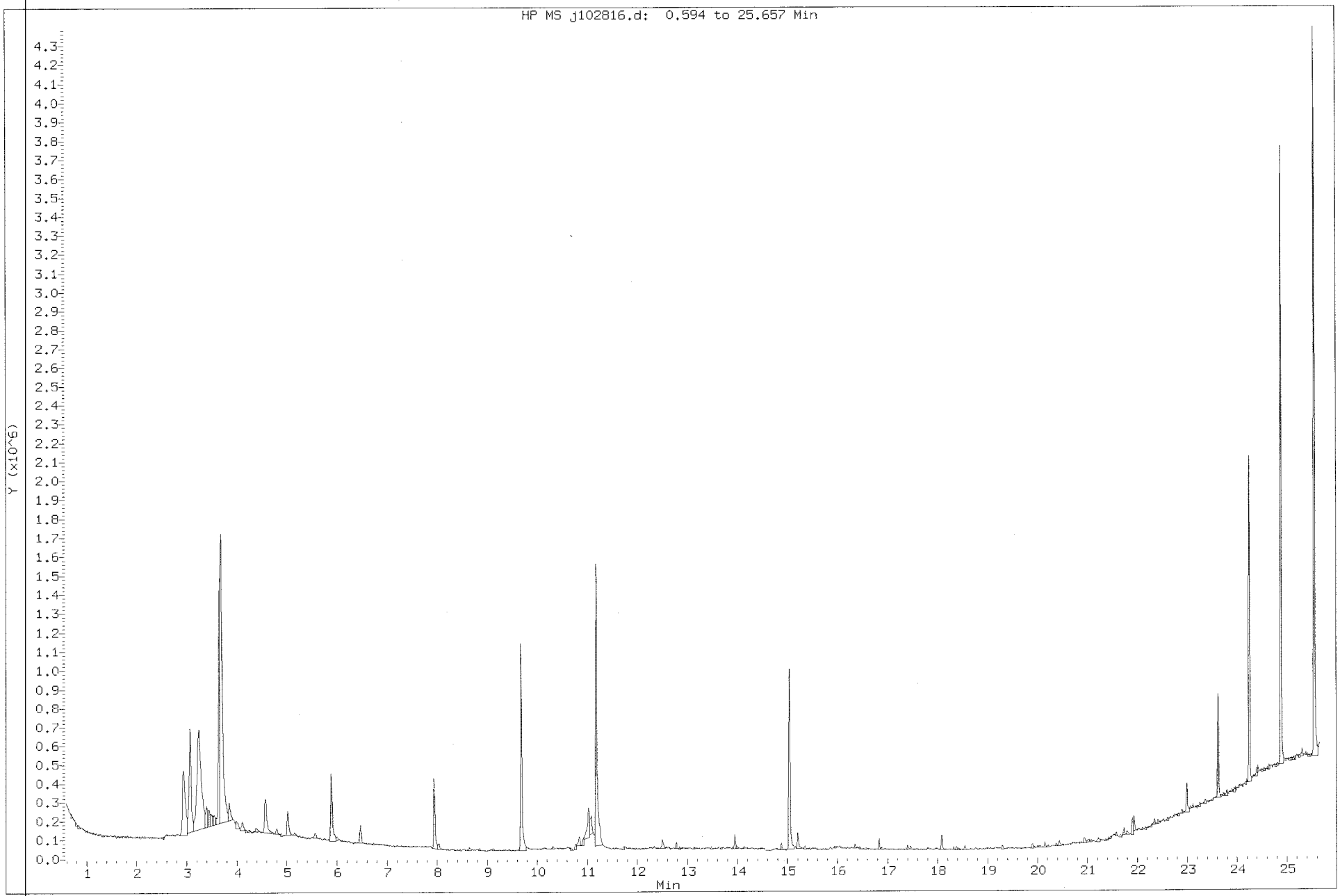

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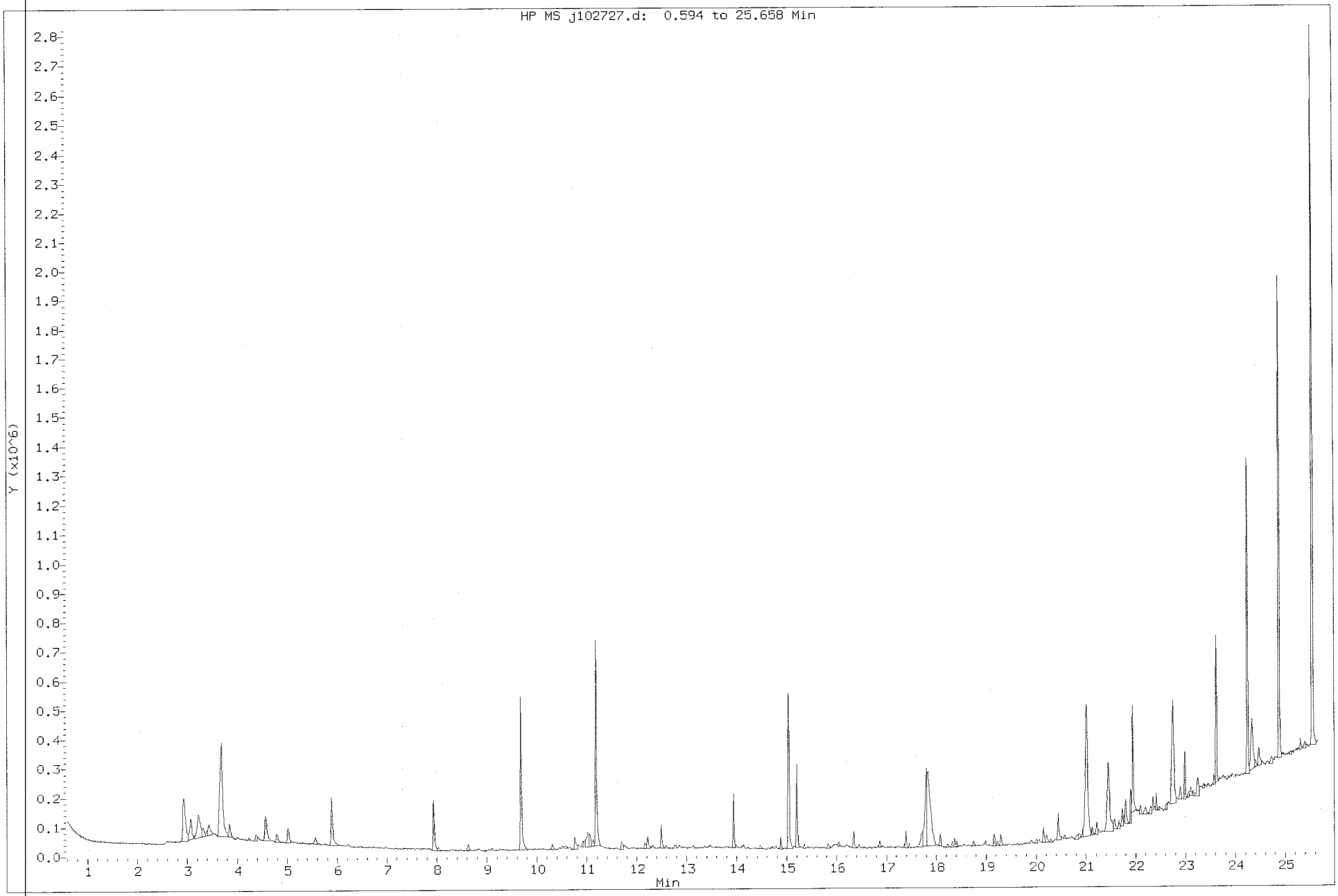

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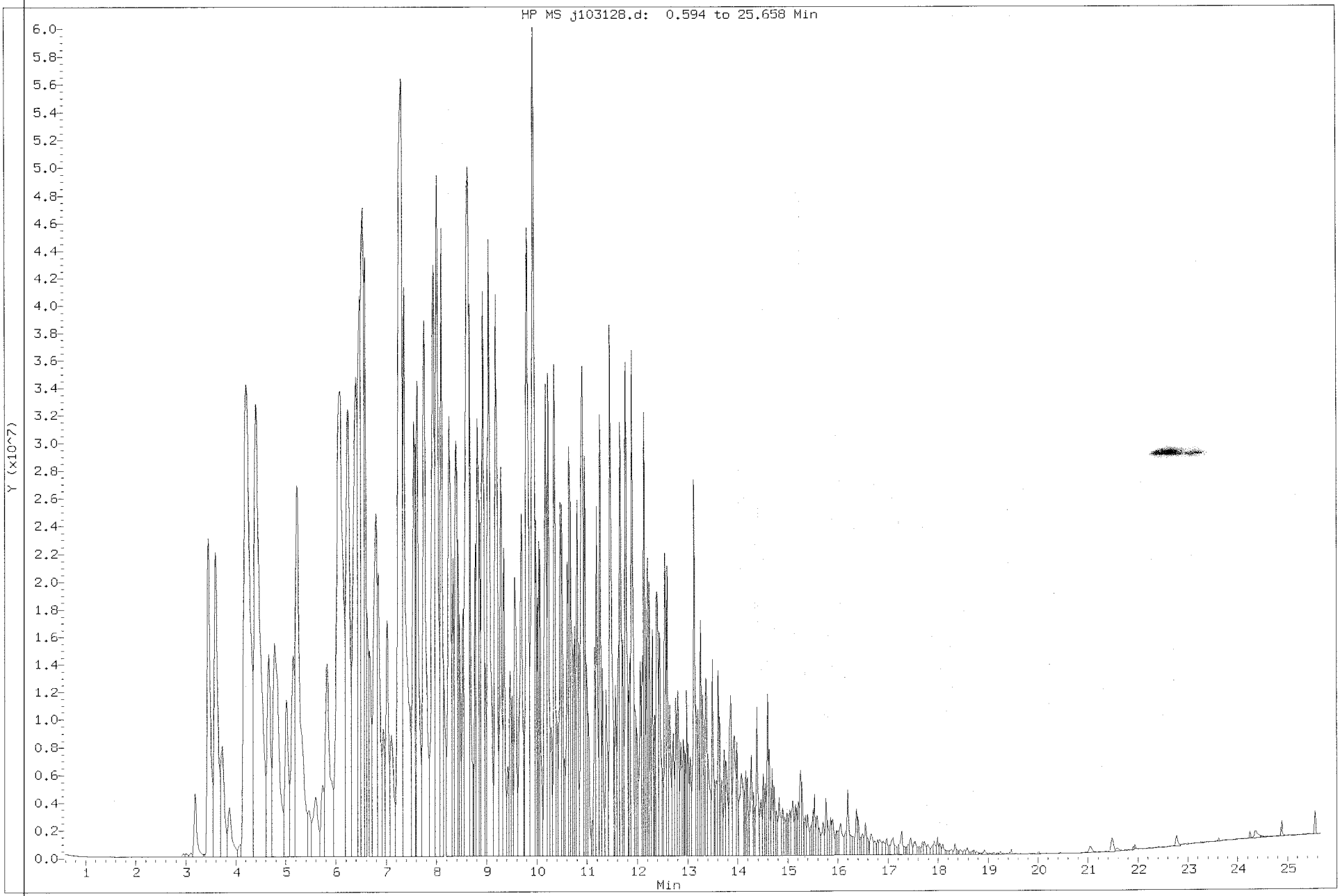

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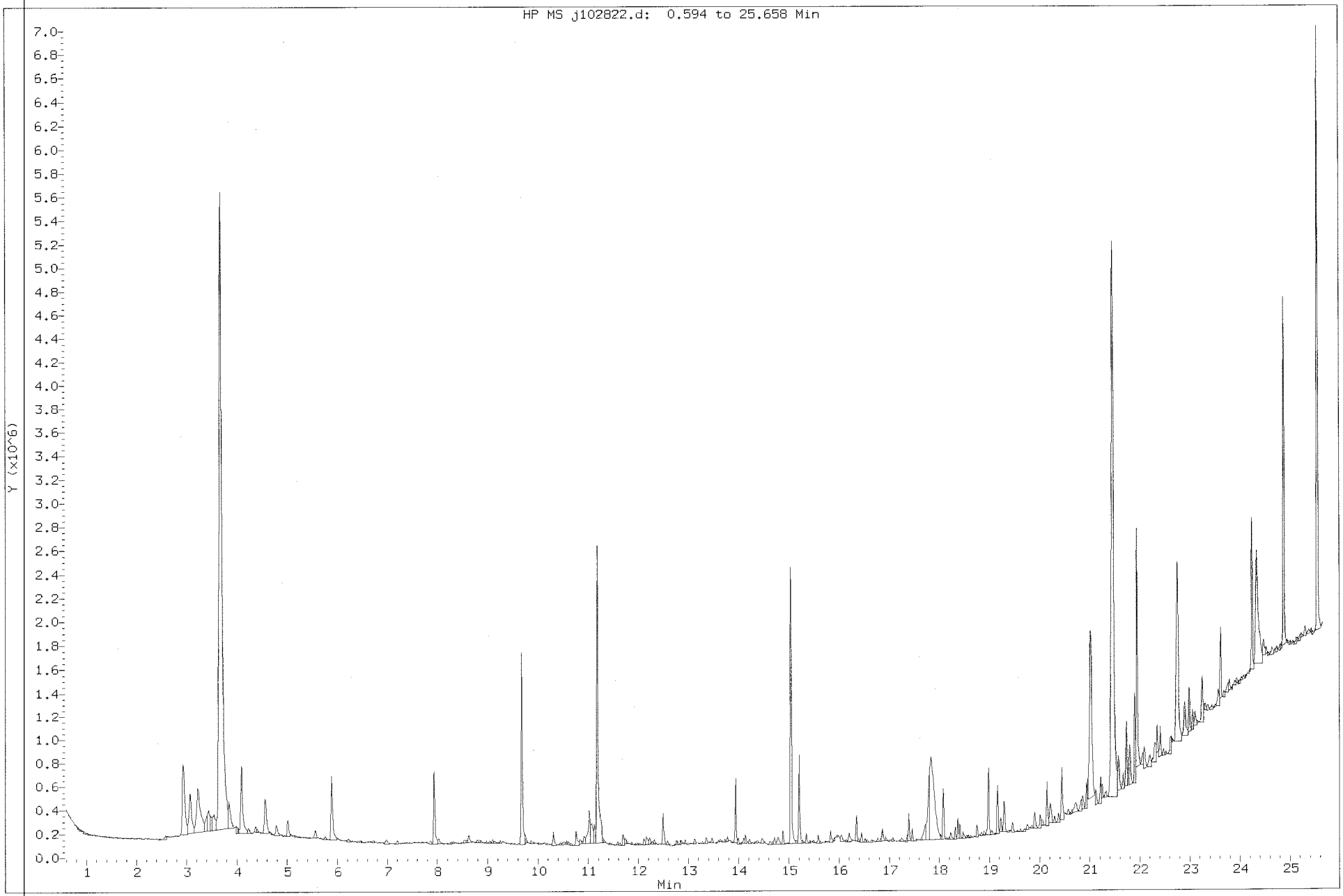
Client Sample ID: HH-OUTC-MW22R (TO17B)



Data File: /chem/msdj.i/28oct11.b/j102828.d
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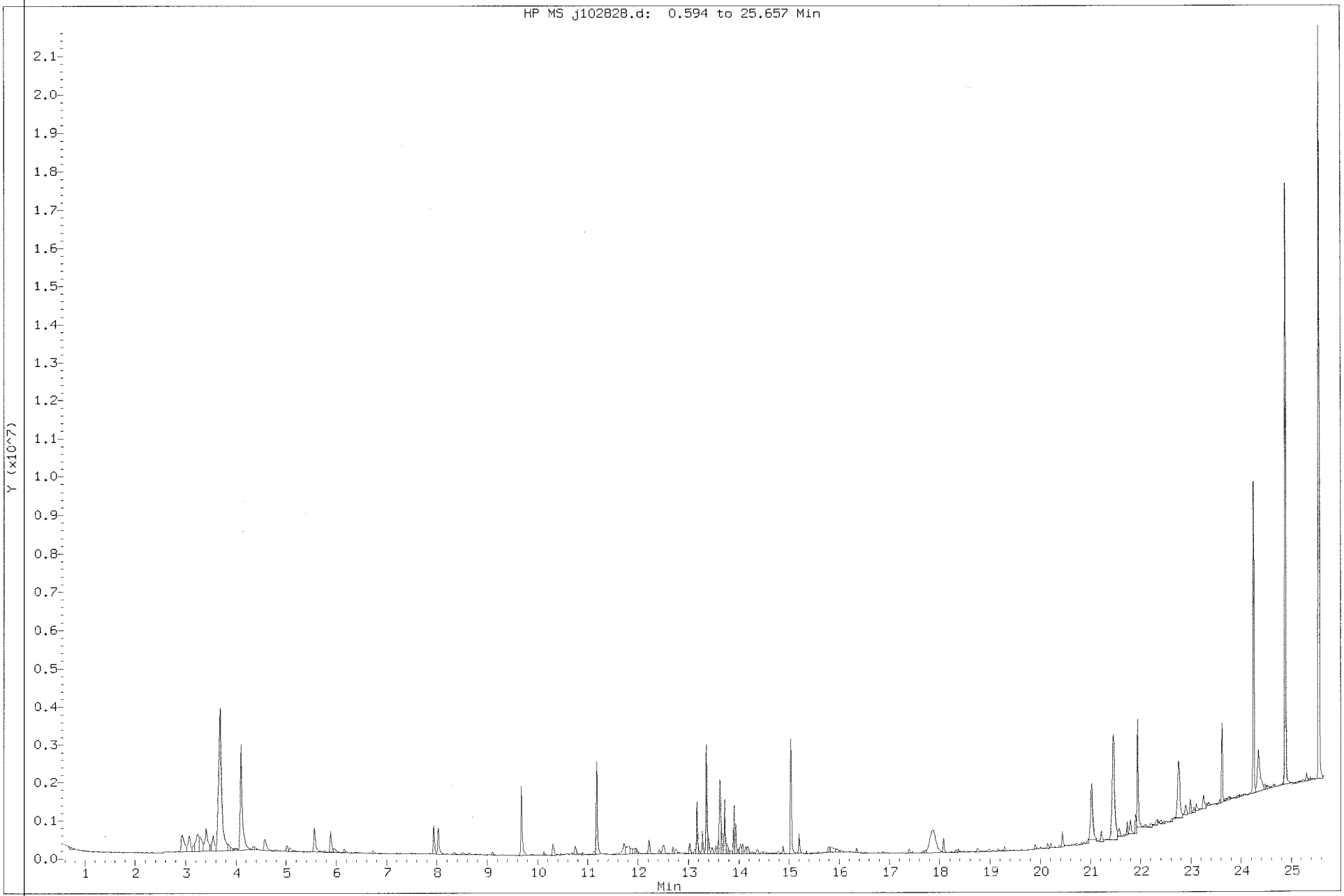
Instrument: msdj.i
Client Sample ID: GASOLINE - EXHAUST (TOTA)



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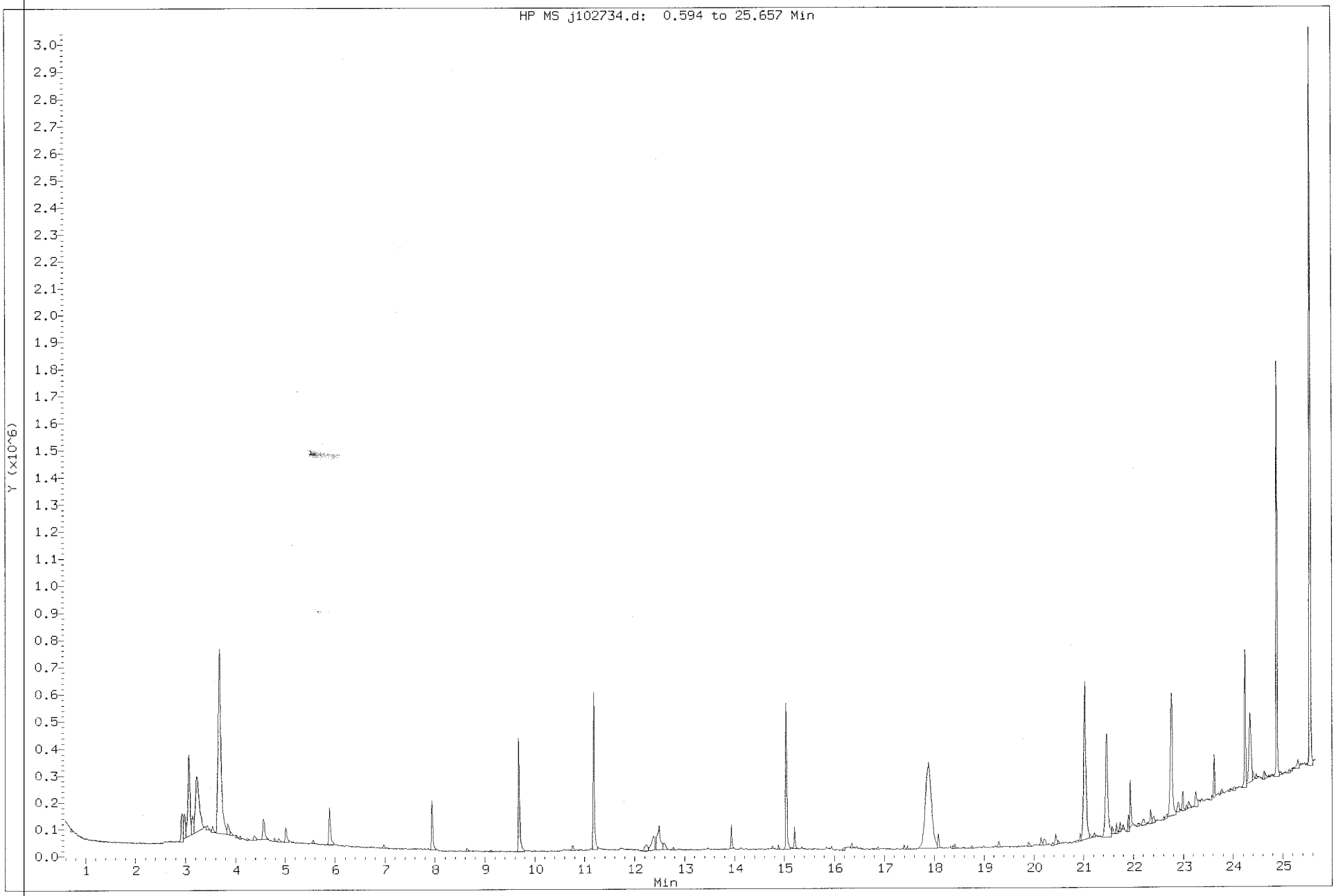
Client Sample ID: GASOLINE-EXHAUST (TO17B)



Data File: /chem/msdj.i/28oct11.b/j102825.d
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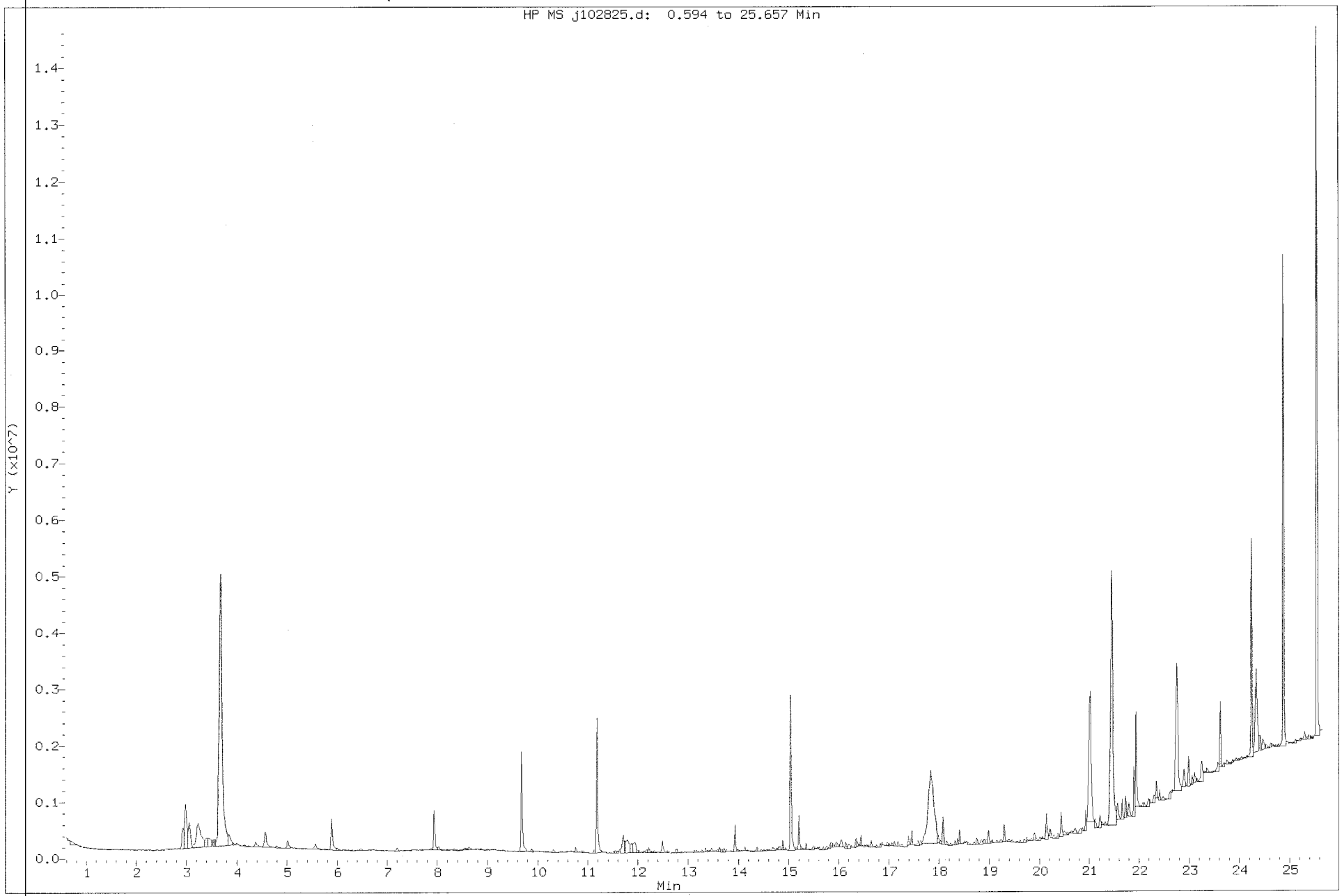
Instrument: msdj.i
Client Sample ID: DIESEL - EXHAUST (TOTA)



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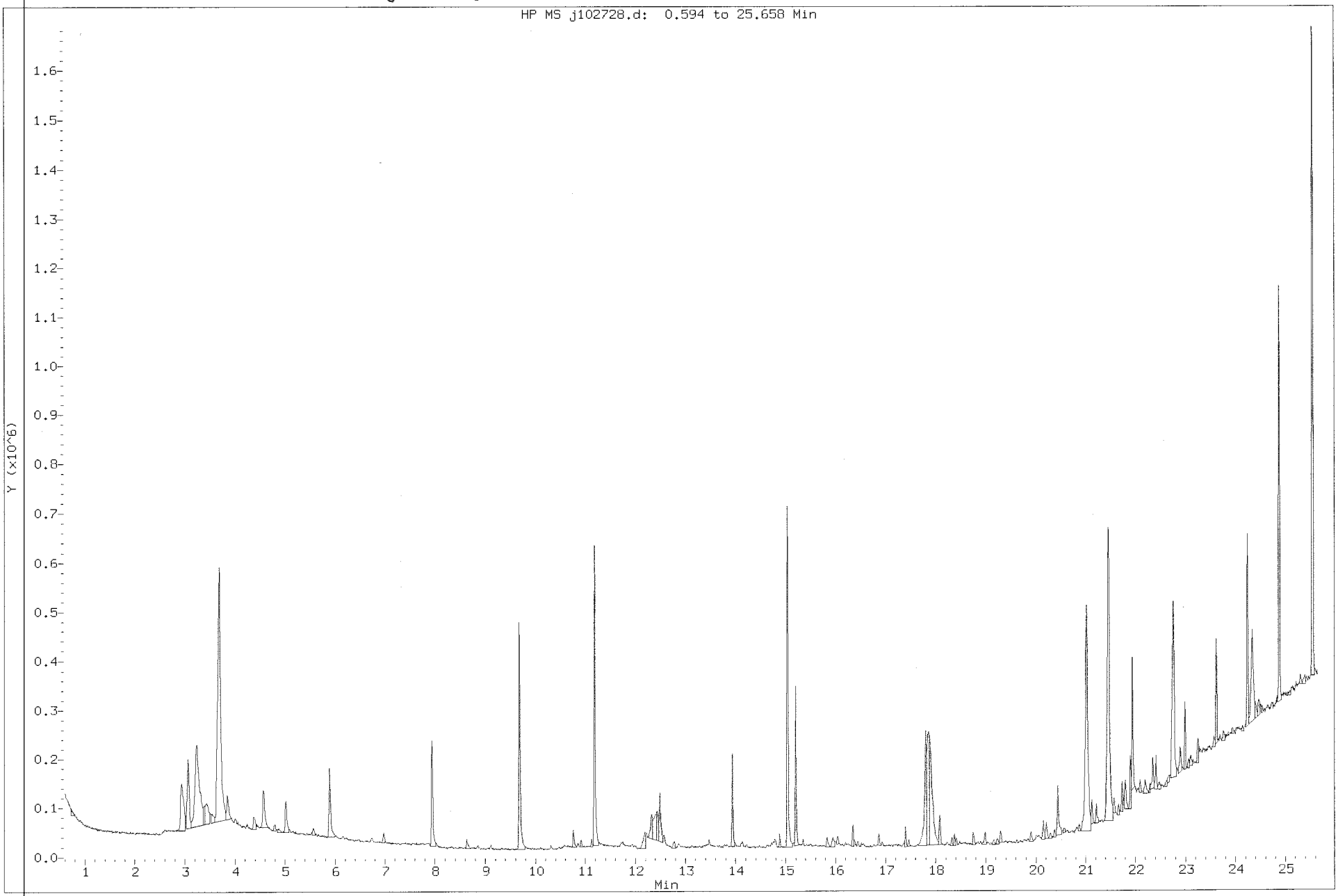
Client Sample ID: DIESEL-EXHAUST (TO) TB)



Data File: /chem/msdj.i/27oct11.b/j102720.d
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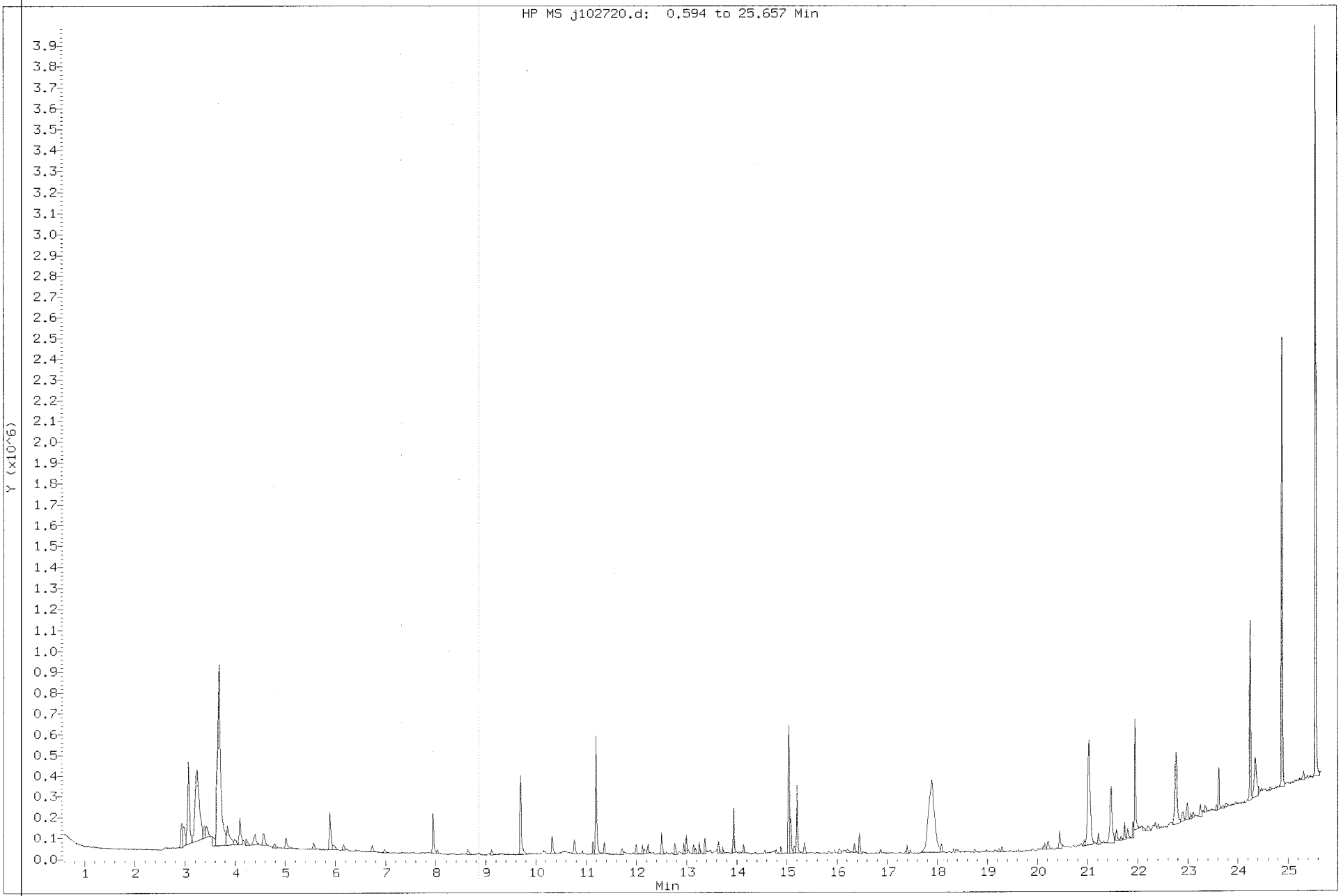
Client Sample ID: HAFB-SP43-VMP10 (TO-17B)



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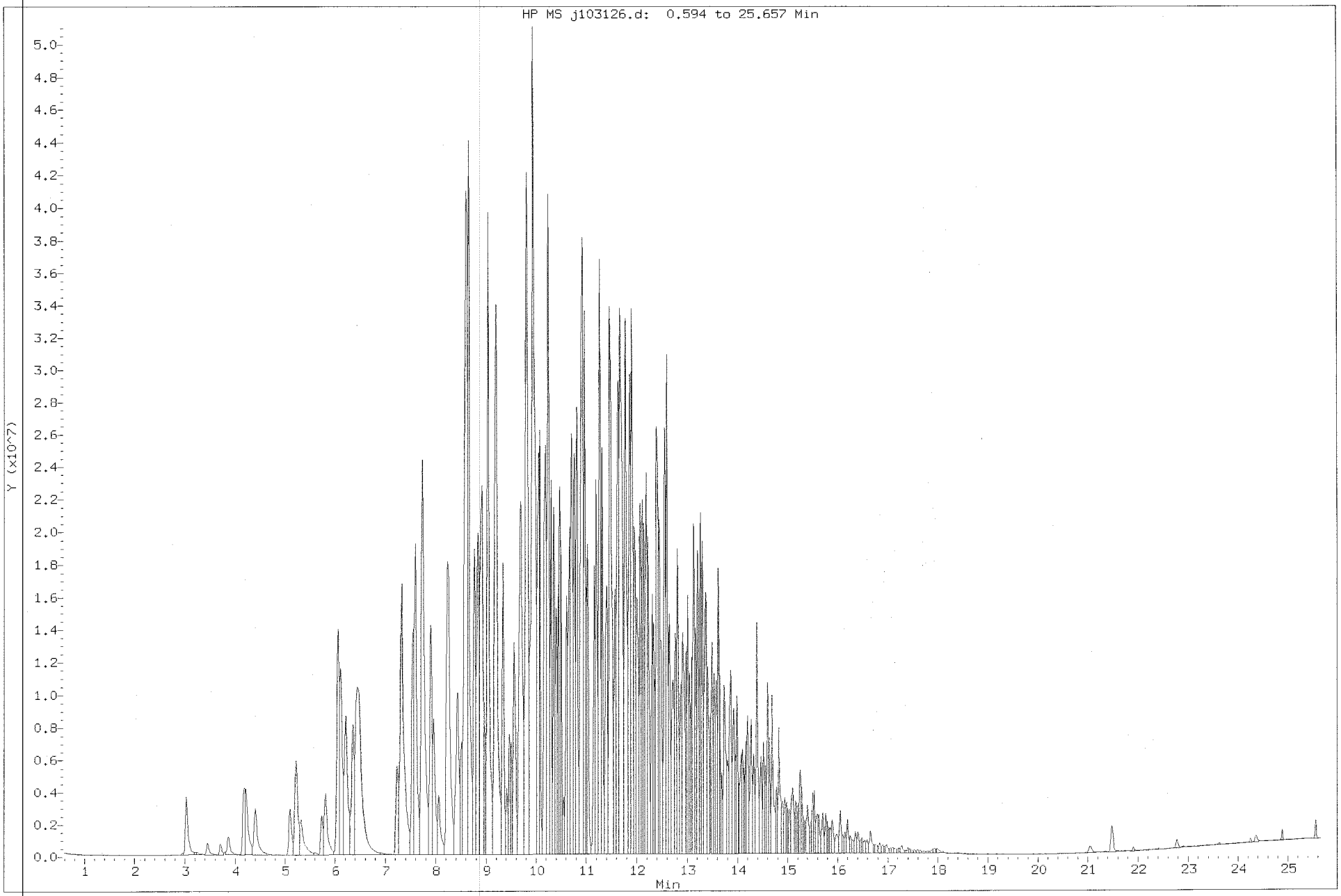

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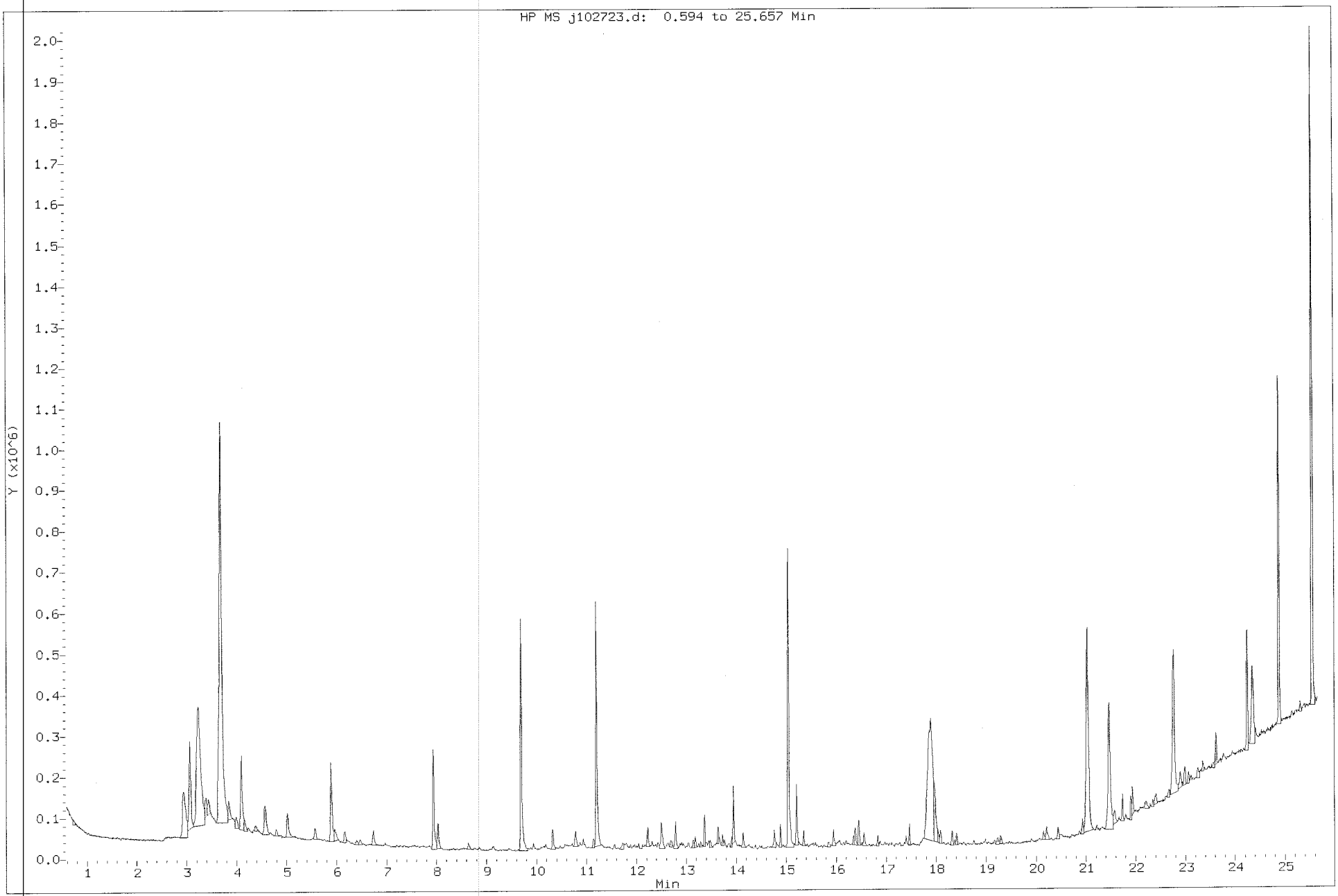
Instrument: msdj.i
Client Sample ID: HAFB-SP43-VMP11-(T017B)



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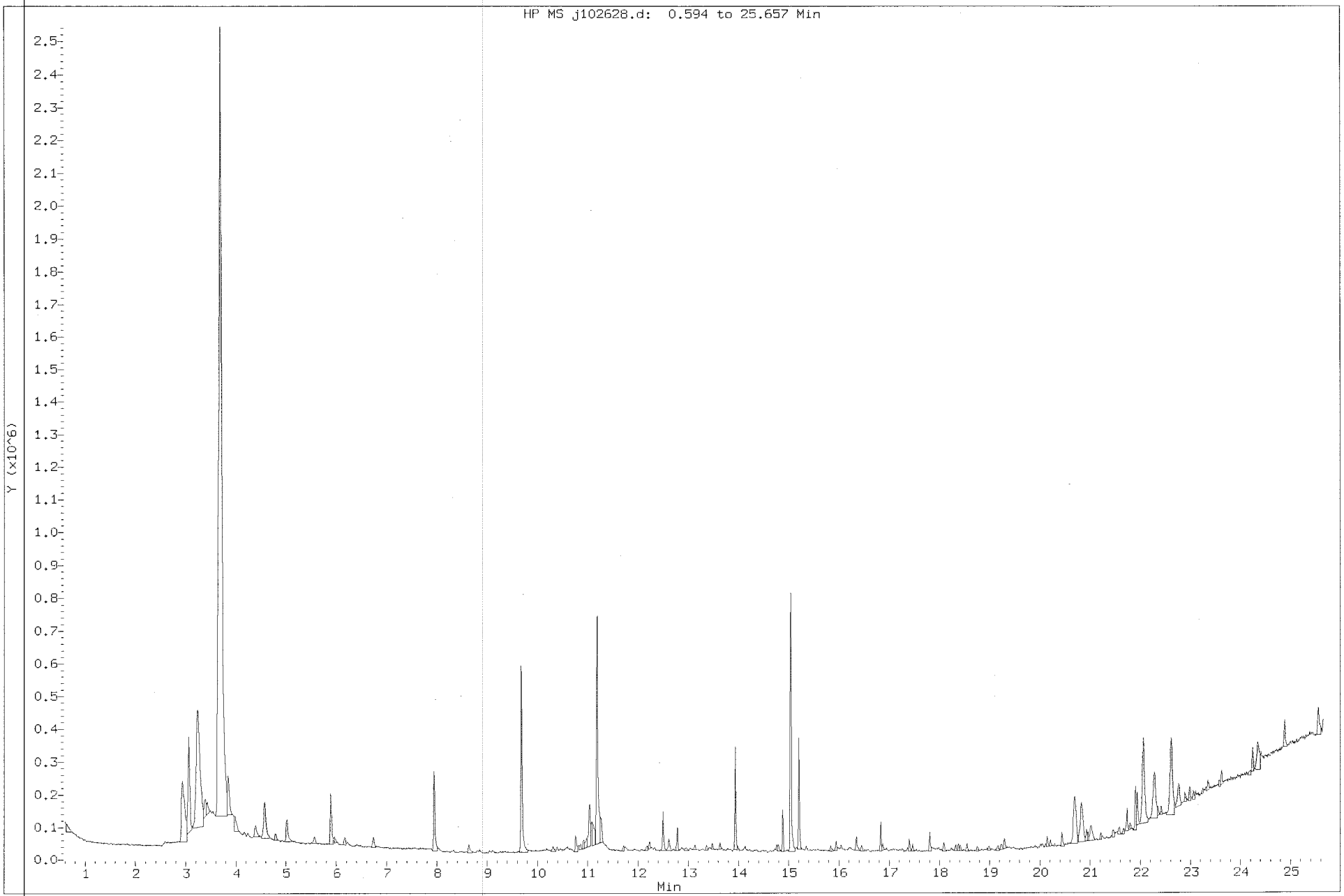

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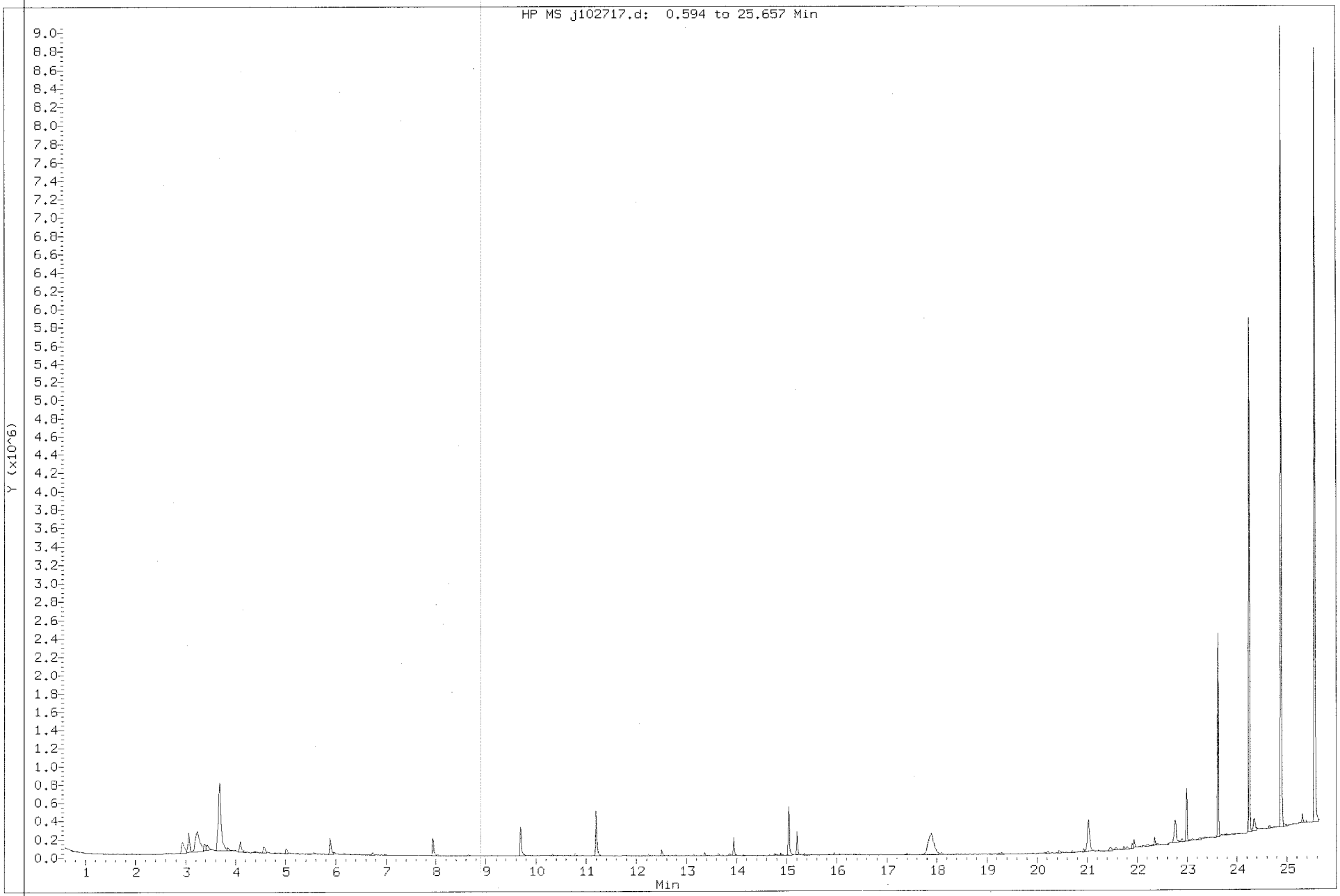

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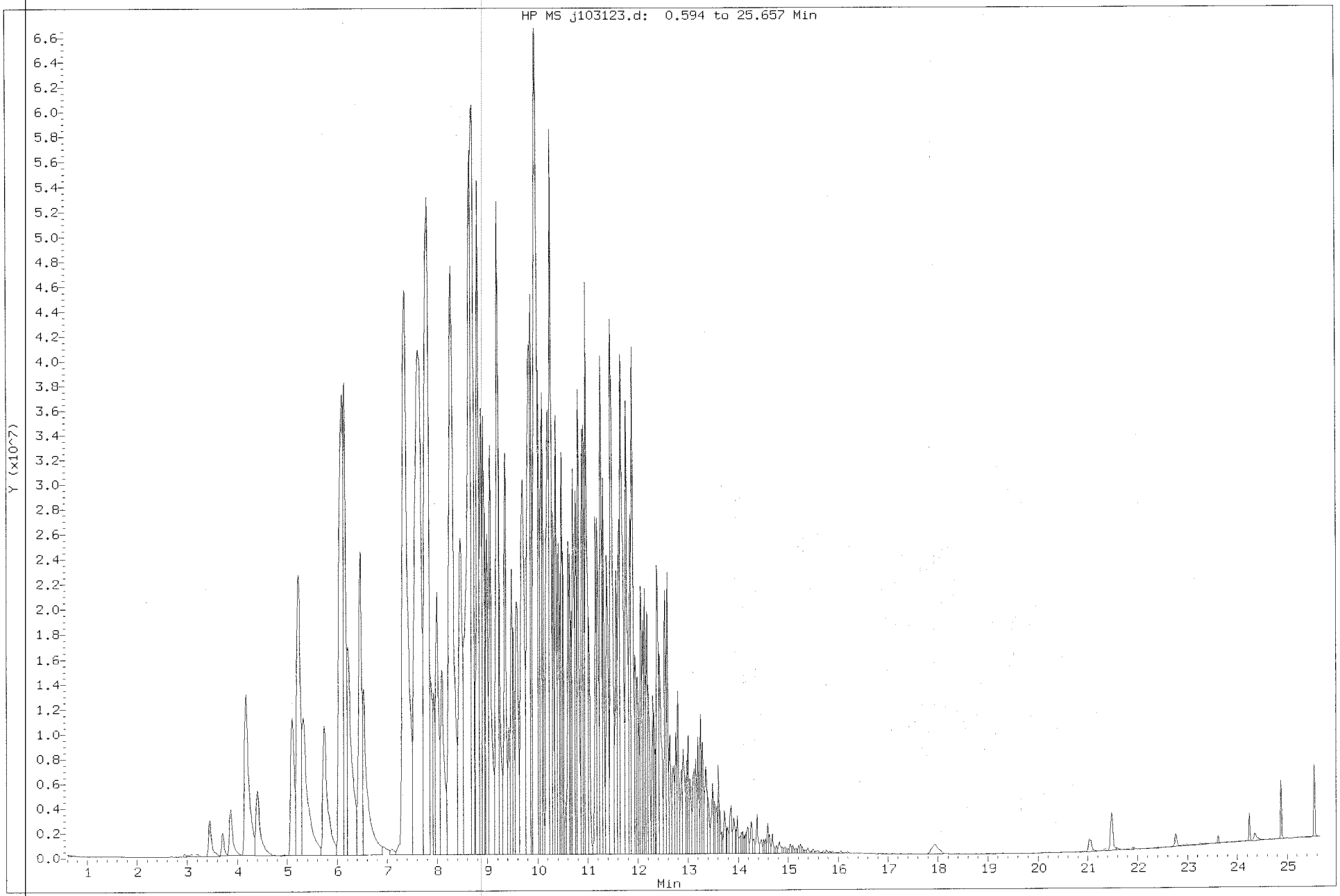
Client Sample ID: HAFB-SP23-VMP16 (TO17A)



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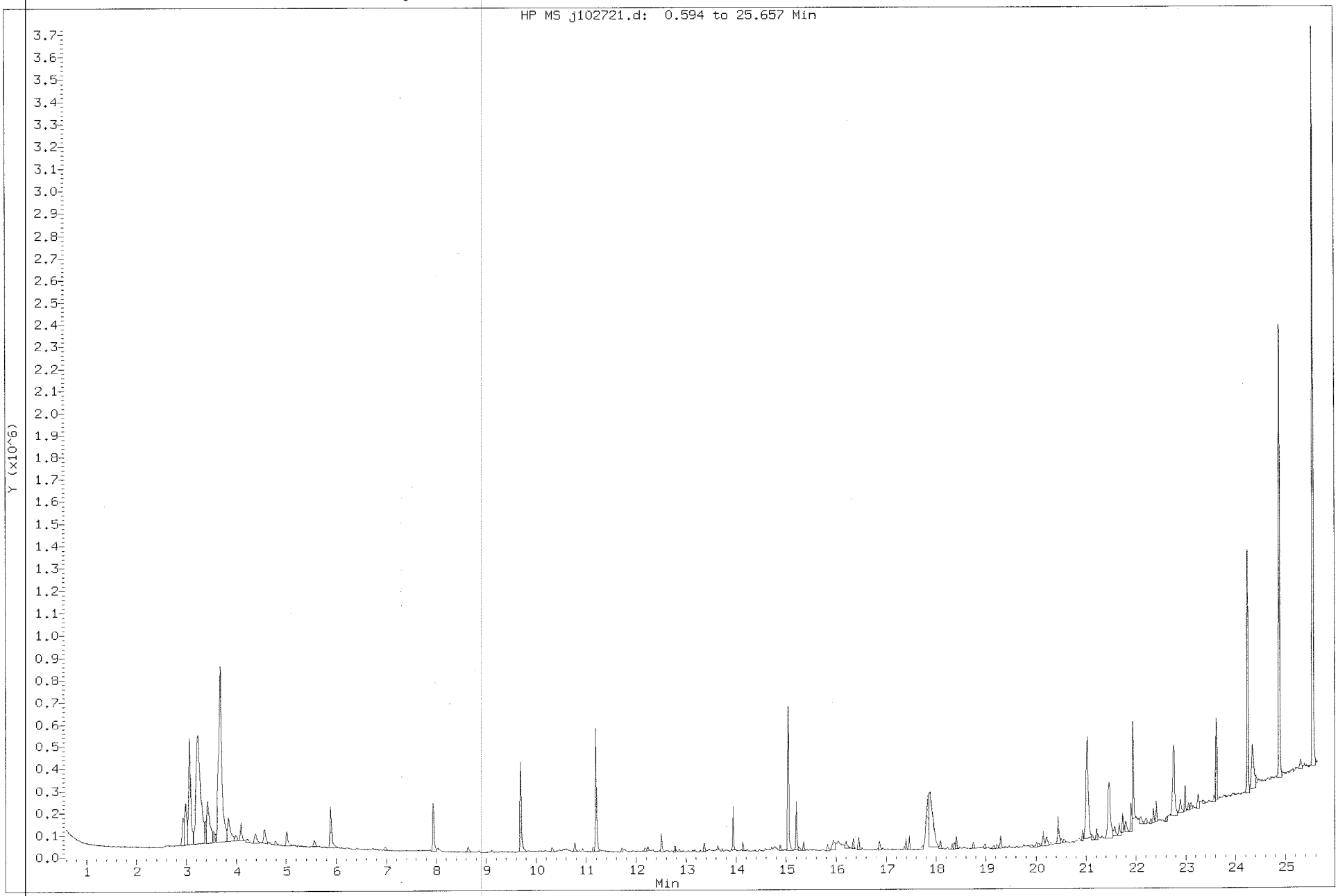

Data File: /chem/msdj.i/27oct11.b/j102710.d
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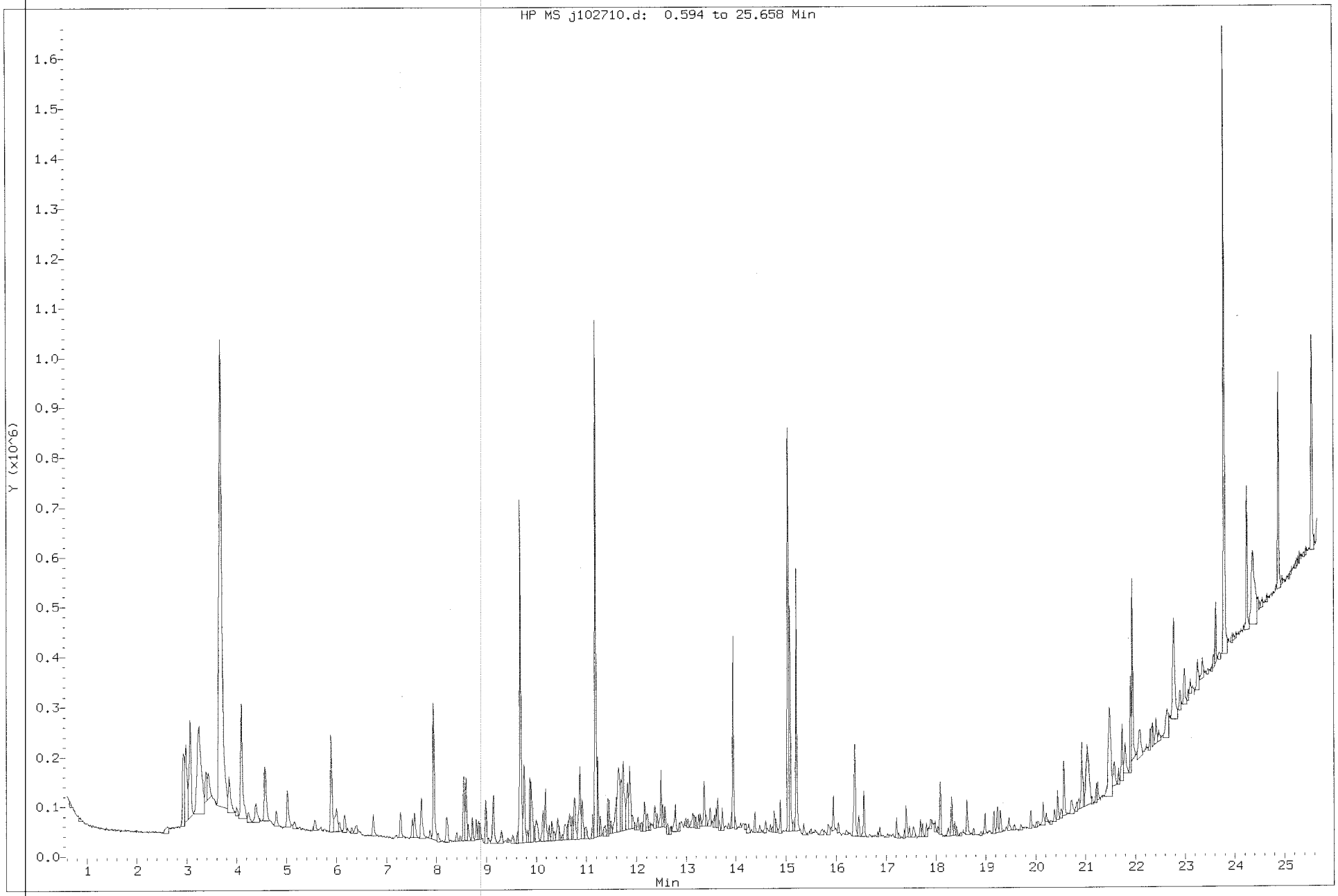
Instrument: msdj.i
Client Sample ID: HAFB-SP43-VMP17(TOTA)



Data File: /chem/msdj.i/27oct11.b/j102724.d
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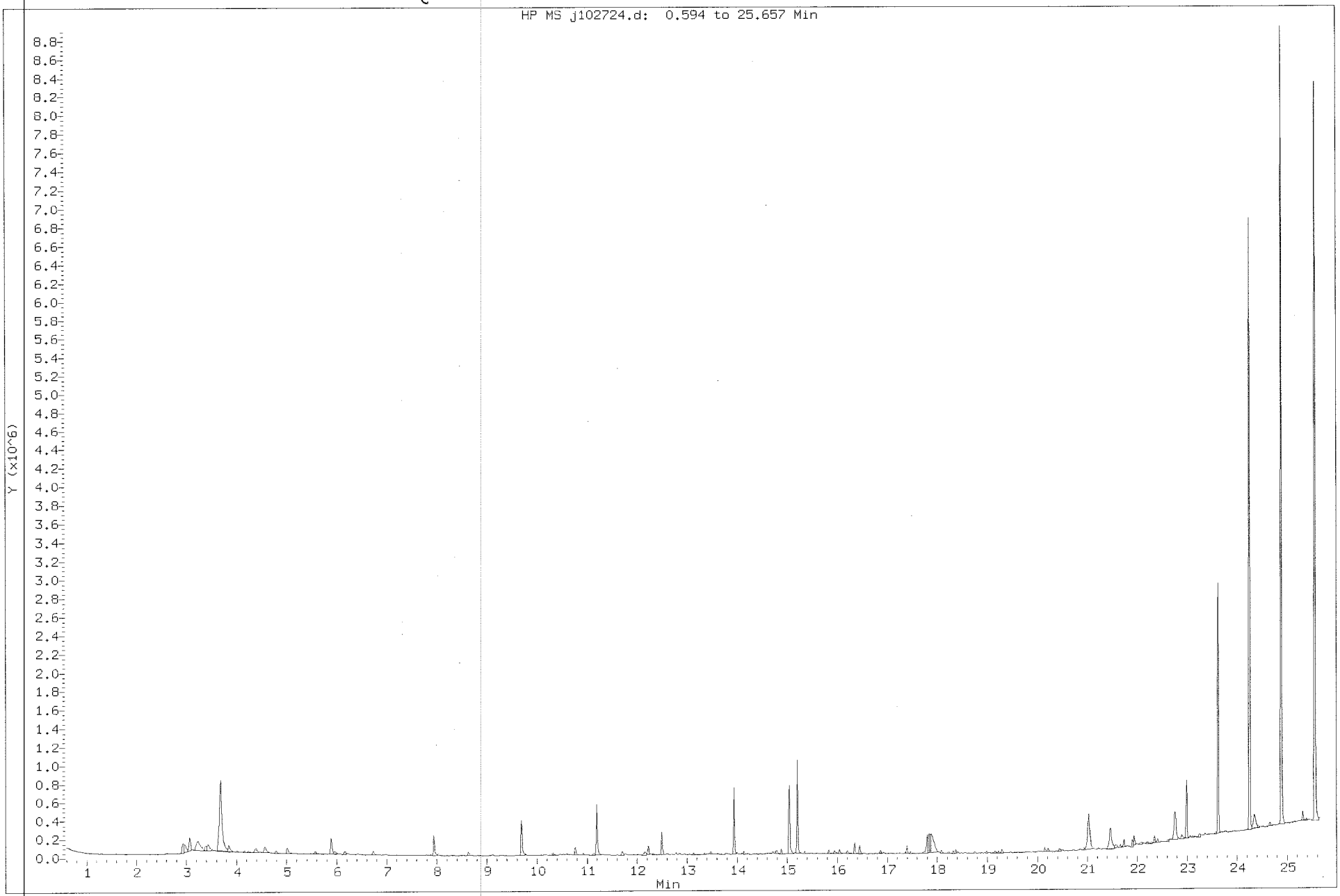
Instrument: msdj.i
Client Sample ID: HAFB-SPL3-VMP17 (T017B)



Data File: /chem/msdj.i/26oct11.b/j102629.d
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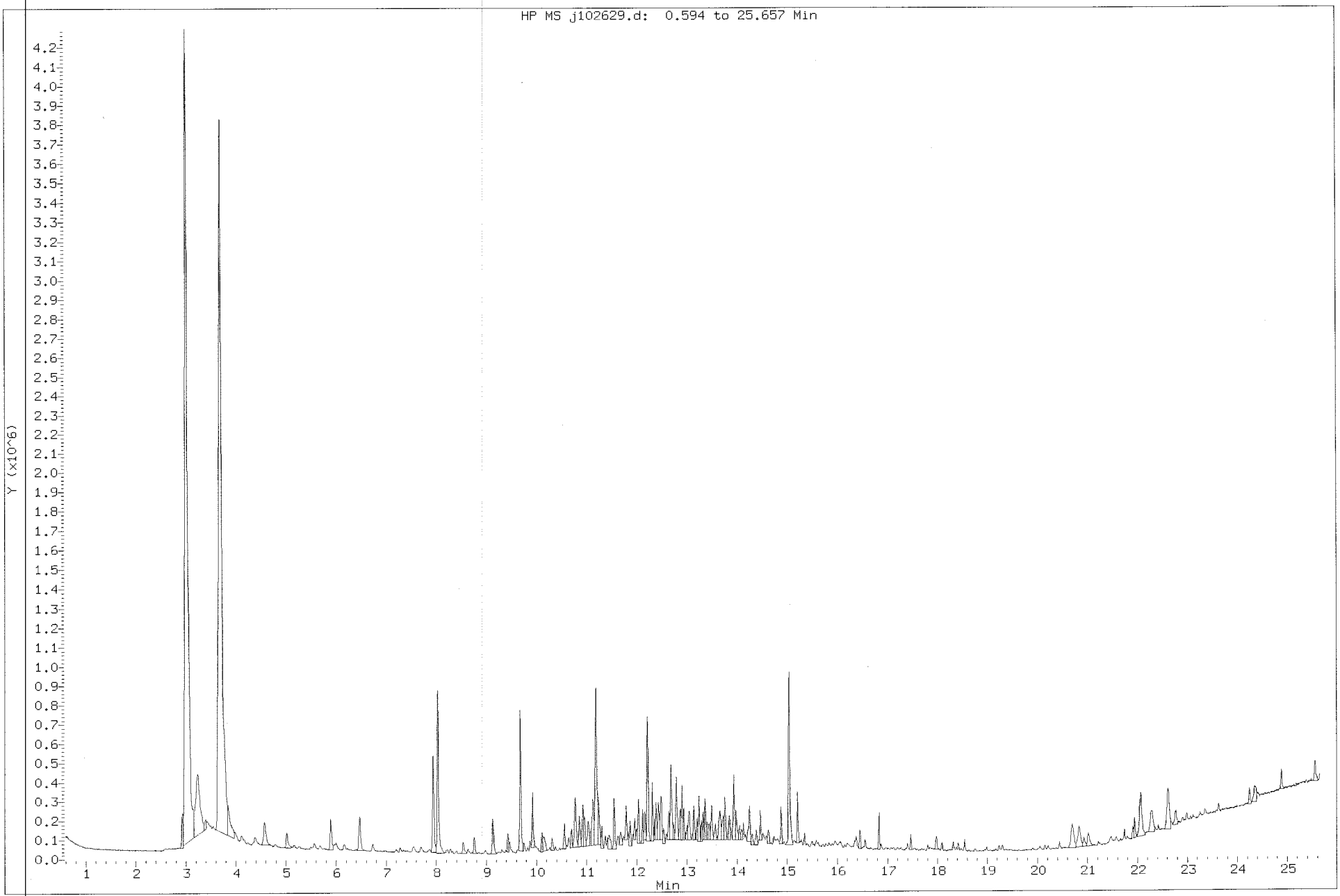
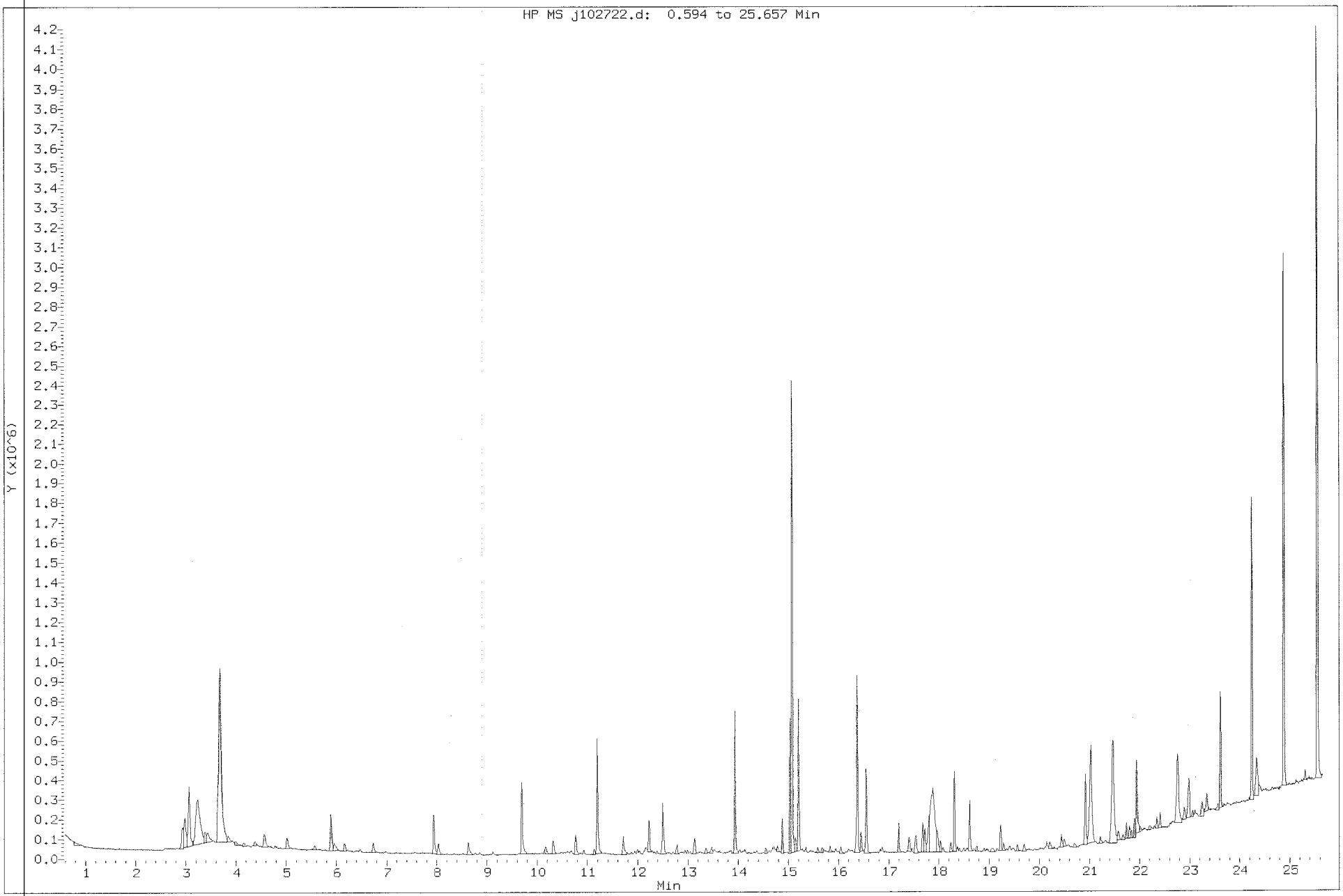
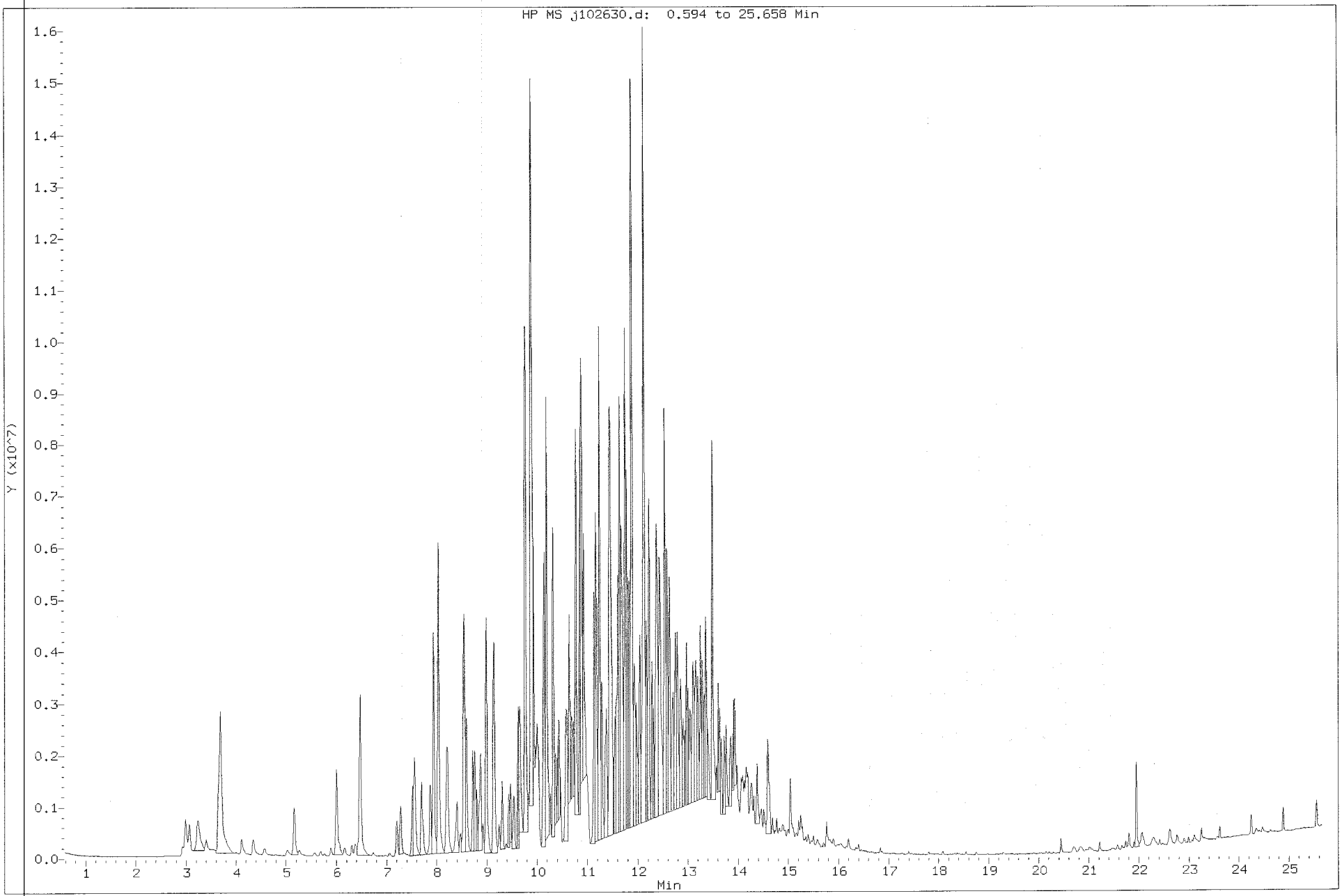
Instrument: msdj.i
Client Sample ID: FV-GP01-HDOH#2 (TO17A)



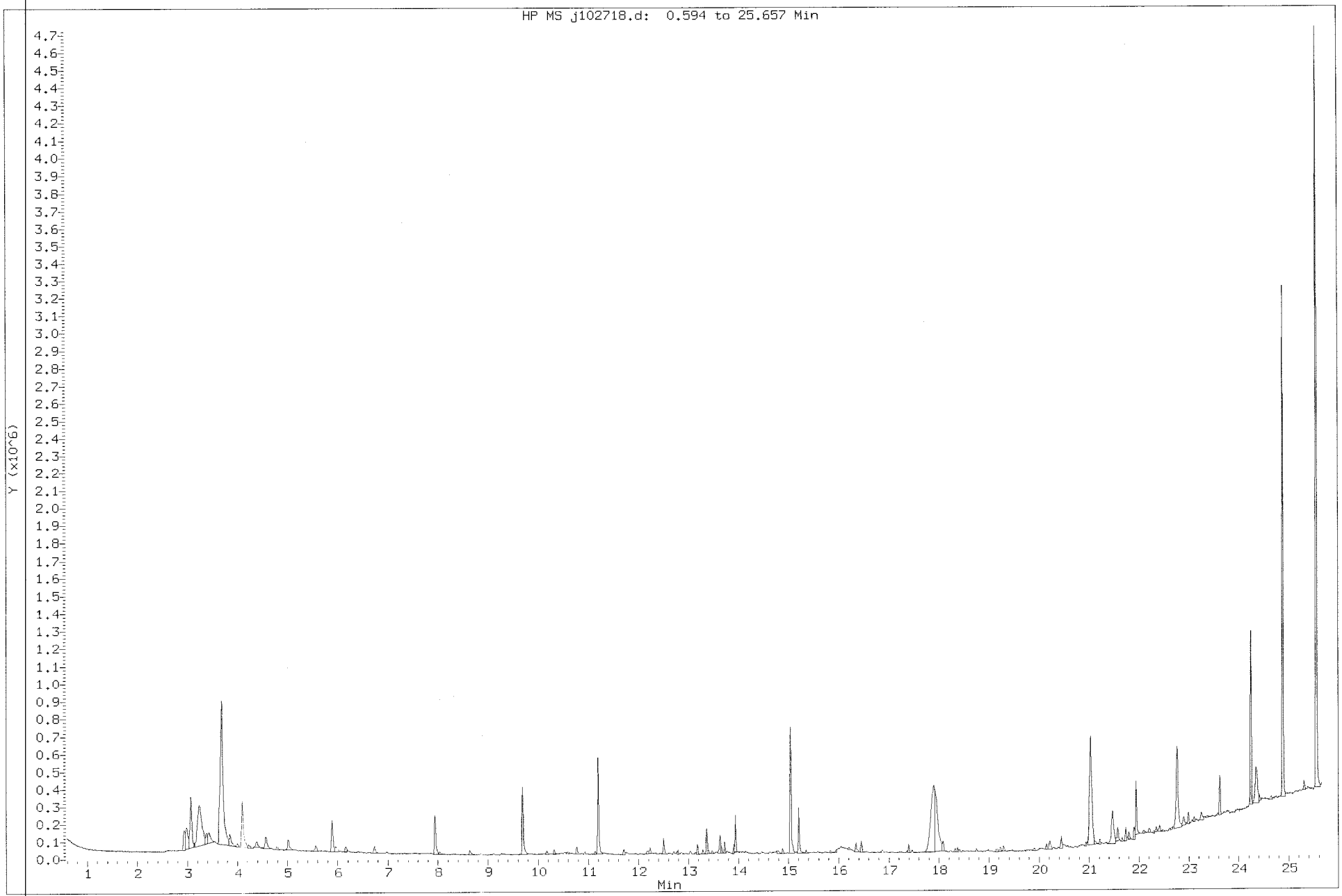
Data File: /chem/msdj.i/27oct11.b/j102722.d
Injection Date: 27-OCT-2011 22:31
Instrument: msdj.i
Client Sample ID: FV-GP01 - HDOH #2 (TOTES)



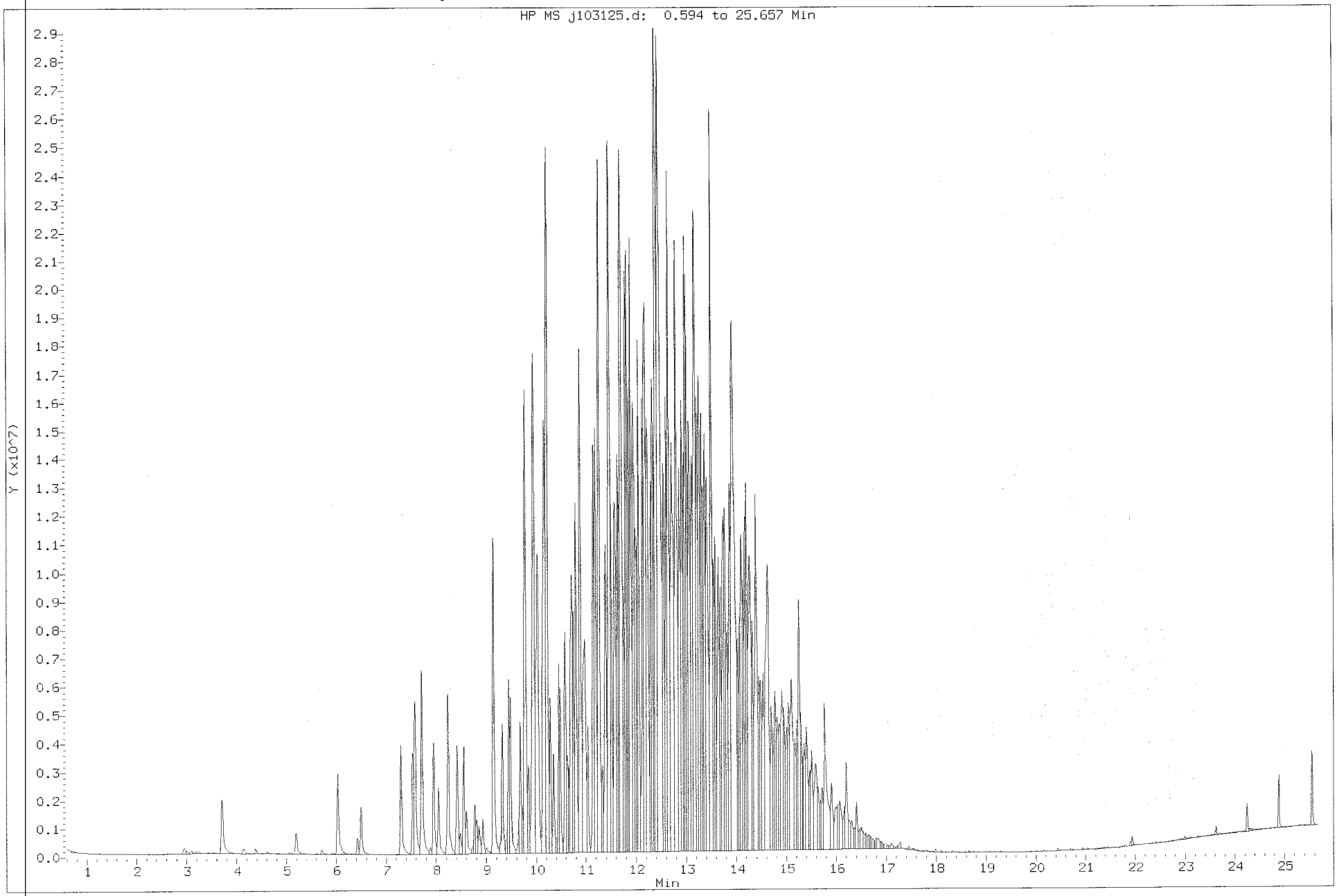
Data File: /chem/msdj.i/26oct11.b/j102630.d
Injection Date: 27-OCT-2011 04:06
Instrument: msdj.i
Client Sample ID: FV-GRAB-HDOH#2 (TO17A)



Data File: /chem/msdj.i/27oct11.b/j102718.d
Injection Date: 27-OCT-2011 20:07
Instrument: msdj.i
Client Sample ID: FV-GP08 - HDOH #2 (TO17B)



Data File: /chem/msdj.i/31oct11.b/j103125.d
Injection Date: 01-NOV-2011 00:27
Instrument: msdj.i
Client Sample ID: FV-GP10R-HDOH #2 (TO17A)



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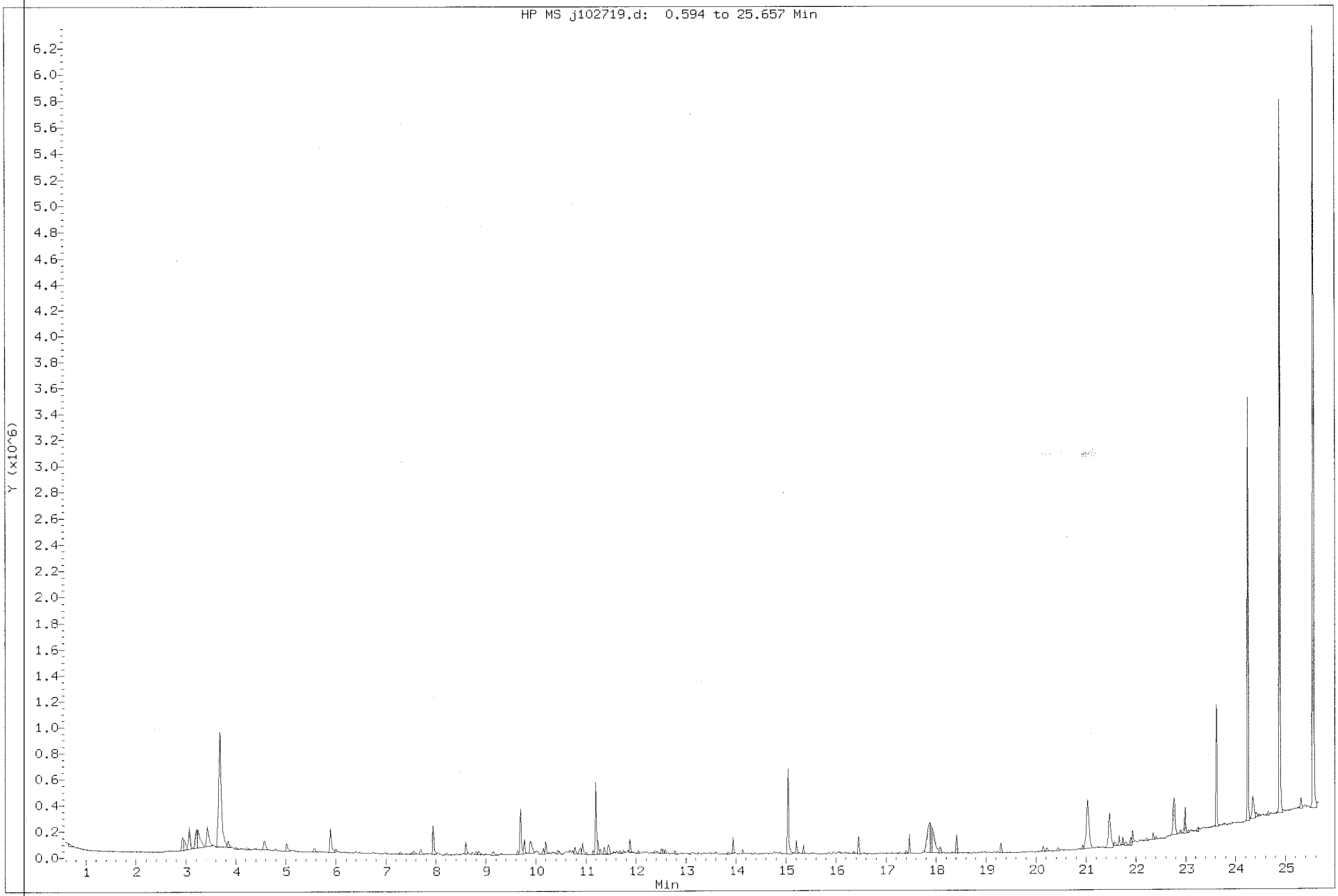
Injection Date: 27-OCT-2011 20:43
Instrument: msdj.i
Client Sample ID: FV-GAGR-HDOH #2 (TO17B)



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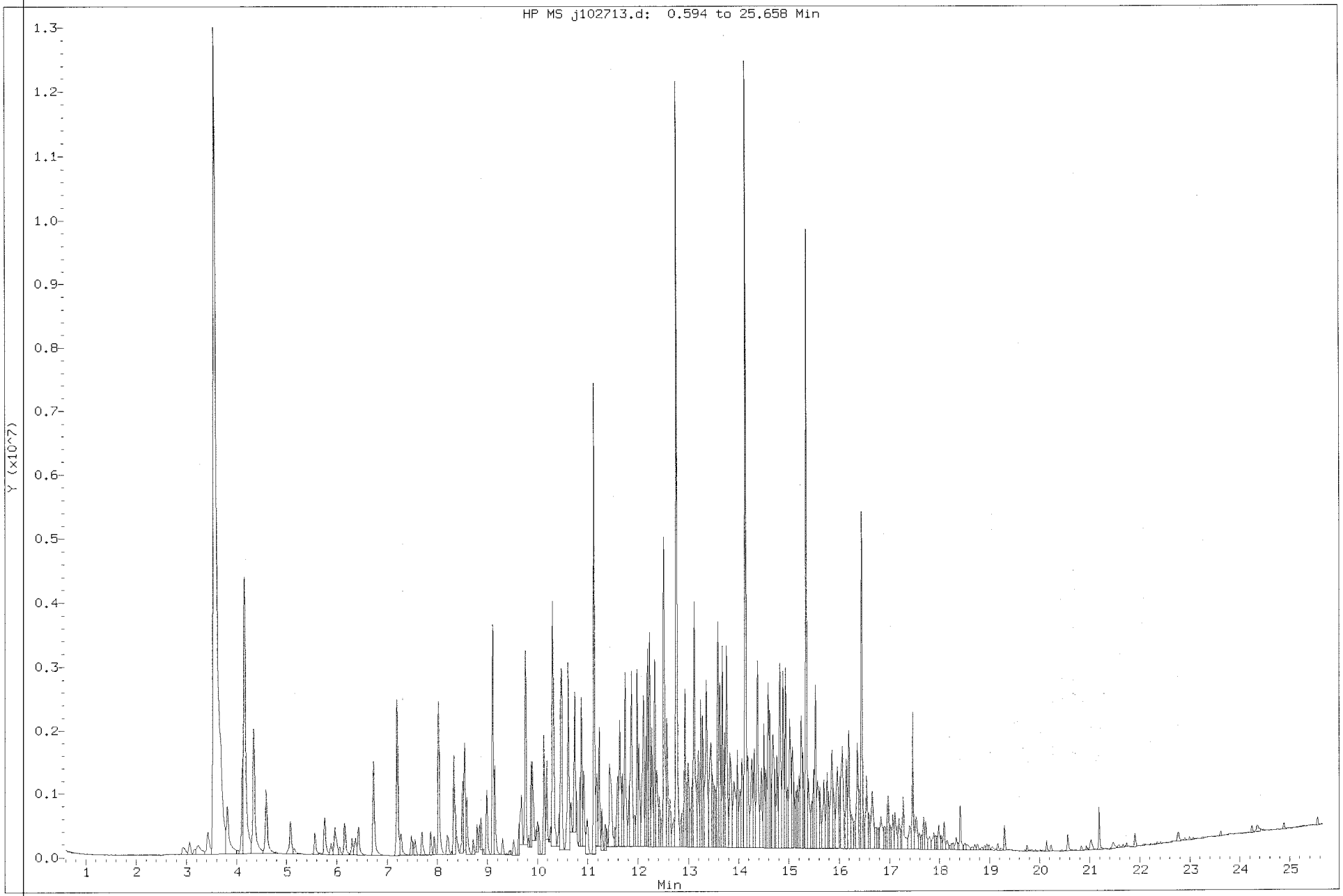
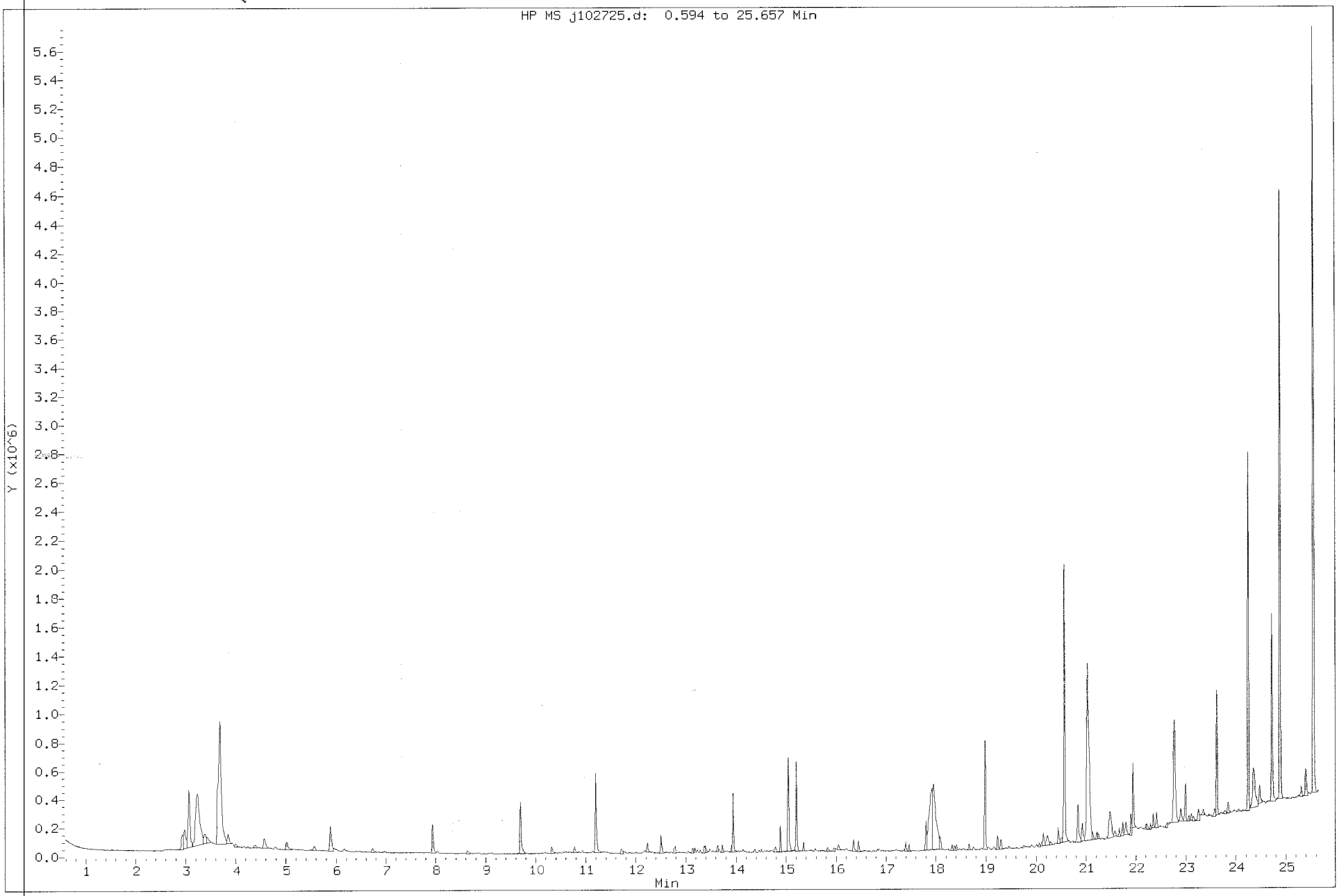
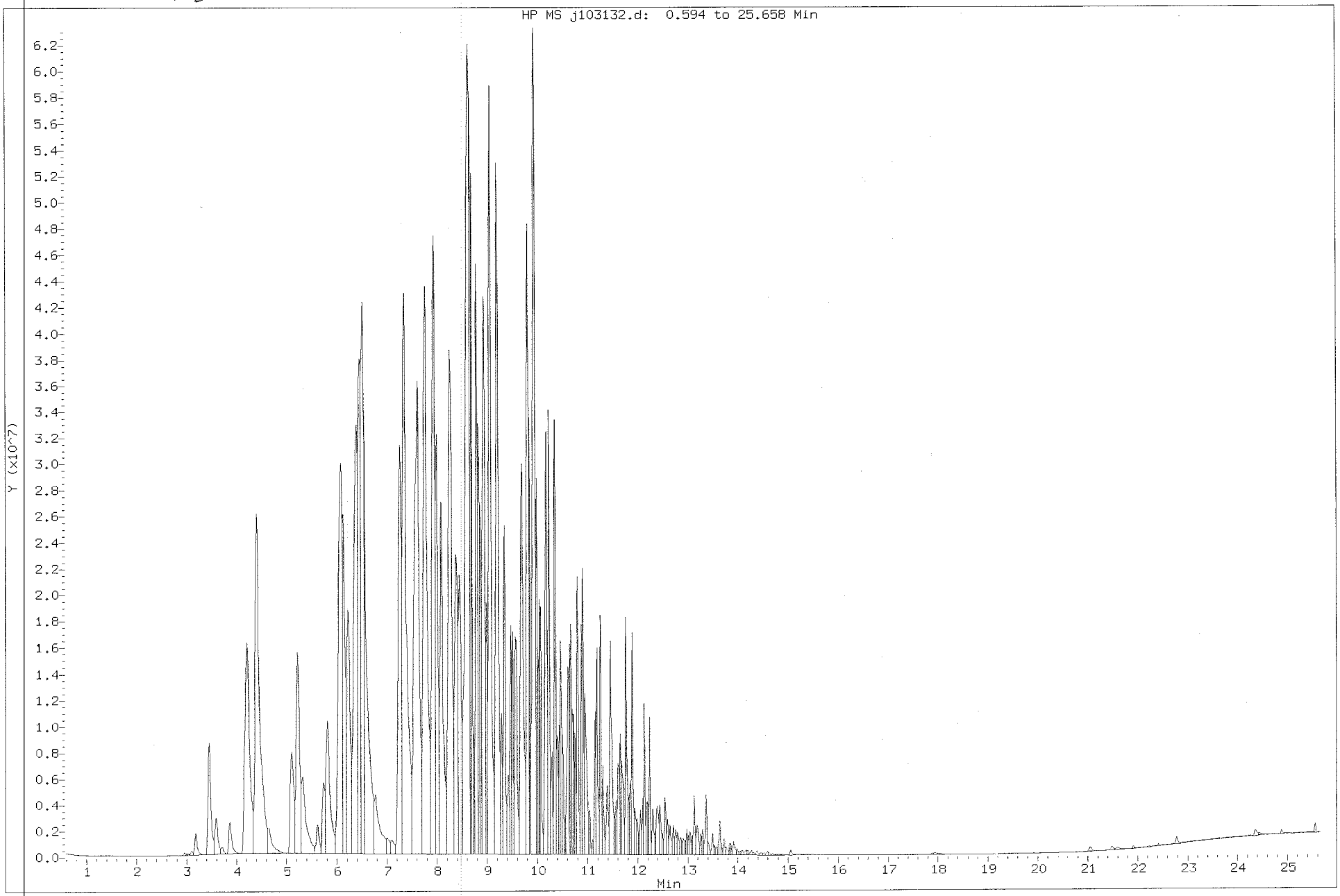
Injection Date: 27-OCT-2011 17:09
Instrument: msdj.i
Client Sample ID: JP8#1 (TO17A)



Data File: /chem/msdj.i/27oct11.b/j102725.d
Injection Date: 28-OCT-2011 00:19
Instrument: msdj.i
Client Sample ID: JP8#1 (TO17B)



Data File: /chem/msdj.i/31oct11.b/j103132.d
Injection Date: 01-NOV-2011 04:25
Instrument: msdj.i
Client Sample ID: HAFB-VP26-B05(18)(T017A)



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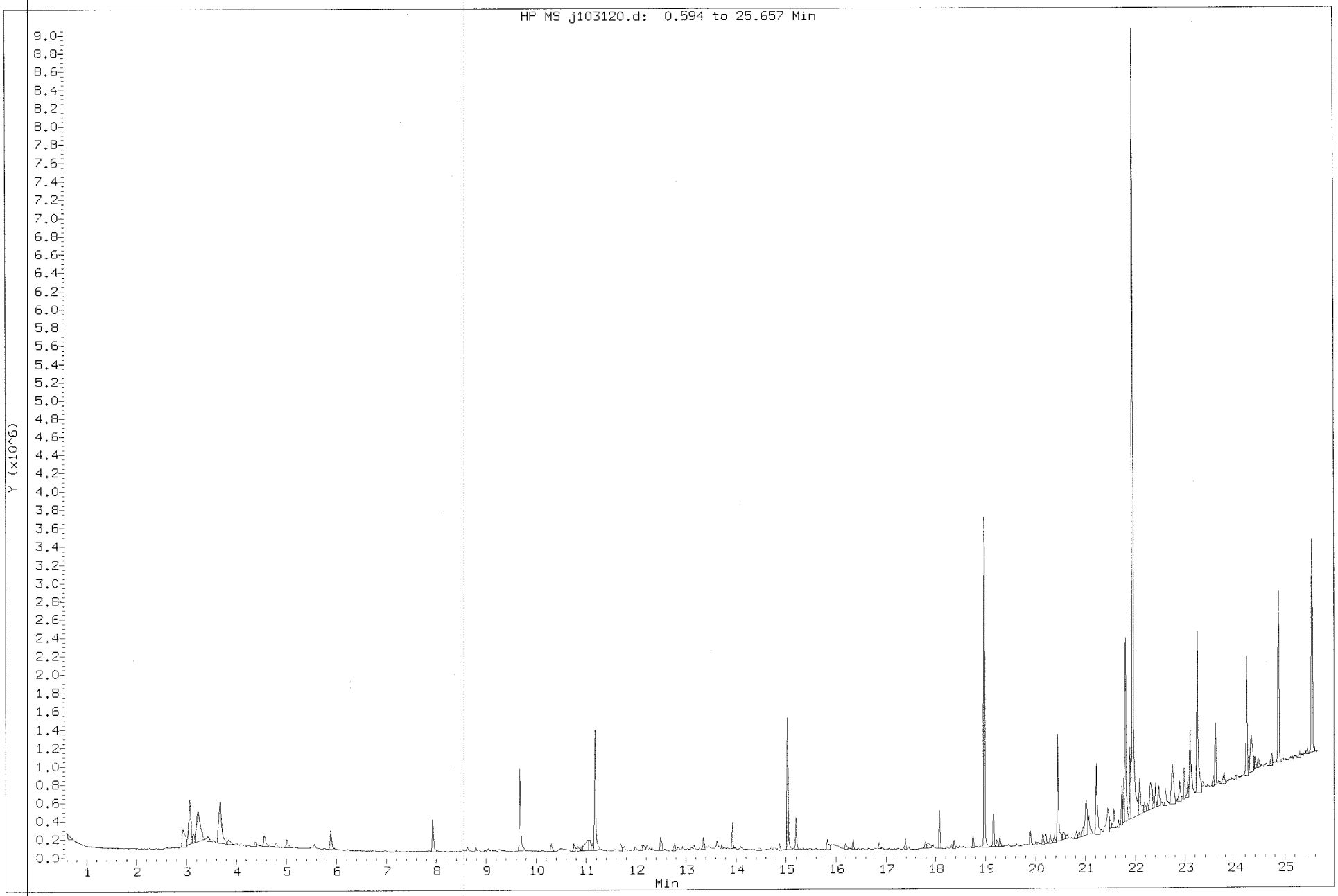
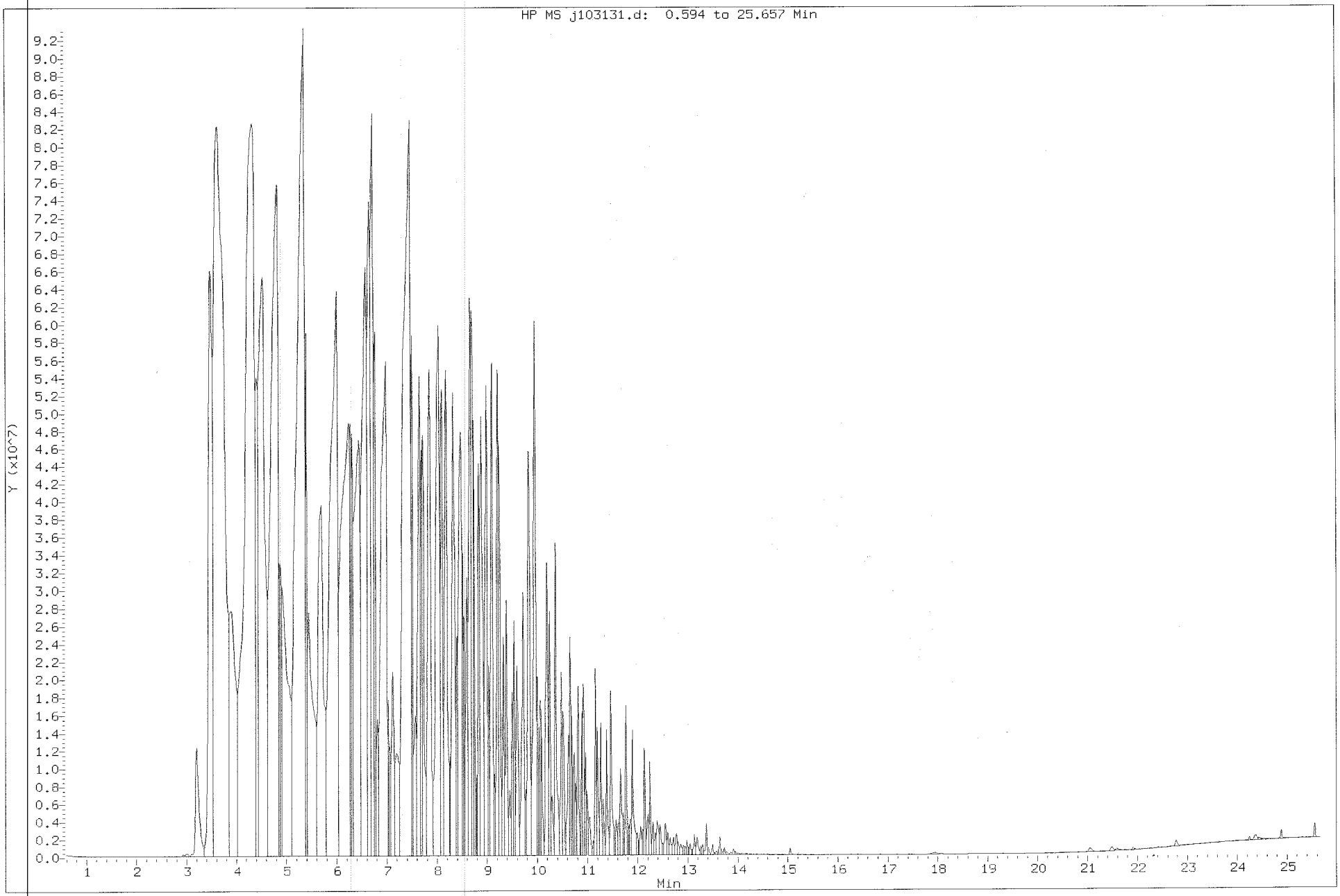
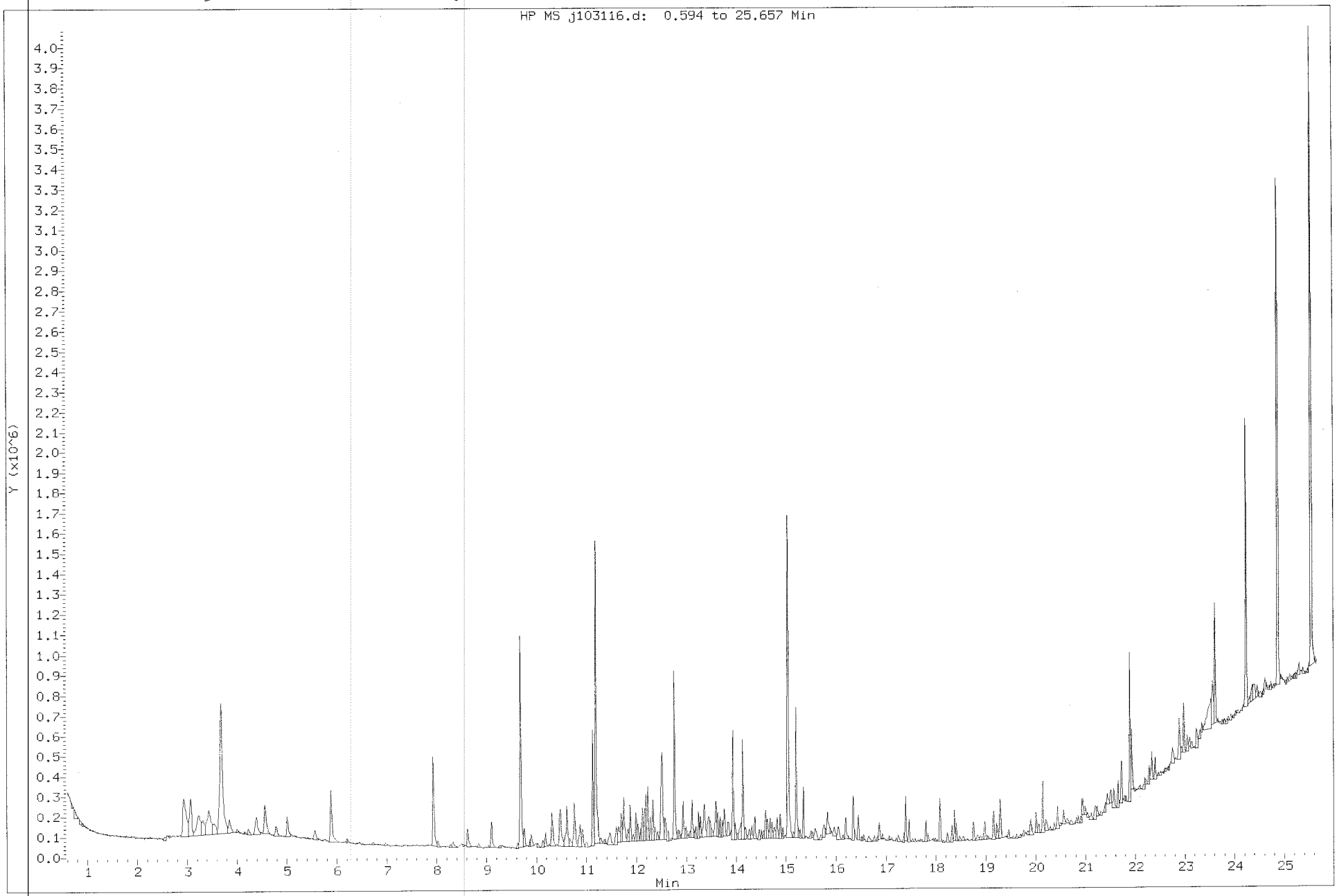
Injection Date: 31-OCT-2011 21:34
Instrument: msdj.i
Client Sample ID: HAFB-VP26-B05(1P)(T017B)



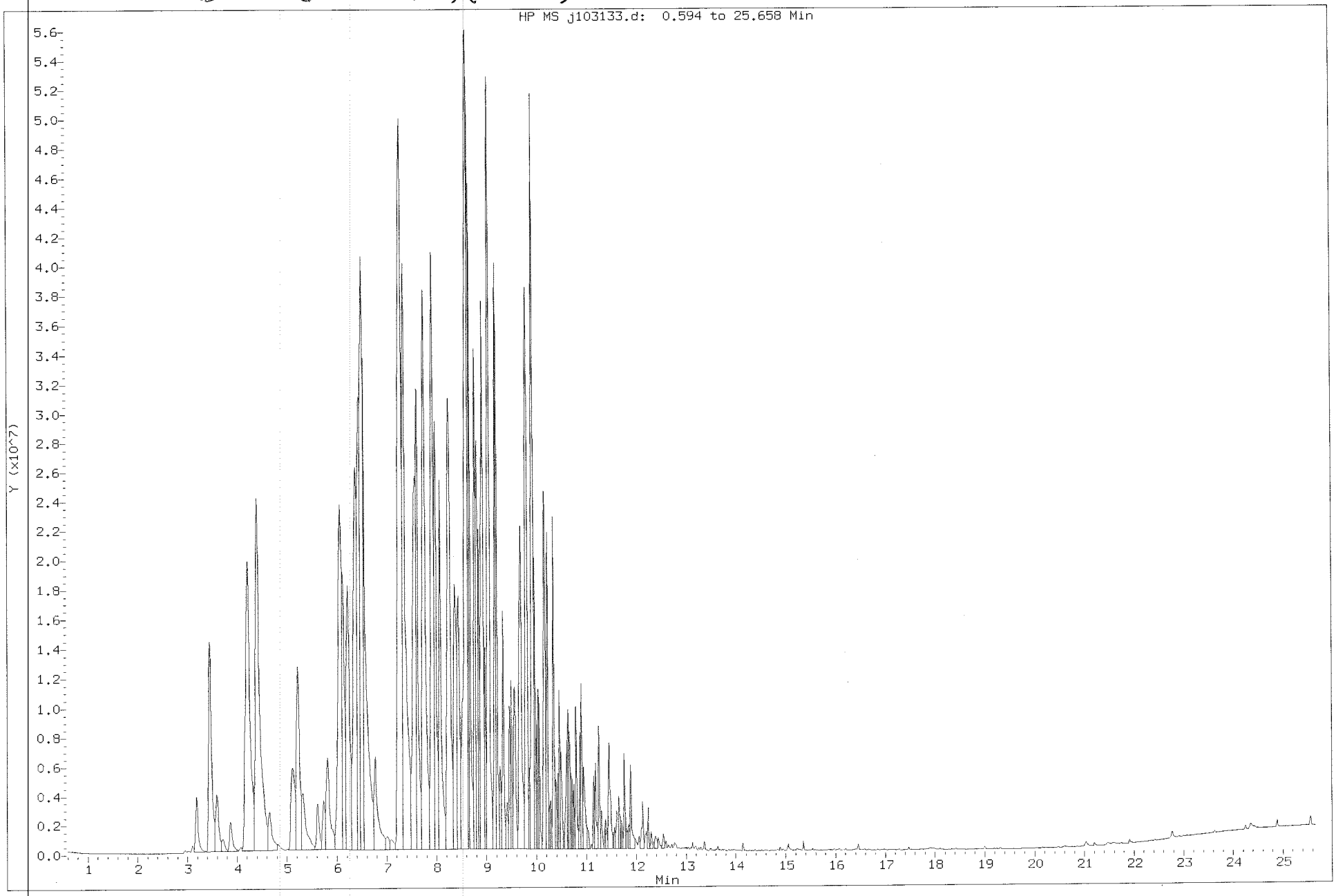
Data File: /chem/msdj.i/31oct11.b/j103131.d
Injection Date: 01-NOV-2011 03:51
Instrument: msdj.i
Client Sample ID: HAFB-VP26-B05(24)(T017A)



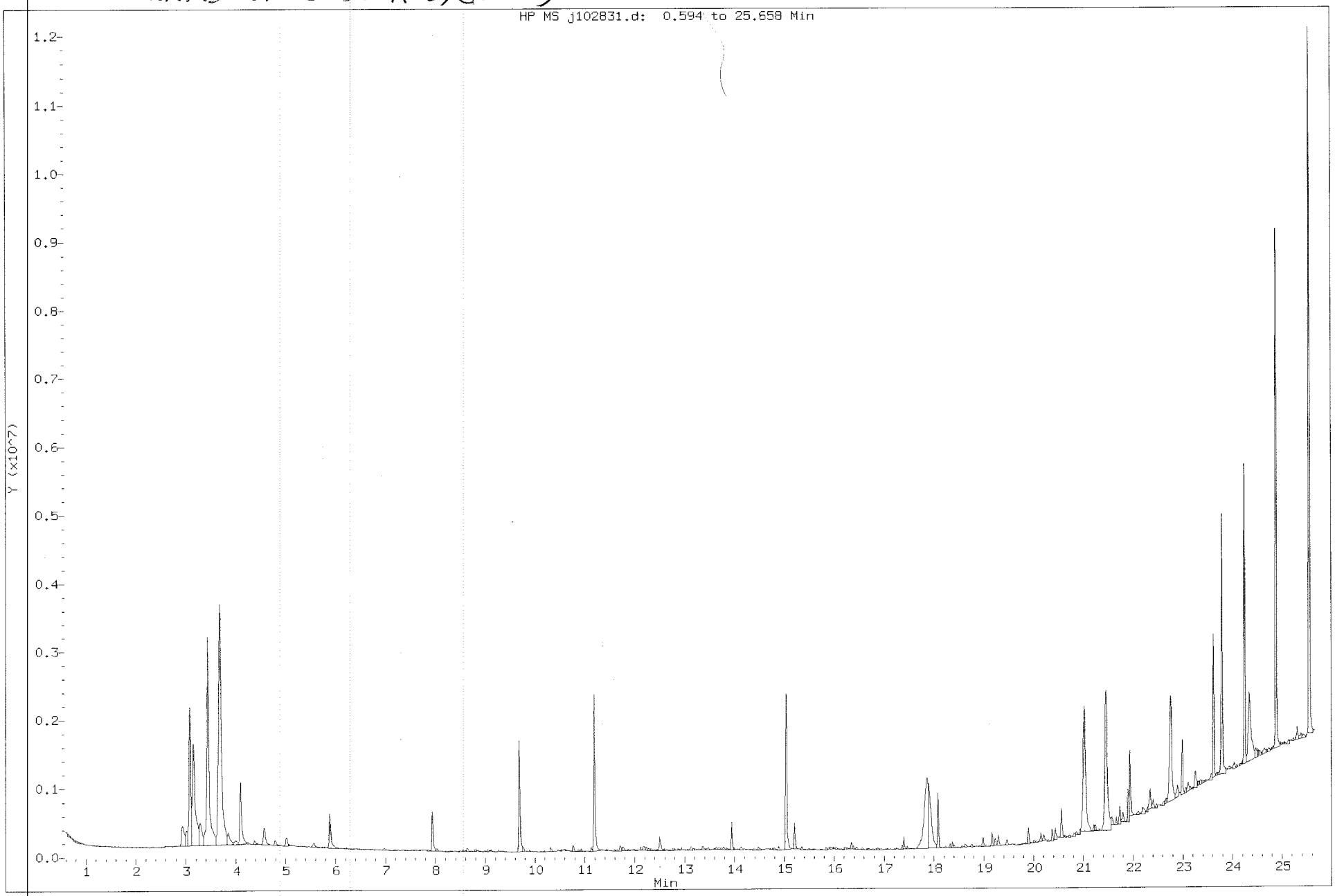
Data File: /chem/msdj.i/31oct11.b/j103116.d
Injection Date: 31-OCT-2011 18:59
Instrument: msdj.i
Client Sample ID: HAFB-VPZ6-B05(R4)(T017B)



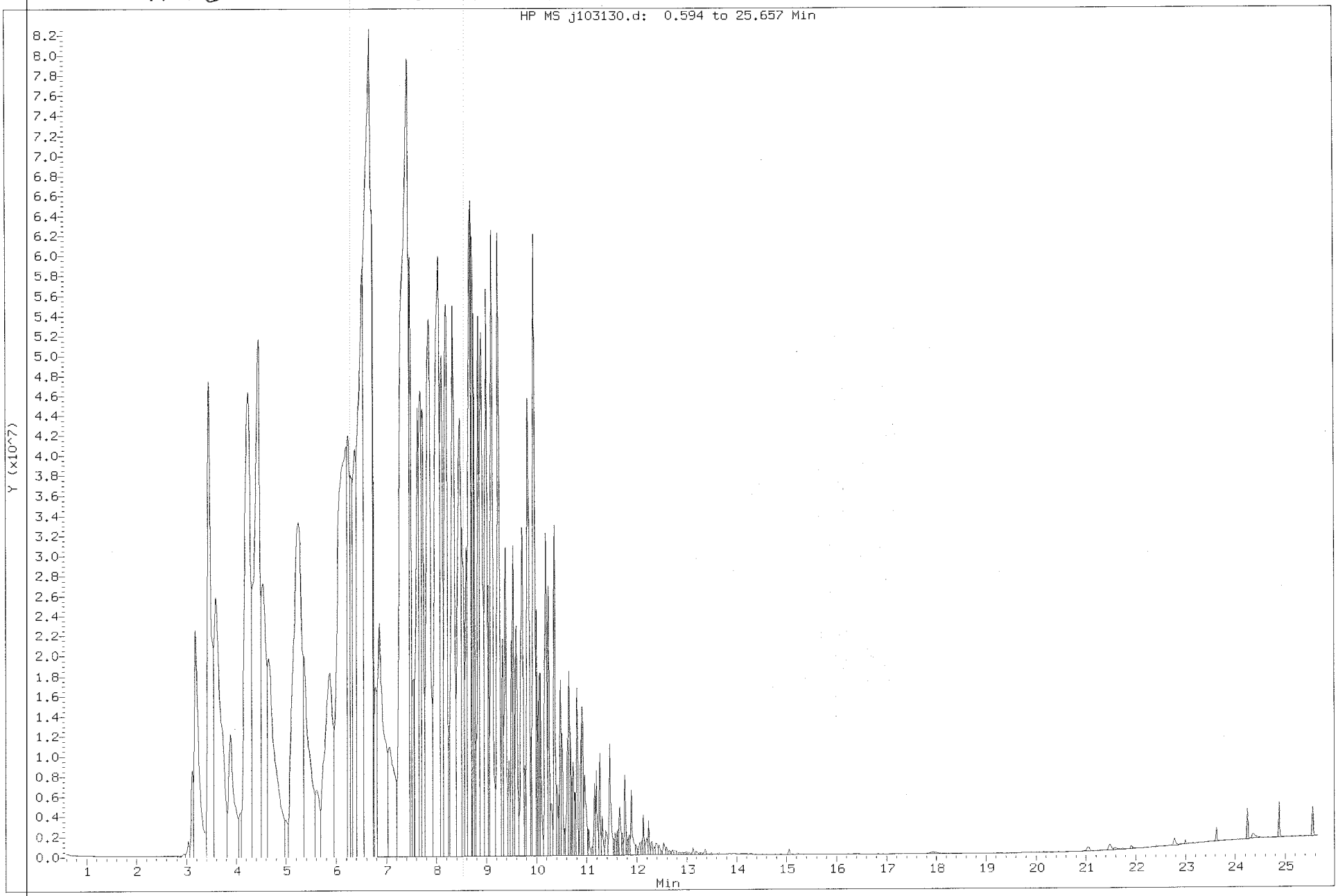
Data File: /chem/msdj.i/31oct11.b/j103133.d
Injection Date: 01-NOV-2011 04:59
Instrument: msdj.i
Client Sample ID: HAFB-VPZ6-B07(20)(T017A)



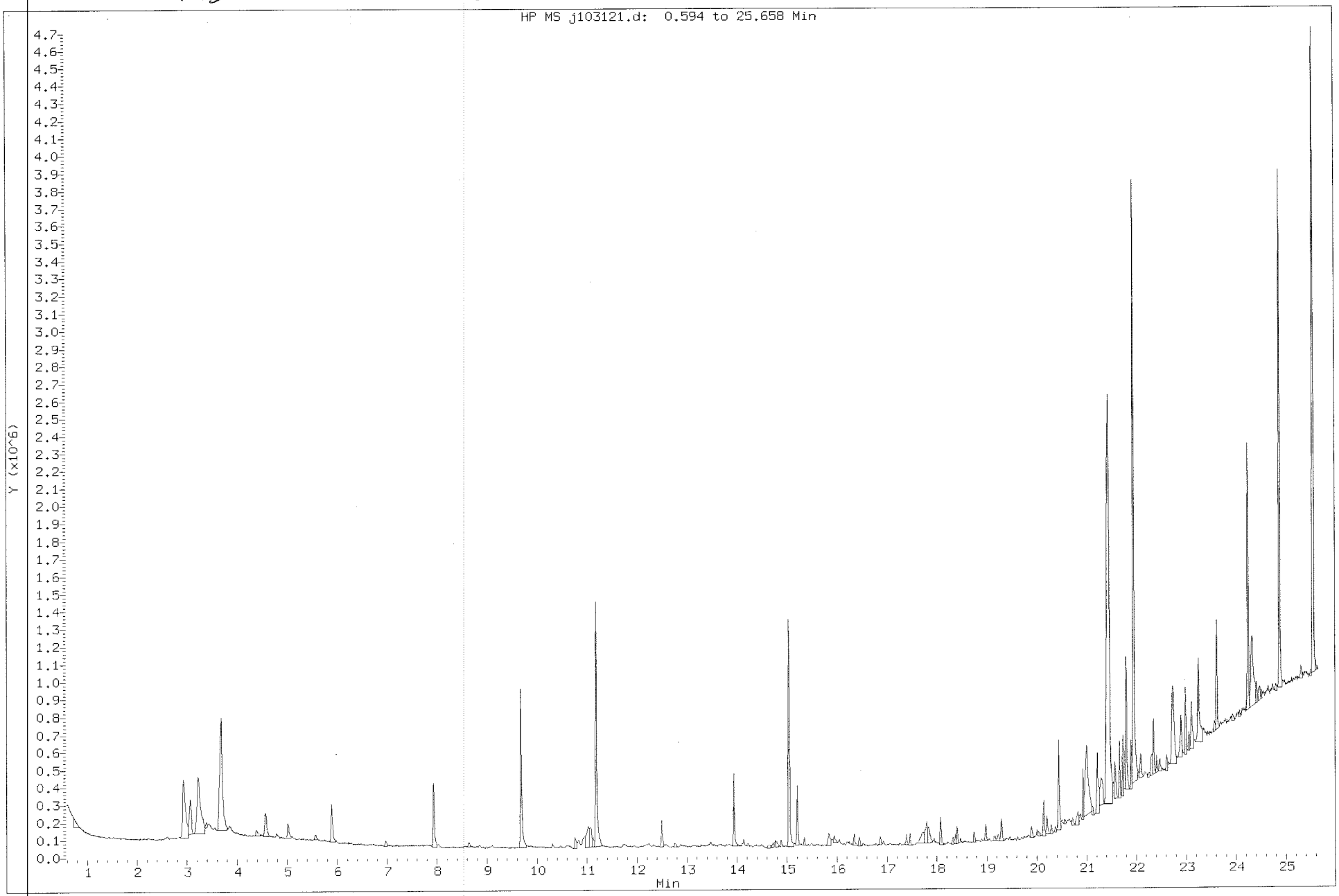
Data File: /chem/msdj.i/28oct11.b/j102831.d
Injection Date: 29-OCT-2011 03:07
Instrument: msdj.i
Client Sample ID: HAFB-VP26-B07(20)(T0178)



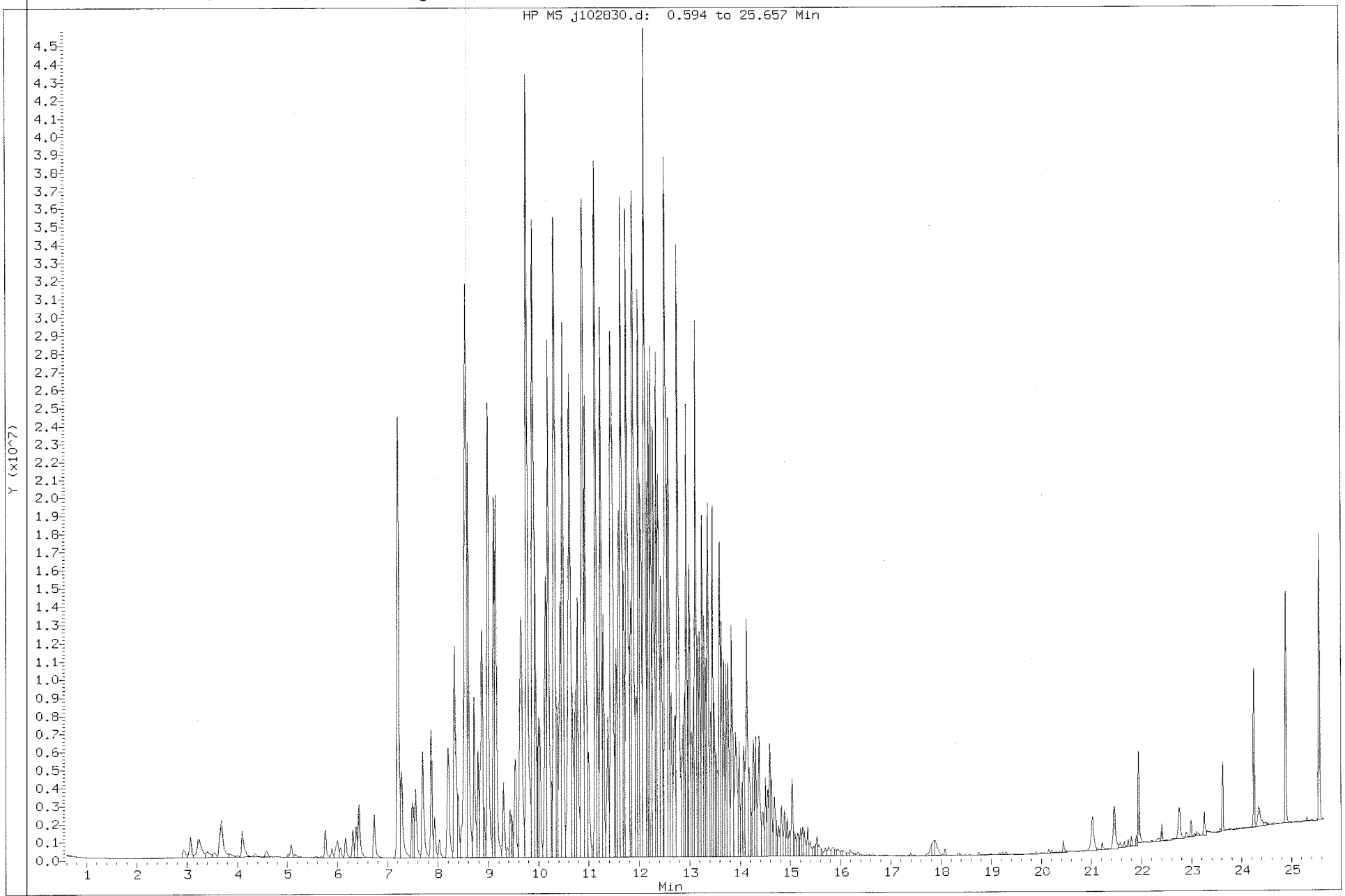
Data File: /chem/msdj.i/31oct11.b/j103130.d
Injection Date: 01-NOV-2011 03:17
Instrument: msdj.i
Client Sample ID: HAFB-VP26-B07(25)(T017A)



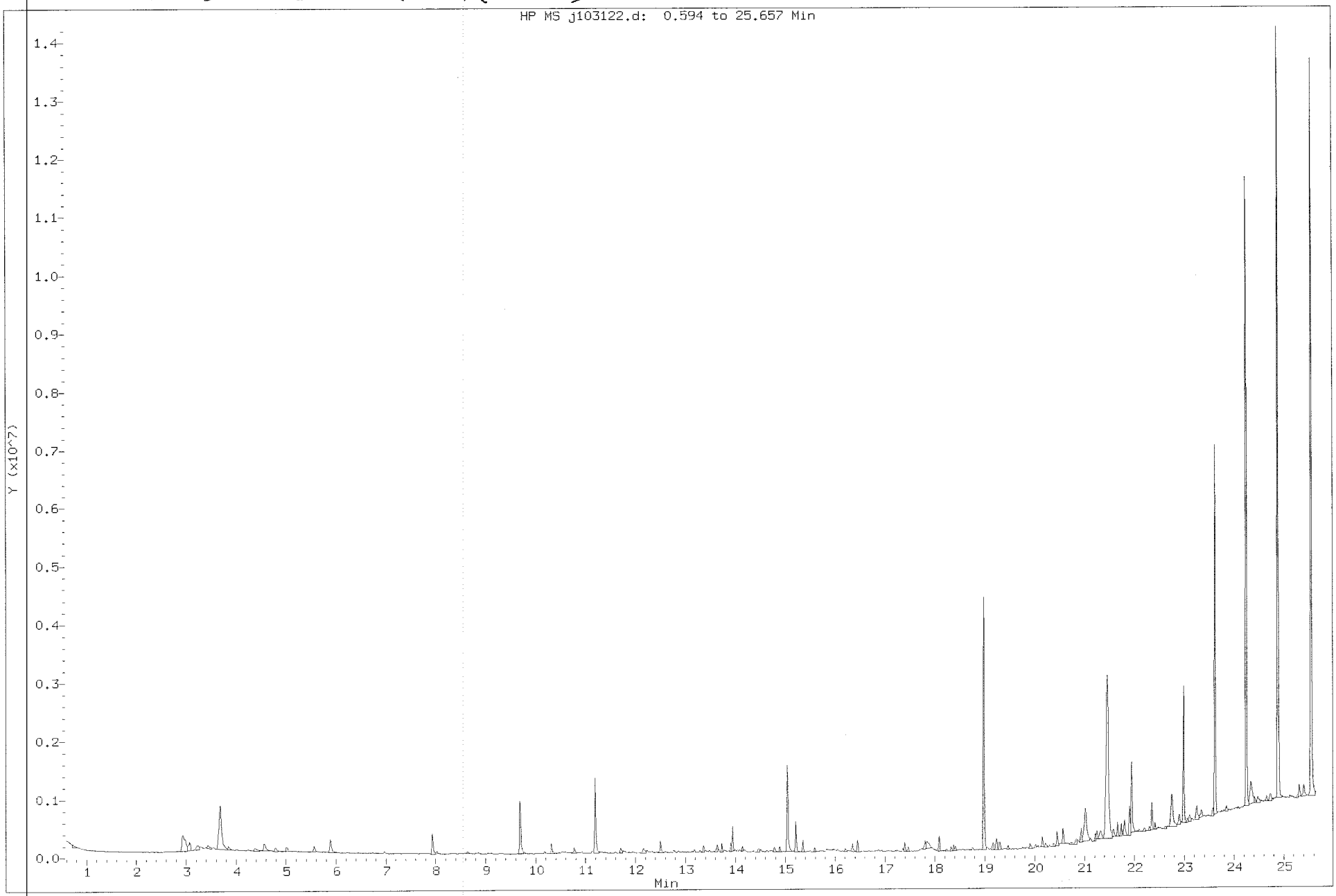
Data File: /chem/msdj.i/31oct11.b/j103121.d
Injection Date: 31-OCT-2011 22:10
Instrument: msdj.i
Client Sample ID: HAFB-VP26-B07(25)(TOTAL)



Data File: /chem/msdj.i/28oct11.b/j102830.d
Injection Date: 29-OCT-2011 02:31
Instrument: msdj.i
Client Sample ID: HAFB-ST03-B58 (347)(T017A)



Data File: /chem/msdj.i/31oct11.b/j103122.d
Injection Date: 31-OCT-2011 22:47
Instrument: msdj.i
Client Sample ID: HAFB-ST03-BS8(347)(TO17B)



Attachment 6: Laboratory Reports

- **TO-3**
- **TO-15**
- **Summa Canister MA-APH**
- **TO-17 (MA-APH, TPH, BTEXN)**
- **ASTM1945D**

Air Toxics LTD.
Laboratory Services Since 1989

10/21/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1110160D

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 10/8/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-3 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1110160D

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/08/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	10/21/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-SP43-VMP10	Modified TO-3	5.2 "Hg	15psi
02A	HAFB-SP43-VMP11	Modified TO-3	5.0 "Hg	15psi
03A	HAFB-SP43-VMP12	Modified TO-3	4.5 "Hg	15psi
04A	HAFB-SP43-VMP16	Modified TO-3	6.0 "Hg	15psi
05A	HAFB-SP43-VMP17	Modified TO-3	5.5 "Hg	15psi
06A	FV-GP01-HDOH#2	Modified TO-3	4.0 "Hg	15psi
07A	FV-GP08-HDOH#2	Modified TO-3	5.0 "Hg	15psi
08A	FV-GP16R-HDOH#2	Modified TO-3	5.5 "Hg	15psi
09A	JP8#1	Modified TO-3	4.0 "Hg	15psi
10A	Lab Blank	Modified TO-3	NA	NA
11A	LCS	Modified TO-3	NA	NA
11AA	LCSD	Modified TO-3	NA	NA
11B	LCS	Modified TO-3	NA	NA
11BB	LCSD	Modified TO-3	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 10/21/11

Laboratory Director

Certfication numbers: AZ Licensure AZ0719, CA NELAP - 02110CA, LA NELAP - 02089,
NY NELAP - 11291, TX NELAP - T104704434-11-3, UT NELAP -CA009332011-1, WA NELAP - C935
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/11 , Expiration date: 06/30/12.
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified TO-3
Tetra Tech EM, Inc.
Workorder# 1110160D

Nine 1 Liter Summa Canister (MA APH Certified) samples were received on October 08, 2011. The laboratory performed analysis for volatile organic compounds in air via modified EPA Method TO-3 using gas chromatography with photo ionization and flame ionization detection. The method involves concentrating up to 200 mL of sample. The concentrated aliquot is then dry purged to remove water vapor prior to entering the chromatographic system. The TPH (Gasoline Range) results are calculated using the response factor of Gasoline. A molecular weight of 100 is used to convert the TPH (Gasoline Range) ppmv result to ug/L.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***TO-3***	***ATL Modifications***
Daily Calibration Standard Frequency	Prior to sample analysis and every 4 - 6 hrs	Prior to sample analysis and after the analytical batch </= 20 samples
Initial Calibration Calculation	4-point calibration using a linear regression model	5-point calibration using average Response Factor
Initial Calibration Frequency	Weekly	When daily calibration standard recovery is outside 75 - 125 %, or upon significant changes to procedure or instrumentation
Moisture Control	Nafion system	Sorbent system
Minimum Detection Limit (MDL)	Calculated using the equation DL = A+3.3S, where A is intercept of calibration line and S is the standard deviation of at least 3 reps of low level standard	40 CFR Pt. 136 App. B
Preparation of Standards	Levels achieved through dilution of gas mixture	Levels achieved through loading various volumes of the gas mixture

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The detection of Benzene may have been masked in sample HAFB-SP43-VMP10 due to complex hydrocarbon interference.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:
B - Compound present in laboratory blank greater than reporting limit.
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED EPA METHOD TO-3 GC/PID/FID

Client Sample ID: HAFB-SP43-VMP10

Lab ID#: 1110160D-01A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Toluene	0.32	1.2	23	87
Ethyl Benzene	0.32	1.4	13 M	58 M
m,p-Xylene	0.32	1.4	37 M	160 M
o-Xylene	0.32	1.4	7.2 M	31 M
TPH (Gasoline Range)	8.1	33	5500	22000

Client Sample ID: HAFB-SP43-VMP11

Lab ID#: 1110160D-02A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.32	1.0	3.1 M	10 M
Toluene	0.32	1.2	32	120
Ethyl Benzene	0.32	1.4	24	110
m,p-Xylene	0.32	1.4	46 M	200 M
o-Xylene	0.32	1.4	7.1	31
TPH (Gasoline Range)	8.1	33	7400	30000

Client Sample ID: HAFB-SP43-VMP12

Lab ID#: 1110160D-03A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Toluene	0.0024	0.0090	0.0036	0.014
Ethyl Benzene	0.0024	0.010	0.0027 M	0.012 M
m,p-Xylene	0.0024	0.010	0.0063 M	0.027 M
TPH (Gasoline Range)	0.060	0.24	0.78	3.2

Client Sample ID: HAFB-SP43-VMP16

Lab ID#: 1110160D-04A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Toluene	1.0	3.8	100	400

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED EPA METHOD TO-3 GC/PID/FID

Client Sample ID: HAFB-SP43-VMP16

Lab ID#: 1110160D-04A

Ethyl Benzene	1.0	4.4	24	110
m,p-Xylene	1.0	4.4	54 M	230 M
o-Xylene	1.0	4.4	5.5	24
TPH (Gasoline Range)	25	100	20000	82000

Client Sample ID: HAFB-SP43-VMP17

Lab ID#: 1110160D-05A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.099	0.32	3.1 M	9.8 M
Toluene	0.099	0.37	9.6	36
Ethyl Benzene	0.099	0.43	4.9	21
m,p-Xylene	0.099	0.43	11	49
o-Xylene	0.099	0.43	2.0	8.9
TPH (Gasoline Range)	2.5	10	2000	8000

Client Sample ID: FV-GP01-HDOH#2

Lab ID#: 1110160D-06A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0023	0.0074	0.030	0.096
Ethyl Benzene	0.0023	0.010	0.061	0.26
m,p-Xylene	0.0023	0.010	0.053 M	0.23 M
o-Xylene	0.0023	0.010	0.0083 M	0.036 M
TPH (Gasoline Range)	0.058	0.24	9.5	39

Client Sample ID: FV-GP08-HDOH#2

Lab ID#: 1110160D-07A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.032	0.10	0.76	2.4
Toluene	0.032	0.12	0.86	3.3
Ethyl Benzene	0.032	0.14	1.8	8.0

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED EPA METHOD TO-3 GC/PID/FID

Client Sample ID: FV-GP08-HDOH#2

Lab ID#: 1110160D-07A

m,p-Xylene	0.032	0.14	4.1	18
o-Xylene	0.032	0.14	1.2	5.3
TPH (Gasoline Range)	0.81	3.3	540	2200

Client Sample ID: FV-GP16R-HDOH#2

Lab ID#: 1110160D-08A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.099	0.32	0.70	2.2
Toluene	0.099	0.37	0.11 M	0.42 M
Ethyl Benzene	0.099	0.43	10	44
m,p-Xylene	0.099	0.43	4.1 M	18 M
o-Xylene	0.099	0.43	4.4 M	19 M
TPH (Gasoline Range)	2.5	10	1500	6100

Client Sample ID: JP8#1

Lab ID#: 1110160D-09A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.12	0.37	6.0	19
Toluene	0.12	0.44	18	67
Ethyl Benzene	0.12	0.50	4.8	21
m,p-Xylene	0.12	0.50	16	67
o-Xylene	0.12	0.50	7.3	32
TPH (Gasoline Range)	2.9	12	1800	7200

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP10

Lab ID#: 1110160D-01A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101307**	**Date of Collection: 10/5/11 2:05:00 PM**	
Dil. Factor:	**325**	**Date of Analysis: 10/13/11 09:25 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.32	1.0	Not Detected M	Not Detected M
Toluene	0.32	1.2	23	87
Ethyl Benzene	0.32	1.4	13 M	58 M
m,p-Xylene	0.32	1.4	37 M	160 M
o-Xylene	0.32	1.4	7.2 M	31 M
TPH (Gasoline Range)	8.1	33	5500	22000

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	95	75-150
Fluorobenzene (PID)	85	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP11

Lab ID#: 1110160D-02A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101308**	**Date of Collection: 10/5/11 1:15:00 PM**	
Dil. Factor:	**323**	**Date of Analysis: 10/13/11 10:17 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.32	1.0	3.1 M	10 M
Toluene	0.32	1.2	32	120
Ethyl Benzene	0.32	1.4	24	110
m,p-Xylene	0.32	1.4	46 M	200 M
o-Xylene	0.32	1.4	7.1	31
TPH (Gasoline Range)	8.1	33	7400	30000

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	110	75-150
Fluorobenzene (PID)	98	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP12

Lab ID#: 1110160D-03A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101309**	**Date of Collection: 10/5/11 12:44:00 PM**	
Dil. Factor:	**2.38**	**Date of Analysis: 10/13/11 11:08 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0024	0.0076	Not Detected	Not Detected
Toluene	0.0024	0.0090	0.0036	0.014
Ethyl Benzene	0.0024	0.010	0.0027 M	0.012 M
m,p-Xylene	0.0024	0.010	0.0063 M	0.027 M
o-Xylene	0.0024	0.010	Not Detected	Not Detected
TPH (Gasoline Range)	0.060	0.24	0.78	3.2

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	96	75-150
Fluorobenzene (PID)	82	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP16

Lab ID#: 1110160D-04A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101311**	**Date of Collection: 10/5/11 1:42:00 PM**	
Dil. Factor:	**1010**	**Date of Analysis: 10/14/11 07:07 AM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	1.0	3.2	Not Detected	Not Detected
Toluene	1.0	3.8	100	400
Ethyl Benzene	1.0	4.4	24	110
m,p-Xylene	1.0	4.4	54 M	230 M
o-Xylene	1.0	4.4	5.5	24
TPH (Gasoline Range)	25	100	20000	82000

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	98	75-150
Fluorobenzene (PID)	88	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP17

Lab ID#: 1110160D-05A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101312**	**Date of Collection: 10/5/11 11:52:00 AM**	
Dil. Factor:	**98.8**	**Date of Analysis: 10/14/11 07:50 AM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.099	0.32	3.1 M	9.8 M
Toluene	0.099	0.37	9.6	36
Ethyl Benzene	0.099	0.43	4.9	21
m,p-Xylene	0.099	0.43	11	49
o-Xylene	0.099	0.43	2.0	8.9
TPH (Gasoline Range)	2.5	10	2000	8000

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	97	75-150
Fluorobenzene (PID)	86	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP01-HDOH#2

Lab ID#: 1110160D-06A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101318**	**Date of Collection: 10/6/11 1:45:00 PM**	
Dil. Factor:	**2.33**	**Date of Analysis: 10/14/11 12:09 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0023	0.0074	0.030	0.096
Toluene	0.0023	0.0088	Not Detected	Not Detected
Ethyl Benzene	0.0023	0.010	0.061	0.26
m,p-Xylene	0.0023	0.010	0.053 M	0.23 M
o-Xylene	0.0023	0.010	0.0083 M	0.036 M
TPH (Gasoline Range)	0.058	0.24	9.5	39

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	102	75-150
Fluorobenzene (PID)	86	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP08-HDOH#2

Lab ID#: 1110160D-07A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101317**	**Date of Collection: 10/6/11 1:06:00 PM**	
Dil. Factor:	**32.3**	**Date of Analysis: 10/14/11 11:26 AM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.032	0.10	0.76	2.4
Toluene	0.032	0.12	0.86	3.3
Ethyl Benzene	0.032	0.14	1.8	8.0
m,p-Xylene	0.032	0.14	4.1	18
o-Xylene	0.032	0.14	1.2	5.3
TPH (Gasoline Range)	0.81	3.3	540	2200

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	97	75-150
Fluorobenzene (PID)	78	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP16R-HDOH#2

Lab ID#: 1110160D-08A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101315**	**Date of Collection: 10/6/11 12:19:00 PM**	
Dil. Factor:	**98.8**	**Date of Analysis: 10/14/11 09:57 AM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.099	0.32	0.70	2.2
Toluene	0.099	0.37	0.11 M	0.42 M
Ethyl Benzene	0.099	0.43	10	44
m,p-Xylene	0.099	0.43	4.1 M	18 M
o-Xylene	0.099	0.43	4.4 M	19 M
TPH (Gasoline Range)	2.5	10	1500	6100

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	97	75-150
Fluorobenzene (PID)	76	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: JP8#1

Lab ID#: 1110160D-09A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101313**	**Date of Collection: 10/6/11 3:15:00 PM**	
Dil. Factor:	**116**	**Date of Analysis: 10/14/11 08:35 AM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.12	0.37	6.0	19
Toluene	0.12	0.44	18	67
Ethyl Benzene	0.12	0.50	4.8	21
m,p-Xylene	0.12	0.50	16	67
o-Xylene	0.12	0.50	7.3	32
TPH (Gasoline Range)	2.9	12	1800	7200

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	113	75-150
Fluorobenzene (PID)	84	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110160D-10A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101305**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/13/11 07:26 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0010	0.0032	Not Detected	Not Detected
Toluene	0.0010	0.0038	Not Detected	Not Detected
Ethyl Benzene	0.0010	0.0043	Not Detected	Not Detected
m,p-Xylene	0.0010	0.0043	Not Detected	Not Detected
o-Xylene	0.0010	0.0043	Not Detected	Not Detected
TPH (Gasoline Range)	0.025	0.10	Not Detected	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	108	75-150
Fluorobenzene (PID)	94	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110160D-11A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101304b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/13/11 06:34 PM**	

Compound	%Recovery
Benzene	88
Toluene	83
Ethyl Benzene	78
m,p-Xylene	80
o-Xylene	85

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Fluorobenzene (PID)	91	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1110160D-11AA

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101323b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/14/11 04:02 PM**	

Compound	%Recovery
Benzene	86
Toluene	84
Ethyl Benzene	77
m,p-Xylene	78
o-Xylene	82

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Fluorobenzene (PID)	92	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110160D-11B

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101302**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/13/11 05:17 PM**	

Compound	**%Recovery**
TPH (Gasoline Range)	97

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Fluorobenzene (FID)	119	75-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1110160D-11BB

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d101321**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/14/11 02:35 PM**	

Compound	**%Recovery**
TPH (Gasoline Range)	90

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Fluorobenzene (FID)	105	75-150

Air Toxics LTD.
Laboratory Services Since 1989

11/2/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1110413C

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 10/20/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-3 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

WORK ORDER #: 1110413C

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/20/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/02/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-VP26-B05(18)	Modified TO-3	4.0 "Hg	5 psi
02A	HAFB-VP26-B05(24)	Modified TO-3	3.5 "Hg	5 psi
03A	HAFB-VP26-B07(20)	Modified TO-3	2.5 "Hg	5 psi
04A	HAFB-VP26-B07(25)	Modified TO-3	4.5 "Hg	5 psi
05A	HAFB-ST03-B58(347)	Modified TO-3	4.4 "Hg	5 psi
06A	HAFB-ST03-B58(422)	Modified TO-3	5.0 "Hg	5 psi
07A	HAFB-ST03-B58(492)	Modified TO-3	4.6 "Hg	5 psi
08A	HAFB-ST03-B59(388)	Modified TO-3	5.0 "Hg	5 psi
09A	HH-OU1C-MW10SG	Modified TO-3	6.0 "Hg	5 psi
10A	HH-OU1C-MW22R	Modified TO-3	5.4 "Hg	5 psi
11A	HH-OU1C-OTNS1	Modified TO-3	4.2 "Hg	5 psi
12A	GASOLINE#2	Modified TO-3	2.6 "Hg	5 psi
13A	DIESEL#3	Modified TO-3	3.2 "Hg	5 psi
14A	GASOLINE-EXHAUST	Modified TO-3	3.2 "Hg	5 psi
15A	DIESEL-EXHAUST	Modified TO-3	3.0 "Hg	5 psi
16A	Lab Blank	Modified TO-3	NA	NA
16B	Lab Blank	Modified TO-3	NA	NA

Continued on next page

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1110413C

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/20/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/02/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
17A	LCS	Modified TO-3	NA	NA
17AA	LCSD	Modified TO-3	NA	NA
17B	LCS	Modified TO-3	NA	NA
17BB	LCSD	Modified TO-3	NA	NA
17C	LCS	Modified TO-3	NA	NA
17CC	LCSD	Modified TO-3	NA	NA
17D	LCS	Modified TO-3	NA	NA
17DD	LCSD	Modified TO-3	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 11/02/11

Laboratory Director

Certfication numbers: AZ Licensure AZ0719, CA NELAP - 02110CA, LA NELAP - 02089,
NY NELAP - 11291, TX NELAP - T104704434-11-3, UT NELAP -CA009332011-1, WA NELAP - C935
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/11 , Expiration date: 06/30/12.
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified TO-3
Tetra Tech EM, Inc.
Workorder# 1110413C

Fifteen 1 Liter Summa Canister (MA APH Certified) samples were received on October 20, 2011. The laboratory performed analysis for volatile organic compounds in air via modified EPA Method TO-3 using gas chromatography with photo ionization and flame ionization detection. The method involves concentrating up to 200 mL of sample. The concentrated aliquot is then dry purged to remove water vapor prior to entering the chromatographic system. The TPH (Gasoline Range) results are calculated using the response factor of Gasoline. A molecular weight of 100 is used to convert the TPH (Gasoline Range) ppmv result to ug/L.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***TO-3***	***ATL Modifications***
Daily Calibration Standard Frequency	Prior to sample analysis and every 4 - 6 hrs	Prior to sample analysis and after the analytical batch </= 20 samples
Initial Calibration Calculation	4-point calibration using a linear regression model	5-point calibration using average Response Factor
Initial Calibration Frequency	Weekly	When daily calibration standard recovery is outside 75 - 125 %, or upon significant changes to procedure or instrumentation
Moisture Control	Nafion system	Sorbent system
Minimum Detection Limit (MDL)	Calculated using the equation DL = A+3.3S, where A is intercept of calibration line and S is the standard deviation of at least 3 reps of low level standard	40 CFR Pt. 136 App. B
Preparation of Standards	Levels achieved through dilution of gas mixture	Levels achieved through loading various volumes of the gas mixture

Receiving Notes

The Chain of Custody (COC) information for sample HH-OU1C-MW22R and HH-OU1C-OTNS1 did not match the information on the canister with regard to canister identification. The client was notified of the discrepancy and the information on the canister was used to process and report the samples.

The Chain of Custody contained incorrect method information. ATL proceeded with the analysis as per the original contract or verbal agreement.

Analytical Notes

The recovery of surrogate Fluorobenzene in samples HAFB-VP26-B05(24), HH-OU1C-MW10SG, and HH-OU1C-MW22R was outside control limits due to high level hydrocarbon matrix interference. Data is reported as qualified.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:
B - Compound present in laboratory blank greater than reporting limit.
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED EPA METHOD TO-3 GC/PID/FID

Client Sample ID: HAFB-VP26-B05(18)

Lab ID#: 1110413C-01A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.62	2.0	46 M	150 M
Toluene	0.62	2.3	52	200
Ethyl Benzene	0.62	2.7	5.7	25
m,p-Xylene	0.62	2.7	8.1	35
o-Xylene	0.62	2.7	1.8 M	7.8 M
TPH (Gasoline Range)	16	63	11000	46000

Client Sample ID: HAFB-VP26-B05(24)

Lab ID#: 1110413C-02A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	3.0	9.7	320	1000
Toluene	3.0	11	32	120
TPH (Gasoline Range)	76	310	77000	320000

Client Sample ID: HAFB-VP26-B07(20)

Lab ID#: 1110413C-03A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.58	1.9	58 M	180 M
Toluene	0.58	2.2	35	130
Ethyl Benzene	0.58	2.5	5.6	24
m,p-Xylene	0.58	2.5	3.5	15
TPH (Gasoline Range)	15	60	10000	42000

Client Sample ID: HAFB-VP26-B07(25)

Lab ID#: 1110413C-04A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	2.0	6.3	220	700
Toluene	2.0	7.5	42	160

Summary of Detected Compounds
MODIFIED EPA METHOD TO-3 GC/PID/FID

Client Sample ID: HAFB-VP26-B07(25)

Lab ID#: 1110413C-04A

m,p-Xylene	2.0	8.6	2.2	9.5
TPH (Gasoline Range)	50	200	35000	140000

Client Sample ID: HAFB-ST03-B58(347)

Lab ID#: 1110413C-05A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Toluene	0.026	0.099	0.89	3.4
m,p-Xylene	0.026	0.11	4.7 M	20 M
o-Xylene	0.026	0.11	1.4	5.9
TPH (Gasoline Range)	0.66	2.7	350	1400

Client Sample ID: HAFB-ST03-B58(422)

Lab ID#: 1110413C-06A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.022	0.069	0.16 M	0.50 M
Toluene	0.022	0.081	1.1	4.0
m,p-Xylene	0.022	0.093	5.2 M	23 M
o-Xylene	0.022	0.093	1.5	6.4
TPH (Gasoline Range)	0.54	2.2	410	1700

Client Sample ID: HAFB-ST03-B58(492)

Lab ID#: 1110413C-07A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.026	0.084	0.24 M	0.75 M
Toluene	0.026	0.099	1.1	4.1
m,p-Xylene	0.026	0.11	5.2 M	23 M
o-Xylene	0.026	0.11	1.5	6.3
TPH (Gasoline Range)	0.66	2.7	410	1700

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED EPA METHOD TO-3 GC/PID/FID

Client Sample ID: HAFB-ST03-B59(388)

Lab ID#: 1110413C-08A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0034	0.011	0.18	0.58
Toluene	0.0034	0.013	0.17	0.64
Ethyl Benzene	0.0034	0.014	0.067 M	0.29 M
m,p-Xylene	0.0034	0.014	0.62	2.7
o-Xylene	0.0034	0.014	0.21	0.90
TPH (Gasoline Range)	0.084	0.34	43	180

Client Sample ID: HH-OU1C-MW10SG

Lab ID#: 1110413C-09A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	1.7	5.4	110 M	360 M
Toluene	1.7	6.3	65	250
Ethyl Benzene	1.7	7.3	6.7	29
m,p-Xylene	1.7	7.3	12 M	53 M
o-Xylene	1.7	7.3	1.8	8.0
TPH (Gasoline Range)	42	170	25000	100000

Client Sample ID: HH-OU1C-MW22R

Lab ID#: 1110413C-10A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.65	2.1	42 M	130 M
Toluene	0.65	2.4	19	70
Ethyl Benzene	0.65	2.8	3.5	15
m,p-Xylene	0.65	2.8	7.3 M	32 M
o-Xylene	0.65	2.8	1.8	7.8
TPH (Gasoline Range)	16	67	9500	39000

Client Sample ID: HH-OU1C-OTNS1

Lab ID#: 1110413C-11A

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED EPA METHOD TO-3 GC/PID/FID

Client Sample ID: HH-OU1C-OTNS1

Lab ID#: 1110413C-11A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0021	0.0067	0.011 M	0.034 M
TPH (Gasoline Range)	0.052	0.21	0.51	2.1

Client Sample ID: GASOLINE#2

Lab ID#: 1110413C-12A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.15	0.47	8.7	28
Toluene	0.15	0.55	24	92
Ethyl Benzene	0.15	0.64	1.7	7.5
m,p-Xylene	0.15	0.64	6.6	29
o-Xylene	0.15	0.64	2.2	9.5
TPH (Gasoline Range)	3.7	15	920	3800

Client Sample ID: DIESEL#3

Lab ID#: 1110413C-13A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0076	0.024	0.64 M	2.0 M
Toluene	0.0076	0.029	1.6	6.2
Ethyl Benzene	0.0076	0.033	0.56 M	2.4 M
m,p-Xylene	0.0076	0.033	0.99	4.3
o-Xylene	0.0076	0.033	0.39	1.7
TPH (Gasoline Range)	0.19	0.78	130	540

Client Sample ID: GASOLINE-EXHAUST

Lab ID#: 1110413C-14A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0040	0.013	1.7	5.4
Toluene	0.0040	0.015	2.1	8.0

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
MODIFIED EPA METHOD TO-3 GC/PID/FID

Client Sample ID: GASOLINE-EXHAUST

Lab ID#: 1110413C-14A

Ethyl Benzene	0.0040	0.017	0.31	1.3
m,p-Xylene	0.0040	0.017	0.96	4.2
o-Xylene	0.0040	0.017	0.51	2.2
TPH (Gasoline Range)	0.10	0.41	32	130

Client Sample ID: DIESEL-EXHAUST

Lab ID#: 1110413C-15A

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0018	0.0058	0.011	0.036
Toluene	0.0018	0.0068	0.0039	0.015
m,p-Xylene	0.0018	0.0078	0.0024	0.010
o-Xylene	0.0018	0.0078	0.0020	0.0088
TPH (Gasoline Range)	0.045	0.18	0.25	1.0

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(18)

Lab ID#: 1110413C-01A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102505**	**Date of Collection: 10/13/11 10:12:00 A**	
Dil. Factor:	**620**	**Date of Analysis: 10/25/11 09:47 AM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.62	2.0	46 M	150 M
Toluene	0.62	2.3	52	200
Ethyl Benzene	0.62	2.7	5.7	25
m,p-Xylene	0.62	2.7	8.1	35
o-Xylene	0.62	2.7	1.8 M	7.8 M
TPH (Gasoline Range)	16	63	11000	46000

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	110	75-150
Fluorobenzene (PID)	94	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(24)

Lab ID#: 1110413C-02A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102609**	**Date of Collection: 10/13/11 10:46:00 A**	
Dil. Factor:	**3040**	**Date of Analysis: 10/26/11 01:37 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	3.0	9.7	320	1000
Toluene	3.0	11	32	120
Ethyl Benzene	3.0	13	Not Detected	Not Detected
m,p-Xylene	3.0	13	Not Detected	Not Detected
o-Xylene	3.0	13	Not Detected	Not Detected
TPH (Gasoline Range)	76	310	77000	320000

Q = Exceeds Quality Control limits, due to matrix effects. Matrix effects confirmed by re-analysis.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	155 Q	75-150
Fluorobenzene (PID)	114	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(20)

Lab ID#: 1110413C-03A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102506**	**Date of Collection: 10/13/11 11:23:00 A**	
Dil. Factor:	**584**	**Date of Analysis: 10/25/11 10:42 AM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.58	1.9	58 M	180 M
Toluene	0.58	2.2	35	130
Ethyl Benzene	0.58	2.5	5.6	24
m,p-Xylene	0.58	2.5	3.5	15
o-Xylene	0.58	2.5	Not Detected	Not Detected
TPH (Gasoline Range)	15	60	10000	42000

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	113	75-150
Fluorobenzene (PID)	96	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(25)

Lab ID#: 1110413C-04A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102606**	**Date of Collection: 10/13/11 11:49:00 A**	
Dil. Factor:	**1980**	**Date of Analysis: 10/26/11 11:37 AM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	2.0	6.3	220	700
Toluene	2.0	7.5	42	160
Ethyl Benzene	2.0	8.6	Not Detected	Not Detected
m,p-Xylene	2.0	8.6	2.2	9.5
o-Xylene	2.0	8.6	Not Detected	Not Detected
TPH (Gasoline Range)	50	200	35000	140000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	119	75-150
Fluorobenzene (PID)	100	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(347)

Lab ID#: 1110413C-05A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102508**	**Date of Collection: 10/14/11 9:35:00 AM**	
Dil. Factor:	**26.2**	**Date of Analysis: 10/25/11 12:05 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.026	0.084	Not Detected	Not Detected
Toluene	0.026	0.099	0.89	3.4
Ethyl Benzene	0.026	0.11	Not Detected M	Not Detected M
m,p-Xylene	0.026	0.11	4.7 M	20 M
o-Xylene	0.026	0.11	1.4	5.9
TPH (Gasoline Range)	0.66	2.7	350	1400

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	100	75-150
Fluorobenzene (PID)	80	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(422)

Lab ID#: 1110413C-06A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102510**	**Date of Collection: 10/14/11 10:19:00 A**	
Dil. Factor:	**21.5**	**Date of Analysis: 10/25/11 01:35 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.022	0.069	0.16 M	0.50 M
Toluene	0.022	0.081	1.1	4.0
Ethyl Benzene	0.022	0.093	Not Detected M	Not Detected M
m,p-Xylene	0.022	0.093	5.2 M	23 M
o-Xylene	0.022	0.093	1.5	6.4
TPH (Gasoline Range)	0.54	2.2	410	1700

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	102	75-150
Fluorobenzene (PID)	80	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(492)

Lab ID#: 1110413C-07A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102513**	**Date of Collection: 10/14/11 10:36:00 A**	
Dil. Factor:	**26.3**	**Date of Analysis: 10/25/11 03:50 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.026	0.084	0.24 M	0.75 M
Toluene	0.026	0.099	1.1	4.1
Ethyl Benzene	0.026	0.11	Not Detected M	Not Detected M
m,p-Xylene	0.026	0.11	5.2 M	23 M
o-Xylene	0.026	0.11	1.5	6.3
TPH (Gasoline Range)	0.66	2.7	410	1700

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	101	75-150
Fluorobenzene (PID)	83	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B59(388)

Lab ID#: 1110413C-08A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102512**	**Date of Collection: 10/14/11 11:03:00 A**	
Dil. Factor:	**3.35**	**Date of Analysis: 10/25/11 03:09 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0034	0.011	0.18	0.58
Toluene	0.0034	0.013	0.17	0.64
Ethyl Benzene	0.0034	0.014	0.067 M	0.29 M
m,p-Xylene	0.0034	0.014	0.62	2.7
o-Xylene	0.0034	0.014	0.21	0.90
TPH (Gasoline Range)	0.084	0.34	43	180

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	120	75-150
Fluorobenzene (PID)	97	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-MW10SG

Lab ID#: 1110413C-09A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102608**	**Date of Collection: 10/18/11 11:43:00 A**	
Dil. Factor:	**1680**	**Date of Analysis: 10/26/11 12:48 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	1.7	5.4	110 M	360 M
Toluene	1.7	6.3	65	250
Ethyl Benzene	1.7	7.3	6.7	29
m,p-Xylene	1.7	7.3	12 M	53 M
o-Xylene	1.7	7.3	1.8	8.0
TPH (Gasoline Range)	42	170	25000	100000

M = Reported value may be biased due to apparent matrix interferences.
Q = Exceeds Quality Control limits, possibly due to matrix effects.
Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	211 Q	75-150
Fluorobenzene (PID)	161 Q	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-MW22R

Lab ID#: 1110413C-10A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102515**	**Date of Collection: 10/18/11 11:09:00 A**	
Dil. Factor:	**652**	**Date of Analysis: 10/25/11 05:21 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.65	2.1	42 M	130 M
Toluene	0.65	2.4	19	70
Ethyl Benzene	0.65	2.8	3.5	15
m,p-Xylene	0.65	2.8	7.3 M	32 M
o-Xylene	0.65	2.8	1.8	7.8
TPH (Gasoline Range)	16	67	9500	39000

M = Reported value may be biased due to apparent matrix interferences.
Q = Exceeds Quality Control limits, due to matrix effects. Matrix effects confirmed by re-analysis.
Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	198 Q	75-150
Fluorobenzene (PID)	151 Q	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-OTNS1

Lab ID#: 1110413C-11A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102517**	**Date of Collection: 10/18/11 10:31:00 A**	
Dil. Factor:	**2.09**	**Date of Analysis: 10/25/11 07:21 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0021	0.0067	0.011 M	0.034 M
Toluene	0.0021	0.0079	Not Detected	Not Detected
Ethyl Benzene	0.0021	0.0091	Not Detected	Not Detected
m,p-Xylene	0.0021	0.0091	Not Detected	Not Detected
o-Xylene	0.0021	0.0091	Not Detected	Not Detected
TPH (Gasoline Range)	0.052	0.21	0.51	2.1

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	110	75-150
Fluorobenzene (PID)	92	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE#2

Lab ID#: 1110413C-12A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102516**	**Date of Collection: 10/18/11 8:35:00 AM**	
Dil. Factor:	**147**	**Date of Analysis: 10/25/11 06:02 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.15	0.47	8.7	28
Toluene	0.15	0.55	24	92
Ethyl Benzene	0.15	0.64	1.7	7.5
m,p-Xylene	0.15	0.64	6.6	29
o-Xylene	0.15	0.64	2.2	9.5
TPH (Gasoline Range)	3.7	15	920	3800

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	115	75-150
Fluorobenzene (PID)	98	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL#3

Lab ID#: 1110413C-13A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102519**	**Date of Collection: 10/18/11 8:35:00 AM**	
Dil. Factor:	**7.62**	**Date of Analysis: 10/25/11 08:36 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0076	0.024	0.64 M	2.0 M
Toluene	0.0076	0.029	1.6	6.2
Ethyl Benzene	0.0076	0.033	0.56 M	2.4 M
m,p-Xylene	0.0076	0.033	0.99	4.3
o-Xylene	0.0076	0.033	0.39	1.7
TPH (Gasoline Range)	0.19	0.78	130	540

M = Reported value may be biased due to apparent matrix interferences.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	117	75-150
Fluorobenzene (PID)	90	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE-EXHAUST

Lab ID#: 1110413C-14A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102610**	**Date of Collection: 10/18/11 8:50:00 AM**	
Dil. Factor:	**4.00**	**Date of Analysis: 10/26/11 02:09 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0040	0.013	1.7	5.4
Toluene	0.0040	0.015	2.1	8.0
Ethyl Benzene	0.0040	0.017	0.31	1.3
m,p-Xylene	0.0040	0.017	0.96	4.2
o-Xylene	0.0040	0.017	0.51	2.2
TPH (Gasoline Range)	0.10	0.41	32	130

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	119	75-150
Fluorobenzene (PID)	96	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL-EXHAUST

Lab ID#: 1110413C-15A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102611**	**Date of Collection: 10/18/11 8:45:00 AM**	
Dil. Factor:	**1.80**	**Date of Analysis: 10/26/11 03:05 PM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0018	0.0058	0.011	0.036
Toluene	0.0018	0.0068	0.0039	0.015
Ethyl Benzene	0.0018	0.0078	Not Detected	Not Detected
m,p-Xylene	0.0018	0.0078	0.0024	0.010
o-Xylene	0.0018	0.0078	0.0020	0.0088
TPH (Gasoline Range)	0.045	0.18	0.25	1.0

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	110	75-150
Fluorobenzene (PID)	94	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110413C-16A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102504**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/25/11 09:06 AM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0010	0.0032	Not Detected	Not Detected
Toluene	0.0010	0.0038	Not Detected	Not Detected
Ethyl Benzene	0.0010	0.0043	Not Detected	Not Detected
m,p-Xylene	0.0010	0.0043	Not Detected	Not Detected
o-Xylene	0.0010	0.0043	Not Detected	Not Detected
TPH (Gasoline Range)	0.025	0.10	Not Detected	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	113	75-150
Fluorobenzene (PID)	97	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110413C-16B

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102605**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/26/11 10:54 AM**	

Compound	Rpt. Limit (ppmv)	Rpt. Limit (ug/L)	Amount (ppmv)	Amount (ug/L)
Benzene	0.0010	0.0032	Not Detected	Not Detected
Toluene	0.0010	0.0038	Not Detected	Not Detected
Ethyl Benzene	0.0010	0.0043	Not Detected	Not Detected
m,p-Xylene	0.0010	0.0043	Not Detected	Not Detected
o-Xylene	0.0010	0.0043	Not Detected	Not Detected
TPH (Gasoline Range)	0.025	0.10	Not Detected	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Fluorobenzene (FID)	112	75-150
Fluorobenzene (PID)	97	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110413C-17A

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102523b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/25/11 10:45 PM**	

Compound	%Recovery
Benzene	82
Toluene	90
Ethyl Benzene	82
m,p-Xylene	82
o-Xylene	86

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Fluorobenzene (PID)	91	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1110413C-17AA

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102524b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/25/11 11:10 PM**	

Compound	%Recovery
Benzene	86
Toluene	89
Ethyl Benzene	83
m,p-Xylene	83
o-Xylene	87

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Fluorobenzene (PID)	89	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110413C-17B

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102602b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/26/11 08:58 AM**	

Compound	%Recovery
Benzene	93
Toluene	87
Ethyl Benzene	81
m,p-Xylene	82
o-Xylene	87

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Fluorobenzene (PID)	99	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1110413C-17BB

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102622b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/26/11 10:07 PM**	

Compound	%Recovery
Benzene	91
Toluene	91
Ethyl Benzene	88
m,p-Xylene	90
o-Xylene	95

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Fluorobenzene (PID)	90	75-125

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110413C-17C

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102502**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/25/11 07:50 AM**	

Compound	**%Recovery**
TPH (Gasoline Range)	103

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Fluorobenzene (FID)	107	75-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1110413C-17CC

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102522**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/25/11 10:10 PM**	

Compound	**%Recovery**
TPH (Gasoline Range)	89

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Fluorobenzene (FID)	108	75-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110413C-17D

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102604**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/26/11 10:03 AM**	

Compound	**%Recovery**
TPH (Gasoline Range)	96

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Fluorobenzene (FID)	115	75-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1110413C-17DD

MODIFIED EPA METHOD TO-3 GC/PID/FID

File Name:	**d102621**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/26/11 09:19 PM**	

Compound	**%Recovery**
TPH (Gasoline Range)	96

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Fluorobenzene (FID)	103	75-150

Air Toxics LTD.
Laboratory Services Since 1989

6/9/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name: Fishing Village
Project #:
Workorder #: 1105519B

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 5/26/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

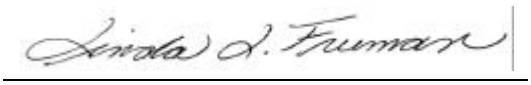
Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1105519B

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	Fishing Village
DATE RECEIVED:	05/26/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	06/09/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	FV-GP-01-HDOH	Modified TO-15	5.5 "Hg	15 psi
02A	FV-GP-06R-HDOH	Modified TO-15	4.5 "Hg	15 psi
02AA	FV-GP-06R-HDOH Lab Duplicate	Modified TO-15	4.5 "Hg	15 psi
03A	FV-GP-08-HDOH	Modified TO-15	2.0 "Hg	15 psi
04A	FV-GP-16R-HDOH	Modified TO-15	5.5 "Hg	15 psi
05A	FV-GP-17-HDOH	Modified TO-15	5.5 "Hg	15 psi
06A	G-IPB20-HDOH	Modified TO-15	6.5 "Hg	15 psi
07A	G-IPH11-HDOH	Modified TO-15	4.0 "Hg	15 psi
08A	G-IPL19-HDOH	Modified TO-15	5.0 "Hg	15 psi
09A	G-IP28-HDOH	Modified TO-15	9.5 "Hg	15 psi
10A	G-SG12-HDOH	Modified TO-15	4.0 "Hg	15 psi
11A	Lab Blank	Modified TO-15	NA	NA
11B	Lab Blank	Modified TO-15	NA	NA
12A	CCV	Modified TO-15	NA	NA
12B	CCV	Modified TO-15	NA	NA
13A	LCS	Modified TO-15	NA	NA
13B	LCS	Modified TO-15	NA	NA

CERTIFIED BY:  DATE: 06/09/11

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/11
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
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LABORATORY NARRATIVE
EPA Method TO-15
Tetra Tech EM, Inc.
Workorder# 1105519B

Ten 1 Liter Summa Canister (MA APH Certified) samples were received on May 26, 2011. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

Dilution was performed on samples FV-GP-08-HDOH, G-IPB20-HDOH, G-IPH11-HDOH and G-IP28-HDOH due to the presence of high level target species.

Dilution was performed on samples FV-GP-01-HDOH, FV-GP-16R-HDOH and G-SG12-HDOH due to the presence of high level non-target species.

All Quality Control Limit exceedences and affected sample results are noted by flags. Each flag is defined at the bottom of this Case Narrative and on each Sample Result Summary page.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: G-IPB20-HDOH

Lab ID#: 1105519B-06A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Tetrahydrofuran	37	780	110	2300
Benzene	37	10000	120	34000
Toluene	37	1600	140	5900
m,p-Xylene	37	98	160	430
o-Xylene	37	47	160	200
Styrene	37	67	160	280

Client Sample ID: G-IPH11-HDOH

Lab ID#: 1105519B-07A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	12000	3000000	37000	9700000
Heptane	12000	16000	48000	64000
Toluene	12000	12000	44000	46000
Ethyl Benzene	12000	19000	50000	81000

Client Sample ID: G-IPL19-HDOH

Lab ID#: 1105519B-08A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Chloromethane	4.8	11	10	22
Ethanol	4.8	13	9.1	25
Acetone	4.8	77	11	180
Carbon Disulfide	4.8	15	15	47
Methylene Chloride	1.2	1.4	4.2	4.7
2-Butanone (Methyl Ethyl Ketone)	4.8	24	14	72
Tetrahydrofuran	1.2	330	3.6	970
Cyclohexane	1.2	1.2	4.2	4.3
Benzene	1.2	150	3.9	480
Toluene	1.2	14	4.6	51
Ethyl Benzene	1.2	2.7	5.2	12

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: G-IPL19-HDOH

Lab ID#: 1105519B-08A

m,p-Xylene	1.2	5.2	5.2	23
o-Xylene	1.2	3.0	5.2	13
Styrene	1.2	3.1	5.2	13
1,2,4-Trimethylbenzene	1.2	1.3	5.9	6.4

Client Sample ID: G-IP28-HDOH

Lab ID#: 1105519B-09A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	20000	6800000	63000	22000000
Toluene	20000	160000	74000	620000

Client Sample ID: G-SG12-HDOH

Lab ID#: 1105519B-10A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Acetone	13	16	32	39
Methyl tert-butyl ether	3.3	4.3	12	15
Cyclohexane	3.3	19	11	66
Tetrachloroethene	3.3	4.2	22	28

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IPB20-HDOH

Lab ID#: 1105519B-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060223**	**Date of Collection:**	**5/20/11 7:52:00 AM**
Dil. Factor:	**73.7**	**Date of Analysis:**	**6/2/11 08:43 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	37	Not Detected	180	Not Detected
Freon 114	37	Not Detected	260	Not Detected
Chloromethane	150	Not Detected	300	Not Detected
Vinyl Chloride	150	Not Detected	380	Not Detected
1,3-Butadiene	37	Not Detected	82	Not Detected
Bromomethane	37	Not Detected	140	Not Detected
Chloroethane	150	Not Detected	390	Not Detected
Freon 11	37	Not Detected	210	Not Detected
Ethanol	150	Not Detected	280	Not Detected
Freon 113	37	Not Detected	280	Not Detected
1,1-Dichloroethene	37	Not Detected	150	Not Detected
Acetone	150	Not Detected	350	Not Detected
2-Propanol	150	Not Detected	360	Not Detected
Carbon Disulfide	150	Not Detected	460	Not Detected
3-Chloropropene	150	Not Detected	460	Not Detected
Methylene Chloride	37	Not Detected	130	Not Detected
Methyl tert-butyl ether	37	Not Detected	130	Not Detected
trans-1,2-Dichloroethene	37	Not Detected	150	Not Detected
Hexane	37	Not Detected	130	Not Detected
1,1-Dichloroethane	37	Not Detected	150	Not Detected
2-Butanone (Methyl Ethyl Ketone)	150	Not Detected	430	Not Detected
cis-1,2-Dichloroethene	37	Not Detected	150	Not Detected
Tetrahydrofuran	37	780	110	2300
Chloroform	37	Not Detected	180	Not Detected
1,1,1-Trichloroethane	37	Not Detected	200	Not Detected
Cyclohexane	37	Not Detected	130	Not Detected
Carbon Tetrachloride	37	Not Detected	230	Not Detected
2,2,4-Trimethylpentane	37	Not Detected	170	Not Detected
Benzene	37	10000	120	34000
1,2-Dichloroethane	37	Not Detected	150	Not Detected
Heptane	37	Not Detected	150	Not Detected
Trichloroethene	37	Not Detected	200	Not Detected
1,2-Dichloropropane	37	Not Detected	170	Not Detected
1,4-Dioxane	150	Not Detected	530	Not Detected
Bromodichloromethane	37	Not Detected	250	Not Detected
cis-1,3-Dichloropropene	37	Not Detected	170	Not Detected
4-Methyl-2-pentanone	37	Not Detected	150	Not Detected
Toluene	37	1600	140	5900
trans-1,3-Dichloropropene	37	Not Detected	170	Not Detected
1,1,2-Trichloroethane	37	Not Detected	200	Not Detected
Tetrachloroethene	37	Not Detected	250	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IPB20-HDOH

Lab ID#: 1105519B-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060223**	**Date of Collection:**	**5/20/11 7:52:00 AM**
Dil. Factor:	**73.7**	**Date of Analysis:**	**6/2/11 08:43 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
2-Hexanone	150	Not Detected	600	Not Detected
Dibromochloromethane	37	Not Detected	310	Not Detected
1,2-Dibromoethane (EDB)	37	Not Detected	280	Not Detected
Chlorobenzene	37	Not Detected	170	Not Detected
Ethyl Benzene	37	Not Detected	160	Not Detected
m,p-Xylene	37	98	160	430
o-Xylene	37	47	160	200
Styrene	37	67	160	280
Bromoform	37	Not Detected	380	Not Detected
Cumene	37	Not Detected	180	Not Detected
1,1,2,2-Tetrachloroethane	37	Not Detected	250	Not Detected
Propylbenzene	37	Not Detected	180	Not Detected
4-Ethyltoluene	37	Not Detected	180	Not Detected
1,3,5-Trimethylbenzene	37	Not Detected	180	Not Detected
1,2,4-Trimethylbenzene	37	Not Detected	180	Not Detected
1,3-Dichlorobenzene	37	Not Detected	220	Not Detected
1,4-Dichlorobenzene	37	Not Detected	220	Not Detected
alpha-Chlorotoluene	37	Not Detected	190	Not Detected
1,2-Dichlorobenzene	37	Not Detected	220	Not Detected
1,2,4-Trichlorobenzene	150	Not Detected	1100	Not Detected
Hexachlorobutadiene	150	Not Detected	1600	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130
1,2-Dichloroethane-d4	112	70-130
4-Bromofluorobenzene	95	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IPH11-HDOH

Lab ID#: 1105519B-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060226**	**Date of Collection:**	**5/20/11 7:37:00 AM**
Dil. Factor:	**23300**	**Date of Analysis:**	**6/2/11 10:51 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	12000	Not Detected	58000	Not Detected
Freon 114	12000	Not Detected	81000	Not Detected
Chloromethane	47000	Not Detected	96000	Not Detected
Vinyl Chloride	47000	Not Detected	120000	Not Detected
1,3-Butadiene	12000	Not Detected	26000	Not Detected
Bromomethane	12000	Not Detected	45000	Not Detected
Chloroethane	47000	Not Detected	120000	Not Detected
Freon 11	12000	Not Detected	65000	Not Detected
Ethanol	47000	Not Detected	88000	Not Detected
Freon 113	12000	Not Detected	89000	Not Detected
1,1-Dichloroethene	12000	Not Detected	46000	Not Detected
Acetone	47000	Not Detected	110000	Not Detected
2-Propanol	47000	Not Detected	110000	Not Detected
Carbon Disulfide	47000	Not Detected	140000	Not Detected
3-Chloropropene	47000	Not Detected	140000	Not Detected
Methylene Chloride	12000	Not Detected	40000	Not Detected
Methyl tert-butyl ether	12000	Not Detected	42000	Not Detected
trans-1,2-Dichloroethene	12000	Not Detected	46000	Not Detected
Hexane	12000	Not Detected	41000	Not Detected
1,1-Dichloroethane	12000	Not Detected	47000	Not Detected
2-Butanone (Methyl Ethyl Ketone)	47000	Not Detected	140000	Not Detected
cis-1,2-Dichloroethene	12000	Not Detected	46000	Not Detected
Tetrahydrofuran	12000	Not Detected	34000	Not Detected
Chloroform	12000	Not Detected	57000	Not Detected
1,1,1-Trichloroethane	12000	Not Detected	64000	Not Detected
Cyclohexane	12000	Not Detected	40000	Not Detected
Carbon Tetrachloride	12000	Not Detected	73000	Not Detected
2,2,4-Trimethylpentane	12000	Not Detected	54000	Not Detected
Benzene	12000	3000000	37000	9700000
1,2-Dichloroethane	12000	Not Detected	47000	Not Detected
Heptane	12000	16000	48000	64000
Trichloroethene	12000	Not Detected	63000	Not Detected
1,2-Dichloropropane	12000	Not Detected	54000	Not Detected
1,4-Dioxane	47000	Not Detected	170000	Not Detected
Bromodichloromethane	12000	Not Detected	78000	Not Detected
cis-1,3-Dichloropropene	12000	Not Detected	53000	Not Detected
4-Methyl-2-pentanone	12000	Not Detected	48000	Not Detected
Toluene	12000	12000	44000	46000
trans-1,3-Dichloropropene	12000	Not Detected	53000	Not Detected
1,1,2-Trichloroethane	12000	Not Detected	64000	Not Detected
Tetrachloroethene	12000	Not Detected	79000	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IPH11-HDOH

Lab ID#: 1105519B-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060226**	**Date of Collection: 5/20/11 7:37:00 AM**	
Dil. Factor:	**23300**	**Date of Analysis: 6/2/11 10:51 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
2-Hexanone	47000	Not Detected	190000	Not Detected
Dibromochloromethane	12000	Not Detected	99000	Not Detected
1,2-Dibromoethane (EDB)	12000	Not Detected	90000	Not Detected
Chlorobenzene	12000	Not Detected	54000	Not Detected
Ethyl Benzene	12000	19000	50000	81000
m,p-Xylene	12000	Not Detected	50000	Not Detected
o-Xylene	12000	Not Detected	50000	Not Detected
Styrene	12000	Not Detected	50000	Not Detected
Bromoform	12000	Not Detected	120000	Not Detected
Cumene	12000	Not Detected	57000	Not Detected
1,1,2,2-Tetrachloroethane	12000	Not Detected	80000	Not Detected
Propylbenzene	12000	Not Detected	57000	Not Detected
4-Ethyltoluene	12000	Not Detected	57000	Not Detected
1,3,5-Trimethylbenzene	12000	Not Detected	57000	Not Detected
1,2,4-Trimethylbenzene	12000	Not Detected	57000	Not Detected
1,3-Dichlorobenzene	12000	Not Detected	70000	Not Detected
1,4-Dichlorobenzene	12000	Not Detected	70000	Not Detected
alpha-Chlorotoluene	12000	Not Detected	60000	Not Detected
1,2-Dichlorobenzene	12000	Not Detected	70000	Not Detected
1,2,4-Trichlorobenzene	47000	Not Detected	340000	Not Detected
Hexachlorobutadiene	47000	Not Detected	500000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Toluene-d8	104	70-130
1,2-Dichloroethane-d4	109	70-130
4-Bromofluorobenzene	101	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IPL19-HDOH

Lab ID#: 1105519B-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060309**	**Date of Collection:**	**5/20/11 8:38:00 AM**
Dil. Factor:	**2.42**	**Date of Analysis:**	**6/3/11 11:13 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	1.2	Not Detected	6.0	Not Detected
Freon 114	1.2	Not Detected	8.4	Not Detected
Chloromethane	4.8	11	10	22
Vinyl Chloride	4.8	Not Detected	12	Not Detected
1,3-Butadiene	1.2	Not Detected	2.7	Not Detected
Bromomethane	1.2	Not Detected	4.7	Not Detected
Chloroethane	4.8	Not Detected	13	Not Detected
Freon 11	1.2	Not Detected	6.8	Not Detected
Ethanol	4.8	13	9.1	25
Freon 113	1.2	Not Detected	9.3	Not Detected
1,1-Dichloroethene	1.2	Not Detected	4.8	Not Detected
Acetone	4.8	77	11	180
2-Propanol	4.8	Not Detected	12	Not Detected
Carbon Disulfide	4.8	15	15	47
3-Chloropropene	4.8	Not Detected	15	Not Detected
Methylene Chloride	1.2	1.4	4.2	4.7
Methyl tert-butyl ether	1.2	Not Detected	4.4	Not Detected
trans-1,2-Dichloroethene	1.2	Not Detected	4.8	Not Detected
Hexane	1.2	Not Detected	4.3	Not Detected
1,1-Dichloroethane	1.2	Not Detected	4.9	Not Detected
2-Butanone (Methyl Ethyl Ketone)	4.8	24	14	72
cis-1,2-Dichloroethene	1.2	Not Detected	4.8	Not Detected
Tetrahydrofuran	1.2	330	3.6	970
Chloroform	1.2	Not Detected	5.9	Not Detected
1,1,1-Trichloroethane	1.2	Not Detected	6.6	Not Detected
Cyclohexane	1.2	1.2	4.2	4.3
Carbon Tetrachloride	1.2	Not Detected	7.6	Not Detected
2,2,4-Trimethylpentane	1.2	Not Detected	5.6	Not Detected
Benzene	1.2	150	3.9	480
1,2-Dichloroethane	1.2	Not Detected	4.9	Not Detected
Heptane	1.2	Not Detected	5.0	Not Detected
Trichloroethene	1.2	Not Detected	6.5	Not Detected
1,2-Dichloropropane	1.2	Not Detected	5.6	Not Detected
1,4-Dioxane	4.8	Not Detected	17	Not Detected
Bromodichloromethane	1.2	Not Detected	8.1	Not Detected
cis-1,3-Dichloropropene	1.2	Not Detected	5.5	Not Detected
4-Methyl-2-pentanone	1.2	Not Detected	5.0	Not Detected
Toluene	1.2	14	4.6	51
trans-1,3-Dichloropropene	1.2	Not Detected	5.5	Not Detected
1,1,2-Trichloroethane	1.2	Not Detected	6.6	Not Detected
Tetrachloroethene	1.2	Not Detected	8.2	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IPL19-HDOH

Lab ID#: 1105519B-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060309**	**Date of Collection: 5/20/11 8:38:00 AM**	
Dil. Factor:	**2.42**	**Date of Analysis: 6/3/11 11:13 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
2-Hexanone	4.8	Not Detected	20	Not Detected
Dibromochloromethane	1.2	Not Detected	10	Not Detected
1,2-Dibromoethane (EDB)	1.2	Not Detected	9.3	Not Detected
Chlorobenzene	1.2	Not Detected	5.6	Not Detected
Ethyl Benzene	1.2	2.7	5.2	12
m,p-Xylene	1.2	5.2	5.2	23
o-Xylene	1.2	3.0	5.2	13
Styrene	1.2	3.1	5.2	13
Bromoform	1.2	Not Detected	12	Not Detected
Cumene	1.2	Not Detected	5.9	Not Detected
1,1,2,2-Tetrachloroethane	1.2	Not Detected	8.3	Not Detected
Propylbenzene	1.2	Not Detected	5.9	Not Detected
4-Ethyltoluene	1.2	Not Detected	5.9	Not Detected
1,3,5-Trimethylbenzene	1.2	Not Detected	5.9	Not Detected
1,2,4-Trimethylbenzene	1.2	1.3	5.9	6.4
1,3-Dichlorobenzene	1.2	Not Detected	7.3	Not Detected
1,4-Dichlorobenzene	1.2	Not Detected	7.3	Not Detected
alpha-Chlorotoluene	1.2	Not Detected	6.3	Not Detected
1,2-Dichlorobenzene	1.2	Not Detected	7.3	Not Detected
1,2,4-Trichlorobenzene	4.8	Not Detected	36	Not Detected
Hexachlorobutadiene	4.8	Not Detected	52	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	125	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IP28-HDOH

Lab ID#: 1105519B-09A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060312**	**Date of Collection:**	**5/20/11 8:35:00 AM**
Dil. Factor:	**39500**	**Date of Analysis:**	**6/3/11 01:13 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	20000	Not Detected	98000	Not Detected
Freon 114	20000	Not Detected	140000	Not Detected
Chloromethane	79000	Not Detected	160000	Not Detected
Vinyl Chloride	79000	Not Detected	200000	Not Detected
1,3-Butadiene	20000	Not Detected	44000	Not Detected
Bromomethane	20000	Not Detected	77000	Not Detected
Chloroethane	79000	Not Detected	210000	Not Detected
Freon 11	20000	Not Detected	110000	Not Detected
Ethanol	79000	Not Detected	150000	Not Detected
Freon 113	20000	Not Detected	150000	Not Detected
1,1-Dichloroethene	20000	Not Detected	78000	Not Detected
Acetone	79000	Not Detected	190000	Not Detected
2-Propanol	79000	Not Detected	190000	Not Detected
Carbon Disulfide	79000	Not Detected	250000	Not Detected
3-Chloropropene	79000	Not Detected	250000	Not Detected
Methylene Chloride	20000	Not Detected	69000	Not Detected
Methyl tert-butyl ether	20000	Not Detected	71000	Not Detected
trans-1,2-Dichloroethene	20000	Not Detected	78000	Not Detected
Hexane	20000	Not Detected	70000	Not Detected
1,1-Dichloroethane	20000	Not Detected	80000	Not Detected
2-Butanone (Methyl Ethyl Ketone)	79000	Not Detected	230000	Not Detected
cis-1,2-Dichloroethene	20000	Not Detected	78000	Not Detected
Tetrahydrofuran	20000	Not Detected	58000	Not Detected
Chloroform	20000	Not Detected	96000	Not Detected
1,1,1-Trichloroethane	20000	Not Detected	110000	Not Detected
Cyclohexane	20000	Not Detected	68000	Not Detected
Carbon Tetrachloride	20000	Not Detected	120000	Not Detected
2,2,4-Trimethylpentane	20000	Not Detected	92000	Not Detected
Benzene	20000	6800000	63000	22000000
1,2-Dichloroethane	20000	Not Detected	80000	Not Detected
Heptane	20000	Not Detected	81000	Not Detected
Trichloroethene	20000	Not Detected	110000	Not Detected
1,2-Dichloropropane	20000	Not Detected	91000	Not Detected
1,4-Dioxane	79000	Not Detected	280000	Not Detected
Bromodichloromethane	20000	Not Detected	130000	Not Detected
cis-1,3-Dichloropropene	20000	Not Detected	90000	Not Detected
4-Methyl-2-pentanone	20000	Not Detected	81000	Not Detected
Toluene	20000	160000	74000	620000
trans-1,3-Dichloropropene	20000	Not Detected	90000	Not Detected
1,1,2-Trichloroethane	20000	Not Detected	110000	Not Detected
Tetrachloroethene	20000	Not Detected	130000	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IP28-HDOH

Lab ID#: 1105519B-09A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060312**	**Date of Collection: 5/20/11 8:35:00 AM**	
Dil. Factor:	**39500**	**Date of Analysis: 6/3/11 01:13 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
2-Hexanone	79000	Not Detected	320000	Not Detected
Dibromochloromethane	20000	Not Detected	170000	Not Detected
1,2-Dibromoethane (EDB)	20000	Not Detected	150000	Not Detected
Chlorobenzene	20000	Not Detected	91000	Not Detected
Ethyl Benzene	20000	Not Detected	86000	Not Detected
m,p-Xylene	20000	Not Detected	86000	Not Detected
o-Xylene	20000	Not Detected	86000	Not Detected
Styrene	20000	Not Detected	84000	Not Detected
Bromoform	20000	Not Detected	200000	Not Detected
Cumene	20000	Not Detected	97000	Not Detected
1,1,2,2-Tetrachloroethane	20000	Not Detected	140000	Not Detected
Propylbenzene	20000	Not Detected	97000	Not Detected
4-Ethyltoluene	20000	Not Detected	97000	Not Detected
1,3,5-Trimethylbenzene	20000	Not Detected	97000	Not Detected
1,2,4-Trimethylbenzene	20000	Not Detected	97000	Not Detected
1,3-Dichlorobenzene	20000	Not Detected	120000	Not Detected
1,4-Dichlorobenzene	20000	Not Detected	120000	Not Detected
alpha-Chlorotoluene	20000	Not Detected	100000	Not Detected
1,2-Dichlorobenzene	20000	Not Detected	120000	Not Detected
1,2,4-Trichlorobenzene	79000	Not Detected	590000	Not Detected
Hexachlorobutadiene	79000	Not Detected	840000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130
1,2-Dichloroethane-d4	111	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-SG12-HDOH

Lab ID#: 1105519B-10A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060315**	**Date of Collection:**	**5/20/11 9:21:00 AM**
Dil. Factor:	**6.66**	**Date of Analysis:**	**6/3/11 02:56 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	3.3	Not Detected	16	Not Detected
Freon 114	3.3	Not Detected	23	Not Detected
Chloromethane	13	Not Detected	28	Not Detected
Vinyl Chloride	13	Not Detected	34	Not Detected
1,3-Butadiene	3.3	Not Detected	7.4	Not Detected
Bromomethane	3.3	Not Detected	13	Not Detected
Chloroethane	13	Not Detected	35	Not Detected
Freon 11	3.3	Not Detected	19	Not Detected
Ethanol	13	Not Detected	25	Not Detected
Freon 113	3.3	Not Detected	26	Not Detected
1,1-Dichloroethene	3.3	Not Detected	13	Not Detected
Acetone	13	16	32	39
2-Propanol	13	Not Detected	33	Not Detected
Carbon Disulfide	13	Not Detected	41	Not Detected
3-Chloropropene	13	Not Detected	42	Not Detected
Methylene Chloride	3.3	Not Detected	12	Not Detected
Methyl tert-butyl ether	3.3	4.3	12	15
trans-1,2-Dichloroethene	3.3	Not Detected	13	Not Detected
Hexane	3.3	Not Detected	12	Not Detected
1,1-Dichloroethane	3.3	Not Detected	13	Not Detected
2-Butanone (Methyl Ethyl Ketone)	13	Not Detected	39	Not Detected
cis-1,2-Dichloroethene	3.3	Not Detected	13	Not Detected
Tetrahydrofuran	3.3	Not Detected	9.8	Not Detected
Chloroform	3.3	Not Detected	16	Not Detected
1,1,1-Trichloroethane	3.3	Not Detected	18	Not Detected
Cyclohexane	3.3	19	11	66
Carbon Tetrachloride	3.3	Not Detected	21	Not Detected
2,2,4-Trimethylpentane	3.3	Not Detected	16	Not Detected
Benzene	3.3	Not Detected	11	Not Detected
1,2-Dichloroethane	3.3	Not Detected	13	Not Detected
Heptane	3.3	Not Detected	14	Not Detected
Trichloroethene	3.3	Not Detected	18	Not Detected
1,2-Dichloropropane	3.3	Not Detected	15	Not Detected
1,4-Dioxane	13	Not Detected	48	Not Detected
Bromodichloromethane	3.3	Not Detected	22	Not Detected
cis-1,3-Dichloropropene	3.3	Not Detected	15	Not Detected
4-Methyl-2-pentanone	3.3	Not Detected	14	Not Detected
Toluene	3.3	Not Detected	12	Not Detected
trans-1,3-Dichloropropene	3.3	Not Detected	15	Not Detected
1,1,2-Trichloroethane	3.3	Not Detected	18	Not Detected
Tetrachloroethene	3.3	4.2	22	28

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-SG12-HDOH

Lab ID#: 1105519B-10A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060315**	**Date of Collection: 5/20/11 9:21:00 AM**	
Dil. Factor:	**6.66**	**Date of Analysis: 6/3/11 02:56 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
2-Hexanone	13	Not Detected	54	Not Detected
Dibromochloromethane	3.3	Not Detected	28	Not Detected
1,2-Dibromoethane (EDB)	3.3	Not Detected	26	Not Detected
Chlorobenzene	3.3	Not Detected	15	Not Detected
Ethyl Benzene	3.3	Not Detected	14	Not Detected
m,p-Xylene	3.3	Not Detected	14	Not Detected
o-Xylene	3.3	Not Detected	14	Not Detected
Styrene	3.3	Not Detected	14	Not Detected
Bromoform	3.3	Not Detected	34	Not Detected
Cumene	3.3	Not Detected	16	Not Detected
1,1,2,2-Tetrachloroethane	3.3	Not Detected	23	Not Detected
Propylbenzene	3.3	Not Detected	16	Not Detected
4-Ethyltoluene	3.3	Not Detected	16	Not Detected
1,3,5-Trimethylbenzene	3.3	Not Detected	16	Not Detected
1,2,4-Trimethylbenzene	3.3	Not Detected	16	Not Detected
1,3-Dichlorobenzene	3.3	Not Detected	20	Not Detected
1,4-Dichlorobenzene	3.3	Not Detected	20	Not Detected
alpha-Chlorotoluene	3.3	Not Detected	17	Not Detected
1,2-Dichlorobenzene	3.3	Not Detected	20	Not Detected
1,2,4-Trichlorobenzene	13	Not Detected	99	Not Detected
Hexachlorobutadiene	13	Not Detected	140	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
Toluene-d8	107	70-130
1,2-Dichloroethane-d4	117	70-130
4-Bromofluorobenzene	103	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1105519B-11A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060208**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/2/11 10:58 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.50	Not Detected	2.5	Not Detected
Freon 114	0.50	Not Detected	3.5	Not Detected
Chloromethane	2.0	Not Detected	4.1	Not Detected
Vinyl Chloride	2.0	Not Detected	5.1	Not Detected
1,3-Butadiene	0.50	Not Detected	1.1	Not Detected
Bromomethane	0.50	Not Detected	1.9	Not Detected
Chloroethane	2.0	Not Detected	5.3	Not Detected
Freon 11	0.50	Not Detected	2.8	Not Detected
Ethanol	2.0	Not Detected	3.8	Not Detected
Freon 113	0.50	Not Detected	3.8	Not Detected
1,1-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Acetone	2.0	Not Detected	4.8	Not Detected
2-Propanol	2.0	Not Detected	4.9	Not Detected
Carbon Disulfide	2.0	Not Detected	6.2	Not Detected
3-Chloropropene	2.0	Not Detected	6.3	Not Detected
Methylene Chloride	0.50	Not Detected	1.7	Not Detected
Methyl tert-butyl ether	0.50	Not Detected	1.8	Not Detected
trans-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Hexane	0.50	Not Detected	1.8	Not Detected
1,1-Dichloroethane	0.50	Not Detected	2.0	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	Not Detected	5.9	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.50	Not Detected	2.4	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Cyclohexane	0.50	Not Detected	1.7	Not Detected
Carbon Tetrachloride	0.50	Not Detected	3.1	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
1,2-Dichloroethane	0.50	Not Detected	2.0	Not Detected
Heptane	0.50	Not Detected	2.0	Not Detected
Trichloroethene	0.50	Not Detected	2.7	Not Detected
1,2-Dichloropropane	0.50	Not Detected	2.3	Not Detected
1,4-Dioxane	2.0	Not Detected	7.2	Not Detected
Bromodichloromethane	0.50	Not Detected	3.4	Not Detected
cis-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
4-Methyl-2-pentanone	0.50	Not Detected	2.0	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
trans-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
1,1,2-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Tetrachloroethene	0.50	Not Detected	3.4	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1105519B-11A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060208**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/2/11 10:58 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
2-Hexanone	2.0	Not Detected	8.2	Not Detected
Dibromochloromethane	0.50	Not Detected	4.2	Not Detected
1,2-Dibromoethane (EDB)	0.50	Not Detected	3.8	Not Detected
Chlorobenzene	0.50	Not Detected	2.3	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
Styrene	0.50	Not Detected	2.1	Not Detected
Bromoform	0.50	Not Detected	5.2	Not Detected
Cumene	0.50	Not Detected	2.4	Not Detected
1,1,2,2-Tetrachloroethane	0.50	Not Detected	3.4	Not Detected
Propylbenzene	0.50	Not Detected	2.4	Not Detected
4-Ethyltoluene	0.50	Not Detected	2.4	Not Detected
1,3,5-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,2,4-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,3-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,4-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
alpha-Chlorotoluene	0.50	Not Detected	2.6	Not Detected
1,2-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,2,4-Trichlorobenzene	2.0	Not Detected	15	Not Detected
Hexachlorobutadiene	2.0	Not Detected	21	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	113	70-130
4-Bromofluorobenzene	99	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1105519B-11B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060306**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/3/11 09:11 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.50	Not Detected	2.5	Not Detected
Freon 114	0.50	Not Detected	3.5	Not Detected
Chloromethane	2.0	Not Detected	4.1	Not Detected
Vinyl Chloride	2.0	Not Detected	5.1	Not Detected
1,3-Butadiene	0.50	Not Detected	1.1	Not Detected
Bromomethane	0.50	Not Detected	1.9	Not Detected
Chloroethane	2.0	Not Detected	5.3	Not Detected
Freon 11	0.50	Not Detected	2.8	Not Detected
Ethanol	2.0	Not Detected	3.8	Not Detected
Freon 113	0.50	Not Detected	3.8	Not Detected
1,1-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Acetone	2.0	Not Detected	4.8	Not Detected
2-Propanol	2.0	Not Detected	4.9	Not Detected
Carbon Disulfide	2.0	Not Detected	6.2	Not Detected
3-Chloropropene	2.0	Not Detected	6.3	Not Detected
Methylene Chloride	0.50	Not Detected	1.7	Not Detected
Methyl tert-butyl ether	0.50	Not Detected	1.8	Not Detected
trans-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Hexane	0.50	Not Detected	1.8	Not Detected
1,1-Dichloroethane	0.50	Not Detected	2.0	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	Not Detected	5.9	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.50	Not Detected	2.4	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Cyclohexane	0.50	Not Detected	1.7	Not Detected
Carbon Tetrachloride	0.50	Not Detected	3.1	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
1,2-Dichloroethane	0.50	Not Detected	2.0	Not Detected
Heptane	0.50	Not Detected	2.0	Not Detected
Trichloroethene	0.50	Not Detected	2.7	Not Detected
1,2-Dichloropropane	0.50	Not Detected	2.3	Not Detected
1,4-Dioxane	2.0	Not Detected	7.2	Not Detected
Bromodichloromethane	0.50	Not Detected	3.4	Not Detected
cis-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
4-Methyl-2-pentanone	0.50	Not Detected	2.0	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
trans-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
1,1,2-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Tetrachloroethene	0.50	Not Detected	3.4	Not Detected

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1105519B-11B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060306**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/3/11 09:11 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
2-Hexanone	2.0	Not Detected	8.2	Not Detected
Dibromochloromethane	0.50	Not Detected	4.2	Not Detected
1,2-Dibromoethane (EDB)	0.50	Not Detected	3.8	Not Detected
Chlorobenzene	0.50	Not Detected	2.3	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
Styrene	0.50	Not Detected	2.1	Not Detected
Bromoform	0.50	Not Detected	5.2	Not Detected
Cumene	0.50	Not Detected	2.4	Not Detected
1,1,2,2-Tetrachloroethane	0.50	Not Detected	3.4	Not Detected
Propylbenzene	0.50	Not Detected	2.4	Not Detected
4-Ethyltoluene	0.50	Not Detected	2.4	Not Detected
1,3,5-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,2,4-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,3-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,4-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
alpha-Chlorotoluene	0.50	Not Detected	2.6	Not Detected
1,2-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,2,4-Trichlorobenzene	2.0	Not Detected	15	Not Detected
Hexachlorobutadiene	2.0	Not Detected	21	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	121	70-130
4-Bromofluorobenzene	101	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1105519B-12A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060204**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/2/11 08:02 AM**	

Compound	%Recovery
Freon 12	100
Freon 114	99
Chloromethane	94
Vinyl Chloride	95
1,3-Butadiene	92
Bromomethane	94
Chloroethane	82
Freon 11	104
Ethanol	101
Freon 113	96
1,1-Dichloroethene	88
Acetone	99
2-Propanol	108
Carbon Disulfide	94
3-Chloropropene	90
Methylene Chloride	93
Methyl tert-butyl ether	96
trans-1,2-Dichloroethene	91
Hexane	82
1,1-Dichloroethane	86
2-Butanone (Methyl Ethyl Ketone)	83
cis-1,2-Dichloroethene	84
Tetrahydrofuran	92
Chloroform	93
1,1,1-Trichloroethane	96
Cyclohexane	90
Carbon Tetrachloride	100
2,2,4-Trimethylpentane	85
Benzene	88
1,2-Dichloroethane	98
Heptane	89
Trichloroethene	91
1,2-Dichloropropane	82
1,4-Dioxane	90
Bromodichloromethane	98
cis-1,3-Dichloropropene	95
4-Methyl-2-pentanone	94
Toluene	82
trans-1,3-Dichloropropene	110
1,1,2-Trichloroethane	91
Tetrachloroethene	95

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1105519B-12A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060204**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/2/11 08:02 AM**	

Compound	%Recovery
2-Hexanone	95
Dibromochloromethane	101
1,2-Dibromoethane (EDB)	99
Chlorobenzene	92
Ethyl Benzene	90
m,p-Xylene	86
o-Xylene	89
Styrene	93
Bromoform	108
Cumene	94
1,1,2,2-Tetrachloroethane	94
Propylbenzene	88
4-Ethyltoluene	91
1,3,5-Trimethylbenzene	84
1,2,4-Trimethylbenzene	90
1,3-Dichlorobenzene	92
1,4-Dichlorobenzene	88
alpha-Chlorotoluene	113
1,2-Dichlorobenzene	86
1,2,4-Trichlorobenzene	82
Hexachlorobutadiene	90

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130
1,2-Dichloroethane-d4	110	70-130
4-Bromofluorobenzene	107	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1105519B-12B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/3/11 07:50 AM**	

Compound	%Recovery
Freon 12	99
Freon 114	97
Chloromethane	96
Vinyl Chloride	98
1,3-Butadiene	91
Bromomethane	93
Chloroethane	86
Freon 11	102
Ethanol	107
Freon 113	94
1,1-Dichloroethene	87
Acetone	101
2-Propanol	109
Carbon Disulfide	96
3-Chloropropene	96
Methylene Chloride	97
Methyl tert-butyl ether	100
trans-1,2-Dichloroethene	86
Hexane	84
1,1-Dichloroethane	89
2-Butanone (Methyl Ethyl Ketone)	80
cis-1,2-Dichloroethene	82
Tetrahydrofuran	92
Chloroform	91
1,1,1-Trichloroethane	95
Cyclohexane	88
Carbon Tetrachloride	99
2,2,4-Trimethylpentane	86
Benzene	90
1,2-Dichloroethane	103
Heptane	101
Trichloroethene	92
1,2-Dichloropropane	84
1,4-Dioxane	90
Bromodichloromethane	100
cis-1,3-Dichloropropene	100
4-Methyl-2-pentanone	96
Toluene	85
trans-1,3-Dichloropropene	105
1,1,2-Trichloroethane	90
Tetrachloroethene	89

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1105519B-12B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/3/11 07:50 AM**	

Compound	%Recovery
2-Hexanone	95
Dibromochloromethane	97
1,2-Dibromoethane (EDB)	93
Chlorobenzene	88
Ethyl Benzene	84
m,p-Xylene	80
o-Xylene	85
Styrene	90
Bromoform	105
Cumene	89
1,1,2,2-Tetrachloroethane	88
Propylbenzene	86
4-Ethyltoluene	86
1,3,5-Trimethylbenzene	81
1,2,4-Trimethylbenzene	86
1,3-Dichlorobenzene	87
1,4-Dichlorobenzene	83
alpha-Chlorotoluene	107
1,2-Dichlorobenzene	84
1,2,4-Trichlorobenzene	78
Hexachlorobutadiene	83

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	104	70-130
1,2-Dichloroethane-d4	108	70-130
4-Bromofluorobenzene	102	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1105519B-13A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060205**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/2/11 08:37 AM**	

Compound	%Recovery
Freon 12	132 Q
Freon 114	124
Chloromethane	125
Vinyl Chloride	131 Q
1,3-Butadiene	124
Bromomethane	122
Chloroethane	113
Freon 11	137 Q
Ethanol	133
Freon 113	120
1,1-Dichloroethene	118
Acetone	131
2-Propanol	138
Carbon Disulfide	136
3-Chloropropene	132
Methylene Chloride	111
Methyl tert-butyl ether	128
trans-1,2-Dichloroethene	127
Hexane	106
1,1-Dichloroethane	114
2-Butanone (Methyl Ethyl Ketone)	107
cis-1,2-Dichloroethene	113
Tetrahydrofuran	111
Chloroform	121
1,1,1-Trichloroethane	124
Cyclohexane	120
Carbon Tetrachloride	128
2,2,4-Trimethylpentane	109
Benzene	114
1,2-Dichloroethane	127
Heptane	116
Trichloroethene	121
1,2-Dichloropropane	109
1,4-Dioxane	114
Bromodichloromethane	123
cis-1,3-Dichloropropene	130
4-Methyl-2-pentanone	115
Toluene	106
trans-1,3-Dichloropropene	128
1,1,2-Trichloroethane	113
Tetrachloroethene	111

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1105519B-13A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060205**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/2/11 08:37 AM**	

Compound	%Recovery
2-Hexanone	114
Dibromochloromethane	118
1,2-Dibromoethane (EDB)	121
Chlorobenzene	110
Ethyl Benzene	105
m,p-Xylene	106
o-Xylene	104
Styrene	114
Bromoform	127
Cumene	113
1,1,2,2-Tetrachloroethane	112
Propylbenzene	112
4-Ethyltoluene	107
1,3,5-Trimethylbenzene	101
1,2,4-Trimethylbenzene	104
1,3-Dichlorobenzene	110
1,4-Dichlorobenzene	105
alpha-Chlorotoluene	137 Q
1,2-Dichlorobenzene	104
1,2,4-Trichlorobenzene	99
Hexachlorobutadiene	102

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	70-130
1,2-Dichloroethane-d4	110	70-130
4-Bromofluorobenzene	103	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1105519B-13B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060305**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/3/11 08:27 AM**	

Compound	%Recovery
Freon 12	128
Freon 114	124
Chloromethane	125
Vinyl Chloride	128
1,3-Butadiene	121
Bromomethane	116
Chloroethane	109
Freon 11	131 Q
Ethanol	125
Freon 113	122
1,1-Dichloroethene	120
Acetone	130
2-Propanol	139
Carbon Disulfide	143 Q
3-Chloropropene	141 Q
Methylene Chloride	115
Methyl tert-butyl ether	127
trans-1,2-Dichloroethene	122
Hexane	103
1,1-Dichloroethane	112
2-Butanone (Methyl Ethyl Ketone)	104
cis-1,2-Dichloroethene	108
Tetrahydrofuran	115
Chloroform	118
1,1,1-Trichloroethane	120
Cyclohexane	114
Carbon Tetrachloride	124
2,2,4-Trimethylpentane	105
Benzene	109
1,2-Dichloroethane	124
Heptane	115
Trichloroethene	112
1,2-Dichloropropane	104
1,4-Dioxane	102
Bromodichloromethane	120
cis-1,3-Dichloropropene	123
4-Methyl-2-pentanone	115
Toluene	101
trans-1,3-Dichloropropene	129
1,1,2-Trichloroethane	107
Tetrachloroethene	108

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1105519B-13B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2060305**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/3/11 08:27 AM**	

Compound	%Recovery
2-Hexanone	109
Dibromochloromethane	116
1,2-Dibromoethane (EDB)	117
Chlorobenzene	107
Ethyl Benzene	102
m,p-Xylene	102
o-Xylene	102
Styrene	108
Bromoform	122
Cumene	110
1,1,2,2-Tetrachloroethane	106
Propylbenzene	102
4-Ethyltoluene	100
1,3,5-Trimethylbenzene	96
1,2,4-Trimethylbenzene	100
1,3-Dichlorobenzene	106
1,4-Dichlorobenzene	97
alpha-Chlorotoluene	129
1,2-Dichlorobenzene	100
1,2,4-Trichlorobenzene	92
Hexachlorobutadiene	94

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	104	70-130
1,2-Dichloroethane-d4	115	70-130
4-Bromofluorobenzene	104	70-130

Air Toxics LTD.
Laboratory Services Since 1989

9/2/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name: Aloha School Street
Project #:
Workorder #: 1106214BR1

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 6/9/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1106214BR1

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	Aloha School Street
DATE RECEIVED:	06/09/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	06/21/2011		
DATE REISSUED:	09/01/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	A-SV04-HDOH	Modified TO-15	3.0 "Hg	15 psi
02A	A-SV013-HDOH	Modified TO-15	3.5 "Hg	15 psi
03A	A-AS4-HDOH	Modified TO-15	1.5 "Hg	15 psi
04A	Diesel#1-HDOH	Modified TO-15	5.0 "Hg	15 psi
04AA	Diesel#1-HDOH Lab Duplicate	Modified TO-15	5.0 "Hg	15 psi
05A	Ambient#1-HDOH	Modified TO-15	4.5 "Hg	15 psi
06A	Lab Blank	Modified TO-15	NA	NA
07A	CCV	Modified TO-15	NA	NA
08A	LCS	Modified TO-15	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 09/01/11

Laboratory Director

Certfication numbers: AZ Licensure AZ0719, CA NELAP - 02110CA, LA NELAP - 02089,
NY NELAP - 11291, TX NELAP - T104704434-11-3, UT NELAP -CA009332011-1, WA NELAP - C935
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/11 , Expiration date: 06/30/12.
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
EPA Method TO-15
Tetra Tech EM, Inc.
Workorder# 1106214BR1

Five 1 Liter Summa Canister (MA APH Certified) samples were received on June 09, 2011. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

Dilution was performed on sample Diesel#1-HDOH due to the presence of high level non-target species.

Dilution was performed on sample Ambient#1-HDOH due to matrix interference.

A single point calibration for TPH referenced to Gasoline was performed for each daily analytical batch. Recovery is reported as 100% in the associated results for each CCV.

THE WORKORDER WAS REISSUED ON SEPTEMBER 01, 2011 TO REPORT SAMPLE AMBIENT#1-HDOH.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: A-SV04-HDOH

Lab ID#: 1106214BR1-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	56	230	230	940

Client Sample ID: A-SV013-HDOH

Lab ID#: 1106214BR1-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	57	130	230	530

Client Sample ID: A-AS4-HDOH

Lab ID#: 1106214BR1-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	53	76	220	310

Client Sample ID: Diesel#1-HDOH

Lab ID#: 1106214BR1-04A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	120	14000	430	49000
TPH ref. to Gasoline (MW=100)	6000	910000	25000	3700000

Client Sample ID: Diesel#1-HDOH Lab Duplicate

Lab ID#: 1106214BR1-04AA

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	24	15000 E	85	53000 E
TPH ref. to Gasoline (MW=100)	1200	900000	4900	3700000

Client Sample ID: Ambient#1-HDOH

Lab ID#: 1106214BR1-05A

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: Ambient#1-HDOH

Lab ID#: 1106214BR1-05A

No Detections Were Found.

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-SV04-HDOH

Lab ID#: 1106214BR1-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061508**	**Date of Collection: 6/3/11 8:15:00 AM**	
Dil. Factor:	**2.24**	**Date of Analysis: 6/15/11 12:41 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1.1	Not Detected	3.9	Not Detected
TPH ref. to Gasoline (MW=100)	56	230	230	940

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	88	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	92	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-SV013-HDOH

Lab ID#: 1106214BR1-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061509**	**Date of Collection: 6/3/11 8:58:00 AM**	
Dil. Factor:	**2.29**	**Date of Analysis: 6/15/11 01:17 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1.1	Not Detected	4.0	Not Detected
TPH ref. to Gasoline (MW=100)	57	130	230	530

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	90	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	92	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-AS4-HDOH

Lab ID#: 1106214BR1-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061510**	**Date of Collection: 6/3/11 8:44:00 AM**	
Dil. Factor:	**2.13**	**Date of Analysis: 6/15/11 01:53 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1.1	Not Detected	3.8	Not Detected
TPH ref. to Gasoline (MW=100)	53	76	220	310

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	86	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	90	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Diesel#1-HDOH

Lab ID#: 1106214BR1-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061512**	**Date of Collection: 6/3/11 2:09:00 PM**	
Dil. Factor:	**242**	**Date of Analysis: 6/15/11 03:12 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	120	14000	430	49000
TPH ref. to Gasoline (MW=100)	6000	910000	25000	3700000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	90	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	94	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Diesel#1-HDOH Lab Duplicate

Lab ID#: 1106214BR1-04AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061511**	**Date of Collection: 6/3/11 2:09:00 PM**	
Dil. Factor:	**48.4**	**Date of Analysis: 6/15/11 02:31 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	24	15000 E	85	53000 E
TPH ref. to Gasoline (MW=100)	1200	900000	4900	3700000

E = Exceeds instrument calibration range.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	88	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	104	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Ambient#1-HDOH

Lab ID#: 1106214BR1-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061521**	**Date of Collection: 6/3/11 2:09:00 PM**	
Dil. Factor:	**4.76**	**Date of Analysis: 6/15/11 09:25 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	2.4	Not Detected	8.4	Not Detected
TPH ref. to Gasoline (MW=100)	120	Not Detected	490	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	83	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	81	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1106214BR1-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061507**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/15/11 11:57 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	0.50	Not Detected	1.8	Not Detected
TPH ref. to Gasoline (MW=100)	25	Not Detected	100	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	91	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	91	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1106214BR1-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061504**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/15/11 10:10 AM**	

Compound	**%Recovery**
Hexane	88
TPH ref. to Gasoline (MW=100)	100

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	88	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	102	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1106214BR1-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061505**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/15/11 10:45 AM**	

Compound	**%Recovery**
Hexane	95
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	85	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	101	70-130

Air Toxics LTD.
Laboratory Services Since 1989

6/22/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name: Aloha School Street
Project #:
Workorder #: 1106214B

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 6/9/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1106214B

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	Aloha School Street
DATE RECEIVED:	06/09/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	06/21/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	A-SV04-HDOH	Modified TO-15	3.0 "Hg	15 psi
02A	A-SV013-HDOH	Modified TO-15	3.5 "Hg	15 psi
03A	A-AS4-HDOH	Modified TO-15	1.5 "Hg	15 psi
04A	Diesel#1-HDOH	Modified TO-15	5.0 "Hg	15 psi
04AA	Diesel#1-HDOH Lab Duplicate	Modified TO-15	5.0 "Hg	15 psi
05A	Ambient#1-HDOH	Modified TO-15	4.5 "Hg	15 psi
06A	Lab Blank	Modified TO-15	NA	NA
07A	CCV	Modified TO-15	NA	NA
08A	LCS	Modified TO-15	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 06/21/11

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/11
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
EPA Method TO-15
Tetra Tech EM, Inc.
Workorder# 1106214B

Five 1 Liter Summa Canister (MA APH Certified) samples were received on June 09, 2011. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

Dilution was performed on sample Diesel#1-HDOH due to the presence of high level non-target species.

Dilution was performed on sample Ambient#1-HDOH due to matrix interference.

A single point calibration for TPH referenced to Gasoline was performed for each daily analytical batch. Recovery is reported as 100% in the associated results for each CCV.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: A-SV04-HDOH

Lab ID#: 1106214B-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	56	230	230	940

Client Sample ID: A-SV013-HDOH

Lab ID#: 1106214B-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	57	130	230	530

Client Sample ID: A-AS4-HDOH

Lab ID#: 1106214B-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	53	76	220	310

Client Sample ID: Diesel#1-HDOH

Lab ID#: 1106214B-04A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	120	14000	430	49000
TPH ref. to Gasoline (MW=100)	6000	910000	25000	3700000

Client Sample ID: Diesel#1-HDOH Lab Duplicate

Lab ID#: 1106214B-04AA

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	24	15000 E	85	53000 E
TPH ref. to Gasoline (MW=100)	1200	900000	4900	3700000

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-SV04-HDOH

Lab ID#: 1106214B-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061508**	**Date of Collection: 6/3/11 8:15:00 AM**	
Dil. Factor:	**2.24**	**Date of Analysis: 6/15/11 12:41 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1.1	Not Detected	3.9	Not Detected
TPH ref. to Gasoline (MW=100)	56	230	230	940

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	88	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	92	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-SV013-HDOH

Lab ID#: 1106214B-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061509**	**Date of Collection: 6/3/11 8:58:00 AM**	
Dil. Factor:	**2.29**	**Date of Analysis: 6/15/11 01:17 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1.1	Not Detected	4.0	Not Detected
TPH ref. to Gasoline (MW=100)	57	130	230	530

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	90	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	92	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-AS4-HDOH

Lab ID#: 1106214B-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061510**	**Date of Collection: 6/3/11 8:44:00 AM**	
Dil. Factor:	**2.13**	**Date of Analysis: 6/15/11 01:53 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1.1	Not Detected	3.8	Not Detected
TPH ref. to Gasoline (MW=100)	53	76	220	310

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	86	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	90	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Diesel#1-HDOH

Lab ID#: 1106214B-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061512**	**Date of Collection: 6/3/11 2:09:00 PM**	
Dil. Factor:	**242**	**Date of Analysis: 6/15/11 03:12 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	120	14000	430	49000
TPH ref. to Gasoline (MW=100)	6000	910000	25000	3700000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	90	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	94	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Diesel#1-HDOH Lab Duplicate

Lab ID#: 1106214B-04AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061511**	**Date of Collection: 6/3/11 2:09:00 PM**	
Dil. Factor:	**48.4**	**Date of Analysis: 6/15/11 02:31 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	24	15000 E	85	53000 E
TPH ref. to Gasoline (MW=100)	1200	900000	4900	3700000

E = Exceeds instrument calibration range.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	88	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	104	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1106214B-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061507**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/15/11 11:57 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	0.50	Not Detected	1.8	Not Detected
TPH ref. to Gasoline (MW=100)	25	Not Detected	100	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	91	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	91	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1106214B-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061504**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/15/11 10:10 AM**	

Compound	**%Recovery**
Hexane	88
TPH ref. to Gasoline (MW=100)	100

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	88	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	102	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1106214B-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2061505**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/15/11 10:45 AM**	

Compound	**%Recovery**
Hexane	95
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	85	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	101	70-130

Air Toxics LTD.
Laboratory Services Since 1989

7/8/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1106457B

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 6/21/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 / 2 lists are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1106457B

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	06/21/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	07/08/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-VP26-B05(18)-HDOH	Modified TO-15 / 2 lists	5.0 "Hg	15 psi
02A	HAFB-VP26-B05(24)-HDOH	Modified TO-15 / 2 lists	5.0 "Hg	15 psi
03A	HAFB-VP26-B07(20)-HDOH	Modified TO-15 / 2 lists	3.5 "Hg	15 psi
03AA	HAFB-VP26-B07(20)-HDOH Lab Duplic	Modified TO-15 / 2 lists	3.5 "Hg	15 psi
04A	HAFB-VP26-B07(25)-HDOH	Modified TO-15 / 2 lists	3.5 "Hg	15 psi
05A	HAFB-VP26-B08(21)-HDOH	Modified TO-15 / 2 lists	4.0 "Hg	15 psi
06A	Lab Blank	Modified TO-15 / 2 lists	NA	NA
07A	CCV	Modified TO-15 / 2 lists	NA	NA
08A	LCS	Modified TO-15 / 2 lists	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 07/08/11

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/11
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
EPA Method TO-15
Tetra Tech EM, Inc.
Workorder# 1106457B

Five 1 Liter Summa Canister (MA APH Certified) samples were received on June 21, 2011. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

A single point calibration for TPH referenced to Gasoline was performed for each daily analytical batch. Recovery is reported as 100% in the associated results for each CCV.

Dilution was performed on samples HAFB-VP26-B05(18)-HDOH, HAFB-VP26-B05(24)-HDOH, HAFB-VP26-B07(20)-HDOH, HAFB-VP26-B07(20)-HDOH Lab Duplicate, HAFB-VP26-B07(25)-HDOH and HAFB-VP26-B08(21)-HDOH due to the presence of high level non-target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: HAFB-VP26-B05(18)-HDOH

Lab ID#: 1106457B-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1200	8600	4300	30000
TPH ref. to Gasoline (MW=100)	60000	8700000	250000	36000000

Client Sample ID: HAFB-VP26-B05(24)-HDOH

Lab ID#: 1106457B-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	60000	3500000	210000	12000000
TPH ref. to Gasoline (MW=100)	3000000	72000000	12000000	290000000

Client Sample ID: HAFB-VP26-B07(20)-HDOH

Lab ID#: 1106457B-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	57	1000	200	3700
TPH ref. to Gasoline (MW=100)	2800	5400000	12000	22000000

Client Sample ID: HAFB-VP26-B07(20)-HDOH Lab Duplicate

Lab ID#: 1106457B-03AA

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	15	1200	54	4100
TPH ref. to Gasoline (MW=100)	760	3900000	3100	16000000

Client Sample ID: HAFB-VP26-B07(25)-HDOH

Lab ID#: 1106457B-04A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1100	66000	4000	230000
TPH ref. to Gasoline (MW=100)	57000	25000000	230000	100000000

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: HAFB-VP26-B08(21)-HDOH

Lab ID#: 1106457B-05A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	16	6500 E	55	23000 E
TPH ref. to Gasoline (MW=100)	780	4800000	3200	20000000

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(18)-HDOH

Lab ID#: 1106457B-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2062817**	**Date of Collection: 6/16/11 11:44:00 AM**	
Dil. Factor:	**2420**	**Date of Analysis: 6/29/11 06:53 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1200	8600	4300	30000
TPH ref. to Gasoline (MW=100)	60000	8700000	250000	36000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	97	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(24)-HDOH

Lab ID#: 1106457B-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2062820**	**Date of Collection: 6/16/11 12:32:00 PM**	
Dil. Factor:	**121000**	**Date of Analysis: 6/29/11 09:09 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,2-Dichloroethane	60000	Not Detected	240000	Not Detected
1,2-Dibromoethane (EDB)	60000	Not Detected	460000	Not Detected
Hexane	60000	3500000	210000	12000000
TPH ref. to Gasoline (MW=100)	3000000	72000000	12000000	290000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	100	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(20)-HDOH

Lab ID#: 1106457B-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2062825**	**Date of Collection: 6/16/11 12:42:00 PM**	
Dil. Factor:	**114**	**Date of Analysis: 6/29/11 12:11 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	57	1000	200	3700
TPH ref. to Gasoline (MW=100)	2800	5400000	12000	22000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	107	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(20)-HDOH Lab Duplicate

Lab ID#: 1106457B-03AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2062823**	**Date of Collection: 6/16/11 12:42:00 PM**	
Dil. Factor:	**30.5**	**Date of Analysis: 6/29/11 10:46 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	15	1200	54	4100
TPH ref. to Gasoline (MW=100)	760	3900000	3100	16000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	129	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	114	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(25)-HDOH

Lab ID#: 1106457B-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2062822**	**Date of Collection: 6/16/11 1:25:00 PM**	
Dil. Factor:	**2290**	**Date of Analysis: 6/29/11 10:17 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1100	66000	4000	230000
TPH ref. to Gasoline (MW=100)	57000	25000000	230000	100000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B08(21)-HDOH

Lab ID#: 1106457B-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2062826**	**Date of Collection: 6/16/11 11:18:00 AM**	
Dil. Factor:	**31.1**	**Date of Analysis: 6/29/11 12:48 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	16	6500 E	55	23000 E
TPH ref. to Gasoline (MW=100)	780	4800000	3200	20000000

E = Exceeds instrument calibration range.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	99	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	122	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1106457B-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2062810**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/11 07:35 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,2-Dichloroethane	0.50	Not Detected	2.0	Not Detected
1,2-Dibromoethane (EDB)	0.50	Not Detected	3.8	Not Detected
Hexane	0.50	Not Detected	1.8	Not Detected
TPH ref. to Gasoline (MW=100)	25	Not Detected	100	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	91	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1106457B-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2062804**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/11 03:54 PM**	

Compound	**%Recovery**
1,2-Dichloroethane	90
1,2-Dibromoethane (EDB)	92
Hexane	94
TPH ref. to Gasoline (MW=100)	100

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	97	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1106457B-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2062807**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/11 05:43 PM**	

Compound	%Recovery
1,2-Dichloroethane	84
1,2-Dibromoethane (EDB)	85
Hexane	85
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	100	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	101	70-130

Air Toxics LTD.
Laboratory Services Since 1989

8/2/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1107310B

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 7/19/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1107310B

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	07/19/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	08/02/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-ST03-B58 (347)	Modified TO-15	5.5"Hg	15 psi
02A	HAFB-ST03-B58 (422)	Modified TO-15	4.0"Hg	15 psi
03A	HAFB-ST03-B58 (492)	Modified TO-15	5.0"Hg	15 psi
04A	HAFB-ST03-B58 (388)	Modified TO-15	4.5"Hg	15 psi
05A	Lab Blank	Modified TO-15	NA	NA
06A	CCV	Modified TO-15	NA	NA
07A	LCS	Modified TO-15	NA	NA
07AA	LCSD	Modified TO-15	NA	NA

CERTIFIED BY: Linda D. Frumarn DATE: 08/02/11

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/11
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
EPA Method TO-15
Tetra Tech EM, Inc.
Workorder# 1107310B

Four 1 Liter Summa Canister (MA APH Certified) samples were received on July 19, 2011. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

The Chain of Custody (COC) information for samples HAFB-ST03-B58 (347) and HAFB-ST03-B58 (492) did not match the entries on the sample tags with regard to sample identification. Therefore the information on the COC was used to process and report the samples.

Analytical Notes

A single point calibration for TPH referenced to Gasoline was performed for each daily analytical batch. Recovery is reported as 100% in the associated results for each CCV.

Dilution was performed on samples HAFB-ST03-B58 (347), HAFB-ST03-B58 (422), HAFB-ST03-B58 (492) and HAFB-ST03-B58 (388) due to the presence of high level non-target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: HAFB-ST03-B58 (347)

Lab ID#: 1107310B-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	4.9	74	17	260
TPH ref. to Gasoline (MW=100)	250	69000	1000	280000

Client Sample ID: HAFB-ST03-B58 (422)

Lab ID#: 1107310B-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	3.1	38	11	130
TPH ref. to Gasoline (MW=100)	160	32000	630	130000

Client Sample ID: HAFB-ST03-B58 (492)

Lab ID#: 1107310B-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	16	170	57	600
TPH ref. to Gasoline (MW=100)	810	210000	3300	860000

Client Sample ID: HAFB-ST03-B58 (388)

Lab ID#: 1107310B-04A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	16	69	56	240
TPH ref. to Gasoline (MW=100)	790	200000	3200	820000

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58 (347)

Lab ID#: 1107310B-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2072127**	**Date of Collection: 7/14/11 10:47:00 AM**	
Dil. Factor:	**9.88**	**Date of Analysis: 7/21/11 09:52 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	4.9	74	17	260
TPH ref. to Gasoline (MW=100)	250	69000	1000	280000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	116	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58 (422)

Lab ID#: 1107310B-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2072128**	**Date of Collection: 7/14/11 11:00:00 AM**	
Dil. Factor:	**6.21**	**Date of Analysis: 7/21/11 10:21 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	3.1	38	11	130
TPH ref. to Gasoline (MW=100)	160	32000	630	130000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	95	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	114	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58 (492)

Lab ID#: 1107310B-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2072125**	**Date of Collection: 7/14/11 11:55:00 AM**	
Dil. Factor:	**32.3**	**Date of Analysis: 7/21/11 08:53 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	16	170	57	600
TPH ref. to Gasoline (MW=100)	810	210000	3300	860000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	116	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58 (388)

Lab ID#: 1107310B-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2072126**	**Date of Collection: 7/14/11 12:08:00 PM**	
Dil. Factor:	**31.7**	**Date of Analysis: 7/21/11 09:21 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	16	69	56	240
TPH ref. to Gasoline (MW=100)	790	200000	3200	820000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	97	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	115	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1107310B-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2072110**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/21/11 11:14 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	0.50	Not Detected	1.8	Not Detected
TPH ref. to Gasoline (MW=100)	25	Not Detected	100	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	97	70-130
4-Bromofluorobenzene	103	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1107310B-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2072102**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/21/11 06:45 AM**	

Compound	**%Recovery**
Hexane	80
TPH ref. to Gasoline (MW=100)	100

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	98	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	108	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1107310B-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2072103**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/21/11 07:13 AM**	

Compound	**%Recovery**
Hexane	85
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	109	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1107310B-07AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2072104**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/21/11 07:42 AM**	

Compound	**%Recovery**
Hexane	87
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	97	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	110	70-130

Air Toxics LTD.
Laboratory Services Since 1989

9/9/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1108544B

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 8/26/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1108544B

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	08/26/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	09/09/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HDOH-GASOLINE#1	Modified TO-15	4.5 "Hg	15 psi
02A	HDOH-DIESEL#2	Modified TO-15	4.0 "Hg	15 psi
02AA	HDOH-DIESEL#2 Lab Duplicate	Modified TO-15	4.0 "Hg	15 psi
03A	Lab Blank	Modified TO-15	NA	NA
04A	CCV	Modified TO-15	NA	NA
05A	LCS	Modified TO-15	NA	NA
05AA	LCSD	Modified TO-15	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 09/09/11

Laboratory Director

Certfication numbers: AZ Licensure AZ0719, CA NELAP - 02110CA, LA NELAP - 02089, NY NELAP - 11291, TX NELAP - T104704434-11-3, UT NELAP -CA009332011-1, WA NELAP - C935
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act, Accreditation number: E87680, Effective date: 07/01/11 , Expiration date: 06/30/12.
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
EPA Method TO-15
Tetra Tech EM, Inc.
Workorder# 1108544B

Two 1 Liter Summa Canister (MA APH Certified) samples were received on August 26, 2011. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

A single point calibration for TPH referenced to Gasoline was performed for each daily analytical batch. Recovery is reported as 100% in the associated results for each CCV.

Dilution was performed on samples HDOH-GASOLINE#1, HDOH-DIESEL#2 and HDOH-DIESEL#2 Lab Duplicate due to the presence of high level non-target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: HDOH-GASOLINE#1

Lab ID#: 1108544B-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	24000	4200000	84000	15000000
TPH ref. to Gasoline (MW=100)	1200000	240000000	4900000	980000000

Client Sample ID: HDOH-DIESEL#2

Lab ID#: 1108544B-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	29	2200	100	7800
TPH ref. to Gasoline (MW=100)	1400	550000	6000	2200000

Client Sample ID: HDOH-DIESEL#2 Lab Duplicate

Lab ID#: 1108544B-02AA

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	29	2000	100	7000
TPH ref. to Gasoline (MW=100)	1400	500000	6000	2000000

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HDOH-GASOLINE#1

Lab ID#: 1108544B-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2083020**	**Date of Collection: 8/25/11 10:30:00 AM**	
Dil. Factor:	**47600**	**Date of Analysis: 8/30/11 09:37 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	24000	4200000	84000	15000000
TPH ref. to Gasoline (MW=100)	1200000	240000000	4900000	980000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	89	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	97	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HDOH-DIESEL#2

Lab ID#: 1108544B-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2083021**	**Date of Collection: 8/25/11 10:30:00 AM**	
Dil. Factor:	**58.2**	**Date of Analysis: 8/30/11 11:16 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	29	2200	100	7800
TPH ref. to Gasoline (MW=100)	1400	550000	6000	2200000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	89	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	112	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HDOH-DIESEL#2 Lab Duplicate

Lab ID#: 1108544B-02AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2083022**	**Date of Collection: 8/25/11 10:30:00 AM**	
Dil. Factor:	**58.2**	**Date of Analysis: 8/31/11 12:07 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	29	2000	100	7000
TPH ref. to Gasoline (MW=100)	1400	500000	6000	2000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	86	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	112	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1108544B-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2083008**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/30/11 09:51 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	0.50	Not Detected	1.8	Not Detected
TPH ref. to Gasoline (MW=100)	25	Not Detected	100	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1108544B-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2083002**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/30/11 05:47 AM**	

Compound	**%Recovery**
Hexane	92
TPH ref. to Gasoline (MW=100)	100

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	106	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1108544B-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2083003**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/30/11 06:27 AM**	

Compound	**%Recovery**
Hexane	90
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	91	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	109	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1108544B-05AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2083004**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/30/11 06:57 AM**	

Compound	**%Recovery**
Hexane	90
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	89	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	107	70-130

Air Toxics LTD.
Laboratory Services Since 1989

8/26/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1108300B

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 8/15/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1108300B

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	08/15/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	08/26/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HH-OUIC-MW10SG	Modified TO-15	4.0 "Hg	15 psi
02A	HH-OUIC-MW22R	Modified TO-15	5.0 "Hg	15 psi
03A	HH-OUIC-OTNS1	Modified TO-15	3.2 "Hg	15 psi
03AA	HH-OUIC-OTNS1 Lab Duplicate	Modified TO-15	3.2 "Hg	15 psi
04A	Lab Blank	Modified TO-15	NA	NA
05A	CCV	Modified TO-15	NA	NA
06A	LCS	Modified TO-15	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 08/26/11

Laboratory Director

Certfication numbers: AZ Licensure AZ0719, CA NELAP - 02110CA, LA NELAP - 02089,
NY NELAP - 11291, TX NELAP - T104704434-11-3, UT NELAP -CA009332011-1, WA NELAP - C935
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/11 , Expiration date: 06/30/12.
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
EPA Method TO-15
Tetra Tech EM, Inc.
Workorder# 1108300B

Three 1 Liter Summa Canister (MA APH Certified) samples were received on August 15, 2011. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

A single point calibration for TPH referenced to Gasoline was performed for each daily analytical batch. Recovery is reported as 100% in the associated results for each CCV.

Dilution was performed on samples HH-OUIC-MW10SG, HH-OUIC-MW22R, HH-OUIC-OTNS1 and HH-OUIC-OTNS1 Lab Duplicate due to the presence of high level non-target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: HH-OUIC-MW10SG

Lab ID#: 1108300B-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	780	150000	2700	520000
TPH ref. to Gasoline (MW=100)	39000	32000000	160000	130000000

Client Sample ID: HH-OUIC-MW22R

Lab ID#: 1108300B-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	480	73000	1700	260000
TPH ref. to Gasoline (MW=100)	24000	11000000	99000	45000000

Client Sample ID: HH-OUIC-OTNS1

Lab ID#: 1108300B-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	76	540	270	1900
TPH ref. to Gasoline (MW=100)	3800	390000	15000	1600000

Client Sample ID: HH-OUIC-OTNS1 Lab Duplicate

Lab ID#: 1108300B-03AA

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	76	460	270	1600
TPH ref. to Gasoline (MW=100)	3800	340000	15000	1400000

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OUIC-MW10SG

Lab ID#: 1108300B-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2081927**	**Date of Collection: 8/11/11 2:03:00 PM**	
Dil. Factor:	**1550**	**Date of Analysis: 8/19/11 11:20 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	780	150000	2700	520000
TPH ref. to Gasoline (MW=100)	39000	32000000	160000	130000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	93	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	109	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OUIC-MW22R

Lab ID#: 1108300B-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2081917**	**Date of Collection: 8/11/11 1:38:00 PM**	
Dil. Factor:	**968**	**Date of Analysis: 8/19/11 03:18 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	480	73000	1700	260000
TPH ref. to Gasoline (MW=100)	24000	11000000	99000	45000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	92	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	106	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OUIC-OTNS1

Lab ID#: 1108300B-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2081916**	**Date of Collection: 8/11/11 2:38:00 PM**	
Dil. Factor:	**151**	**Date of Analysis: 8/19/11 02:38 PM**	

Compound	**Rpt. Limit (ppbv)**	**Amount (ppbv)**	**Rpt. Limit (ug/m3)**	**Amount (ug/m3)**
Hexane	76	540	270	1900
TPH ref. to Gasoline (MW=100)	3800	390000	15000	1600000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	98	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	105	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OUIC-OTNS1 Lab Duplicate

Lab ID#: 1108300B-03AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2081921**	**Date of Collection: 8/11/11 2:38:00 PM**	
Dil. Factor:	**151**	**Date of Analysis: 8/19/11 06:02 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	76	460	270	1600
TPH ref. to Gasoline (MW=100)	3800	340000	15000	1400000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	95	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	102	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1108300B-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2081909**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/19/11 10:25 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	0.50	Not Detected	1.8	Not Detected
TPH ref. to Gasoline (MW=100)	25	Not Detected	100	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	100	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1108300B-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2081906**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/19/11 08:45 AM**	

Compound	**%Recovery**
Hexane	82
TPH ref. to Gasoline (MW=100)	100

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	99	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	111	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1108300B-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2081907**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/19/11 09:13 AM**	

Compound	**%Recovery**
Hexane	86
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	114	70-130

Air Toxics LTD.
Laboratory Services Since 1989

10/21/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1110160B

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 10/8/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1110160B

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/08/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	10/21/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-SP43-VMP10	Modified TO-15	5.2 "Hg	15psi
01AA	HAFB-SP43-VMP10 Lab Duplicate	Modified TO-15	5.2 "Hg	15psi
02A	HAFB-SP43-VMP11	Modified TO-15	5.0 "Hg	15psi
03A	HAFB-SP43-VMP12	Modified TO-15	4.5 "Hg	15psi
04A	HAFB-SP43-VMP16	Modified TO-15	6.0 "Hg	15psi
05A	HAFB-SP43-VMP17	Modified TO-15	5.5 "Hg	15psi
06A	FV-GP01-HDOH#2	Modified TO-15	4.0 "Hg	15psi
07A	FV-GP08-HDOH#2	Modified TO-15	5.0 "Hg	15psi
08A	FV-GP16R-HDOH#2	Modified TO-15	5.5 "Hg	15psi
09A	JP8#1	Modified TO-15	4.0 "Hg	15psi
10A	Lab Blank	Modified TO-15	NA	NA
11A	CCV	Modified TO-15	NA	NA
12A	LCS	Modified TO-15	NA	NA
12AA	LCSD	Modified TO-15	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 10/21/11

Laboratory Director

Certfication numbers: AZ Licensure AZ0719, CA NELAP - 02110CA, LA NELAP - 02089,
NY NELAP - 11291, TX NELAP - T104704434-11-3, UT NELAP -CA009332011-1, WA NELAP - C935
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/11 , Expiration date: 06/30/12.
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
EPA Method TO-15
Tetra Tech EM, Inc.
Workorder# 1110160B

Nine 1 Liter Summa Canister (MA APH Certified) samples were received on October 08, 2011. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

A single point calibration for TPH referenced to Gasoline was performed for each daily analytical batch. Recovery is reported as 100% in the associated results for each CCV.

Dilution was performed on samples HAFB-SP43-VMP10, HAFB-SP43-VMP10 Lab Duplicate, HAFB-SP43-VMP11, HAFB-SP43-VMP16, HAFB-SP43-VMP17, FV-GP08-HDOH#2, FV-GP16R-HDOH#2 and JP8#1 due to the presence of high level non-target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: HAFB-SP43-VMP10

Lab ID#: 1110160B-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	6100	9900000	25000	40000000

Client Sample ID: HAFB-SP43-VMP10 Lab Duplicate

Lab ID#: 1110160B-01AA

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	6100	9500000	25000	39000000

Client Sample ID: HAFB-SP43-VMP11

Lab ID#: 1110160B-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	6000	11000000	25000	45000000

Client Sample ID: HAFB-SP43-VMP12

Lab ID#: 1110160B-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	60	1500	240	6100

Client Sample ID: HAFB-SP43-VMP16

Lab ID#: 1110160B-04A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	6300	21000000	26000	86000000

Client Sample ID: HAFB-SP43-VMP17

Lab ID#: 1110160B-05A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: HAFB-SP43-VMP17

Lab ID#: 1110160B-05A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	6200	2600000	25000	11000000

Client Sample ID: FV-GP01-HDOH#2

Lab ID#: 1110160B-06A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1.2	4.0	4.1	14
TPH ref. to Gasoline (MW=100)	58	13000	240	53000

Client Sample ID: FV-GP08-HDOH#2

Lab ID#: 1110160B-07A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	600	660000	2500	2700000

Client Sample ID: FV-GP16R-HDOH#2

Lab ID#: 1110160B-08A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	6200	3200000	25000	13000000

Client Sample ID: JP8#1

Lab ID#: 1110160B-09A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	120	27000	410	94000
TPH ref. to Gasoline (MW=100)	5800	3400000	24000	14000000

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP10

Lab ID#: 1110160B-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101216**	**Date of Collection: 10/5/11 2:05:00 PM**	
Dil. Factor:	**244**	**Date of Analysis: 10/12/11 04:09 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	120	Not Detected	430	Not Detected
TPH ref. to Gasoline (MW=100)	6100	9900000	25000	40000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	104	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP10 Lab Duplicate

Lab ID#: 1110160B-01AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101217**	**Date of Collection: 10/5/11 2:05:00 PM**	
Dil. Factor:	**244**	**Date of Analysis: 10/12/11 04:52 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	120	Not Detected	430	Not Detected
TPH ref. to Gasoline (MW=100)	6100	9500000	25000	39000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	103	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP11

Lab ID#: 1110160B-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101218**	**Date of Collection: 10/5/11 1:15:00 PM**	
Dil. Factor:	**242**	**Date of Analysis: 10/12/11 05:31 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	120	Not Detected	430	Not Detected
TPH ref. to Gasoline (MW=100)	6000	11000000	25000	45000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	103	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP12

Lab ID#: 1110160B-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101222**	**Date of Collection: 10/5/11 12:44:00 PM**	
Dil. Factor:	**2.38**	**Date of Analysis: 10/12/11 08:39 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1.2	Not Detected	4.2	Not Detected
TPH ref. to Gasoline (MW=100)	60	1500	240	6100

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	90	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP16

Lab ID#: 1110160B-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101219**	**Date of Collection: 10/5/11 1:42:00 PM**	
Dil. Factor:	**252**	**Date of Analysis: 10/12/11 06:13 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	130	Not Detected	440	Not Detected
TPH ref. to Gasoline (MW=100)	6300	21000000	26000	86000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	116	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	105	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP17

Lab ID#: 1110160B-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101214**	**Date of Collection: 10/5/11 11:52:00 AM**	
Dil. Factor:	**247**	**Date of Analysis: 10/12/11 01:43 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	120	Not Detected	440	Not Detected
TPH ref. to Gasoline (MW=100)	6200	2600000	25000	11000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	114	70-130
Toluene-d8	113	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP01-HDOH#2

Lab ID#: 1110160B-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101223**	**Date of Collection: 10/6/11 1:45:00 PM**	
Dil. Factor:	**2.33**	**Date of Analysis: 10/12/11 09:15 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1.2	4.0	4.1	14
TPH ref. to Gasoline (MW=100)	58	13000	240	53000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	95	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP08-HDOH#2

Lab ID#: 1110160B-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101215**	**Date of Collection: 10/6/11 1:06:00 PM**	
Dil. Factor:	**24.2**	**Date of Analysis: 10/12/11 03:24 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	12	Not Detected	43	Not Detected
TPH ref. to Gasoline (MW=100)	600	660000	2500	2700000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	114	70-130
Toluene-d8	115	70-130
4-Bromofluorobenzene	102	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP16R-HDOH#2

Lab ID#: 1110160B-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101224**	**Date of Collection: 10/6/11 12:19:00 PM**	
Dil. Factor:	**247**	**Date of Analysis: 10/12/11 09:52 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	120	Not Detected	440	Not Detected
TPH ref. to Gasoline (MW=100)	6200	3200000	25000	13000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	97	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	99	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: JP8#1

Lab ID#: 1110160B-09A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101220**	**Date of Collection: 10/6/11 3:15:00 PM**	
Dil. Factor:	**233**	**Date of Analysis: 10/12/11 06:55 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	120	27000	410	94000
TPH ref. to Gasoline (MW=100)	5800	3400000	24000	14000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	98	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110160B-10A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101213**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/11 01:01 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	0.50	Not Detected	1.8	Not Detected
TPH ref. to Gasoline (MW=100)	25	Not Detected	100	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	116	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	84	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1110160B-11A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101206**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/11 07:49 AM**	

Compound	**%Recovery**
Hexane	105
TPH ref. to Gasoline (MW=100)	100

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	113	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110160B-12A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101207**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/11 08:37 AM**	

Compound	**%Recovery**
Hexane	106
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	94	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1110160B-12AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2101208**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/11 09:11 AM**	

Compound	**%Recovery**
Hexane	104
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	95	70-130

Air Toxics LTD.
Laboratory Services Since 1989

11/3/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1110413B

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 10/20/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

WORK ORDER #: 1110413B

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/20/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/03/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-VP26-B05(18)	Modified TO-15	4.0 "Hg	5 psi
02A	HAFB-VP26-B05(24)	Modified TO-15	3.5 "Hg	5 psi
03A	HAFB-VP26-B07(20)	Modified TO-15	2.5 "Hg	5 psi
04A	HAFB-VP26-B07(25)	Modified TO-15	4.5 "Hg	5 psi
05A	HAFB-ST03-B58(347)	Modified TO-15	4.4 "Hg	5 psi
05AA	HAFB-ST03-B58(347) Lab Duplicate	Modified TO-15	4.4 "Hg	5 psi
06A	HAFB-ST03-B58(422)	Modified TO-15	5.0 "Hg	5 psi
07A	HAFB-ST03-B58(492)	Modified TO-15	4.6 "Hg	5 psi
08A	HAFB-ST03-B59(388)	Modified TO-15	5.0 "Hg	5 psi
09A	HH-OU1C-MW10SG	Modified TO-15	6.0 "Hg	5 psi
10A	HH-OU1C-MW22R	Modified TO-15	5.4 "Hg	5 psi
11A	HH-OU1C-OTNS1	Modified TO-15	4.2 "Hg	5 psi
12A	GASOLINE#2	Modified TO-15	2.6 "Hg	5 psi
12AA	GASOLINE#2 Lab Duplicate	Modified TO-15	2.6 "Hg	5 psi
13A	DIESEL#3	Modified TO-15	3.2 "Hg	5 psi
13AA	DIESEL#3 Lab Duplicate	Modified TO-15	3.2 "Hg	5 psi
14A	GASOLINE-EXHAUST	Modified TO-15	3.2 "Hg	5 psi

Continued on next page

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1110413B

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/20/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/03/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
15A	DIESEL-EXHAUST	Modified TO-15	3.0 "Hg	5 psi
16A	Lab Blank	Modified TO-15	NA	NA
16B	Lab Blank	Modified TO-15	NA	NA
16C	Lab Blank	Modified TO-15	NA	NA
17A	CCV	Modified TO-15	NA	NA
17B	CCV	Modified TO-15	NA	NA
17C	CCV	Modified TO-15	NA	NA
18A	LCS	Modified TO-15	NA	NA
18AA	LCSD	Modified TO-15	NA	NA
18B	LCS	Modified TO-15	NA	NA
18BB	LCSD	Modified TO-15	NA	NA
18C	LCS	Modified TO-15	NA	NA
18CC	LCSD	Modified TO-15	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 11/03/11

Laboratory Director

Certfication numbers: AZ Licensure AZ0719, CA NELAP - 02110CA, LA NELAP - 02089,
NY NELAP - 11291, TX NELAP - T104704434-11-3, UT NELAP -CA009332011-1, WA NELAP - C935
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/11 , Expiration date: 06/30/12.
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
EPA Method TO-15
Tetra Tech EM, Inc.
Workorder# 1110413B

Fifteen 1 Liter Summa Canister (MA APH Certified) samples were received on October 20, 2011. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

The Chain of Custody (COC) information for sample HH-OU1C-MW22R and HH-OU1C-OTNS1 did not match the information on the canister with regard to canister identification. The client was notified of the discrepancy and the information on the canister was used to process and report the samples.

The Chain of Custody contained incorrect method information. ATL proceeded with the analysis as per the original contract or verbal agreement.

Analytical Notes

A single point calibration for TPH referenced to Gasoline was performed for each daily analytical batch. Recovery is reported as 100% in the associated results for each CCV.

Dilution was performed on samples HAFB-VP26-B05(24), DIESEL#3, DIESEL#3 Lab Duplicate and GASOLINE-EXHAUST due to the presence of high level target species.

Dilution was performed on samples HAFB-VP26-B05(18), HAFB-VP26-B07(20), HAFB-VP26-B07(25), HAFB-ST03-B58(347), HAFB-ST03-B58(347) Lab Duplicate, HAFB-ST03-B58(422), HAFB-ST03-B58(492), HAFB-ST03-B59(388), HH-OU1C-MW10SG, HH-OU1C-MW22R, GASOLINE#2 and GASOLINE#2 Lab Duplicate due to the presence of high level non-target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: HAFB-VP26-B05(18)

Lab ID#: 1110413B-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	520	3100	1800	11000
TPH ref. to Gasoline (MW=100)	26000	32000000	100000	130000000

Client Sample ID: HAFB-VP26-B05(24)

Lab ID#: 1110413B-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	13000	2500000	44000	8800000
TPH ref. to Gasoline (MW=100)	630000	67000000	2600000	270000000

Client Sample ID: HAFB-VP26-B07(20)

Lab ID#: 1110413B-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	730	57000	2600	200000
TPH ref. to Gasoline (MW=100)	36000	26000000	150000	110000000

Client Sample ID: HAFB-VP26-B07(25)

Lab ID#: 1110413B-04A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1600	80000	5600	280000
TPH ref. to Gasoline (MW=100)	79000	73000000	320000	300000000

Client Sample ID: HAFB-ST03-B58(347)

Lab ID#: 1110413B-05A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	7.8	91	28	320
TPH ref. to Gasoline (MW=100)	390	380000	1600	1600000

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: HAFB-ST03-B58(347) Lab Duplicate

Lab ID#: 1110413B-05AA

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	7.8	87	28	300
TPH ref. to Gasoline (MW=100)	390	440000	1600	1800000

Client Sample ID: HAFB-ST03-B58(422)

Lab ID#: 1110413B-06A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	11	140	38	500
TPH ref. to Gasoline (MW=100)	540	590000	2200	2400000

Client Sample ID: HAFB-ST03-B58(492)

Lab ID#: 1110413B-07A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	10	140	37	500
TPH ref. to Gasoline (MW=100)	530	630000	2200	2600000

Client Sample ID: HAFB-ST03-B59(388)

Lab ID#: 1110413B-08A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1.4	140	4.9	490
TPH ref. to Gasoline (MW=100)	69	54000	280	220000

Client Sample ID: HH-OU1C-MW10SG

Lab ID#: 1110413B-09A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1700	130000	5900	450000
TPH ref. to Gasoline (MW=100)	84000	53000000	340000	220000000

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: HH-OU1C-MW22R

Lab ID#: 1110413B-10A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	4100	120000	14000	430000
TPH ref. to Gasoline (MW=100)	200000	43000000	830000	180000000

Client Sample ID: HH-OU1C-OTNS1

Lab ID#: 1110413B-11A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	39	520	160	2100

Client Sample ID: GASOLINE#2

Lab ID#: 1110413B-12A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1200	59000	4300	210000
TPH ref. to Gasoline (MW=100)	61000	5600000	250000	23000000

Client Sample ID: GASOLINE#2 Lab Duplicate

Lab ID#: 1110413B-12AA

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	3700	63000	13000	220000
TPH ref. to Gasoline (MW=100)	180000	6300000	750000	26000000

Client Sample ID: DIESEL#3

Lab ID#: 1110413B-13A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	5.0	1800	18	6400
TPH ref. to Gasoline (MW=100)	250	140000	1000	570000

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: DIESEL#3 Lab Duplicate

Lab ID#: 1110413B-13AA

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	5.0	1700	18	6000
TPH ref. to Gasoline (MW=100)	250	130000	1000	530000

Client Sample ID: GASOLINE-EXHAUST

Lab ID#: 1110413B-14A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	7.5	500	26	1800
TPH ref. to Gasoline (MW=100)	380	26000	1500	110000

Client Sample ID: DIESEL-EXHAUST

Lab ID#: 1110413B-15A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
TPH ref. to Gasoline (MW=100)	37	130	150	530

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(18)

Lab ID#: 1110413B-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102425**	**Date of Collection: 10/13/11 10:12:00 A**	
Dil. Factor:	**1030**	**Date of Analysis: 10/25/11 06:18 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	520	3100	1800	11000
TPH ref. to Gasoline (MW=100)	26000	32000000	100000	130000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	98	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(24)

Lab ID#: 1110413B-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102422**	**Date of Collection: 10/13/11 10:46:00 A**	
Dil. Factor:	**25300**	**Date of Analysis: 10/24/11 10:46 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	13000	2500000	44000	8800000
TPH ref. to Gasoline (MW=100)	630000	67000000	2600000	270000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	99	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	81	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(20)

Lab ID#: 1110413B-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102416**	**Date of Collection: 10/13/11 11:23:00 A**	
Dil. Factor:	**1460**	**Date of Analysis: 10/24/11 05:47 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	730	57000	2600	200000
TPH ref. to Gasoline (MW=100)	36000	26000000	150000	110000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	105	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	88	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(25)

Lab ID#: 1110413B-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102417**	**Date of Collection: 10/13/11 11:49:00 A**	
Dil. Factor:	**3160**	**Date of Analysis: 10/24/11 06:32 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1600	80000	5600	280000
TPH ref. to Gasoline (MW=100)	79000	73000000	320000	300000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	101	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	88	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(347)

Lab ID#: 1110413B-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102113**	**Date of Collection: 10/14/11 9:35:00 AM**	
Dil. Factor:	**15.7**	**Date of Analysis: 10/21/11 04:24 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	7.8	91	28	320
TPH ref. to Gasoline (MW=100)	390	380000	1600	1600000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	111	70-130
Toluene-d8	109	70-130
4-Bromofluorobenzene	93	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(347) Lab Duplicate

Lab ID#: 1110413B-05AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102114**	**Date of Collection: 10/14/11 9:35:00 AM**	
Dil. Factor:	**15.7**	**Date of Analysis: 10/21/11 05:20 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	7.8	87	28	300
TPH ref. to Gasoline (MW=100)	390	440000	1600	1800000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	112	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(422)

Lab ID#: 1110413B-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102115**	**Date of Collection: 10/14/11 10:19:00 A**	
Dil. Factor:	**21.5**	**Date of Analysis: 10/21/11 06:08 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	11	140	38	500
TPH ref. to Gasoline (MW=100)	540	590000	2200	2400000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	110	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(492)

Lab ID#: 1110413B-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102116**	**Date of Collection: 10/14/11 10:36:00 A**	
Dil. Factor:	**21.1**	**Date of Analysis: 10/21/11 06:58 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	10	140	37	500
TPH ref. to Gasoline (MW=100)	530	630000	2200	2600000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	110	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B59(388)

Lab ID#: 1110413B-08A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102120**	**Date of Collection: 10/14/11 11:03:00 A**	
Dil. Factor:	**2.77**	**Date of Analysis: 10/21/11 10:07 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1.4	140	4.9	490
TPH ref. to Gasoline (MW=100)	69	54000	280	220000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	109	70-130
4-Bromofluorobenzene	102	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-MW10SG

Lab ID#: 1110413B-09A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102419**	**Date of Collection: 10/18/11 11:43:00 A**	
Dil. Factor:	**3360**	**Date of Analysis: 10/24/11 08:07 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	1700	130000	5900	450000
TPH ref. to Gasoline (MW=100)	84000	53000000	340000	220000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	88	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-MW22R

Lab ID#: 1110413B-10A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102510**	**Date of Collection: 10/18/11 11:09:00 A**	
Dil. Factor:	**8150**	**Date of Analysis: 10/25/11 12:28 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	4100	120000	14000	430000
TPH ref. to Gasoline (MW=100)	200000	43000000	830000	180000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	83	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-OTNS1

Lab ID#: 1110413B-11A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102117**	**Date of Collection: 10/18/11 10:31:00 A**	
Dil. Factor:	**1.56**	**Date of Analysis: 10/21/11 07:41 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	0.78	Not Detected	2.7	Not Detected
TPH ref. to Gasoline (MW=100)	39	520	160	2100

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	110	70-130
4-Bromofluorobenzene	90	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE#2

Lab ID#: 1110413B-12A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102512**	**Date of Collection: 10/18/11 8:35:00 AM**	
Dil. Factor:	**2450**	**Date of Analysis: 10/25/11 01:45 PM**	

Compound	**Rpt. Limit (ppbv)**	**Amount (ppbv)**	**Rpt. Limit (ug/m3)**	**Amount (ug/m3)**
Hexane	1200	59000	4300	210000
TPH ref. to Gasoline (MW=100)	61000	5600000	250000	23000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	101	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	82	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE#2 Lab Duplicate

Lab ID#: 1110413B-12AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102511**	**Date of Collection: 10/18/11 8:35:00 AM**	
Dil. Factor:	**7350**	**Date of Analysis: 10/25/11 01:06 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	3700	63000	13000	220000
TPH ref. to Gasoline (MW=100)	180000	6300000	750000	26000000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	100	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	81	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL#3

Lab ID#: 1110413B-13A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102412**	**Date of Collection: 10/18/11 8:35:00 AM**	
Dil. Factor:	**10.0**	**Date of Analysis: 10/24/11 02:04 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	5.0	1800	18	6400
TPH ref. to Gasoline (MW=100)	250	140000	1000	570000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	110	70-130
Toluene-d8	107	70-130
4-Bromofluorobenzene	95	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL#3 Lab Duplicate

Lab ID#: 1110413B-13AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102413**	**Date of Collection: 10/18/11 8:35:00 AM**	
Dil. Factor:	**10.0**	**Date of Analysis: 10/24/11 02:39 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	5.0	1700	18	6000
TPH ref. to Gasoline (MW=100)	250	130000	1000	530000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	105	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE-EXHAUST

Lab ID#: 1110413B-14A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102411**	**Date of Collection: 10/18/11 8:50:00 AM**	
Dil. Factor:	**15.0**	**Date of Analysis: 10/24/11 01:24 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	7.5	500	26	1800
TPH ref. to Gasoline (MW=100)	380	26000	1500	110000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	89	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL-EXHAUST

Lab ID#: 1110413B-15A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102118**	**Date of Collection: 10/18/11 8:45:00 AM**	
Dil. Factor:	**1.49**	**Date of Analysis: 10/21/11 08:27 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	0.74	Not Detected	2.6	Not Detected
TPH ref. to Gasoline (MW=100)	37	130	150	530

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	87	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110413B-16A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102108**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/21/11 12:01 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	0.50	Not Detected	1.8	Not Detected
TPH ref. to Gasoline (MW=100)	25	Not Detected	100	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	113	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	81	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110413B-16B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102409**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/24/11 11:33 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	0.50	Not Detected	1.8	Not Detected
TPH ref. to Gasoline (MW=100)	25	Not Detected	100	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	81	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110413B-16C

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102509**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/25/11 11:49 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Hexane	0.50	Not Detected	1.8	Not Detected
TPH ref. to Gasoline (MW=100)	25	Not Detected	100	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	82	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1110413B-17A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102102**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/21/11 07:54 AM**	

Compound	**%Recovery**
Hexane	119
TPH ref. to Gasoline (MW=100)	100

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	116	70-130
Toluene-d8	107	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1110413B-17B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102405**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/24/11 08:59 AM**	

Compound	**%Recovery**
Hexane	118
TPH ref. to Gasoline (MW=100)	100

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1110413B-17C

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102503**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/25/11 08:25 AM**	

Compound	**%Recovery**
Hexane	114
TPH ref. to Gasoline (MW=100)	100

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	98	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110413B-18A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102103**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/21/11 08:40 AM**	

Compound	**%Recovery**
Hexane	107
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	111	70-130
Toluene-d8	108	70-130
4-Bromofluorobenzene	98	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1110413B-18AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102104**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/21/11 09:16 AM**	

Compound	**%Recovery**
Hexane	105
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	108	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110413B-18B

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102406**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/24/11 09:37 AM**	

Compound	**%Recovery**
Hexane	109
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	98	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1110413B-18BB

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102407**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/24/11 10:13 AM**	

Compound	**%Recovery**
Hexane	109
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	95	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110413B-18C

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102504**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/25/11 08:58 AM**	

Compound	**%Recovery**
Hexane	105
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	98	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	94	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1110413B-18CC

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2102505**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/25/11 09:30 AM**	

Compound	**%Recovery**
Hexane	112
TPH ref. to Gasoline (MW=100)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	92	70-130

Air Toxics LTD.
Laboratory Services Since 1989

6/22/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name: Fishing Village
Project #:
Workorder #: 1105519A

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 5/26/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Massachusetts APH are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1105519A

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	Fishing Village
DATE RECEIVED:	05/26/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	06/20/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	FV-GP-01-HDOH	Massachusetts APH	5.5 "Hg	15 psi
02A	FV-GP-06R-HDOH	Massachusetts APH	4.5 "Hg	15 psi
02AA	FV-GP-06R-HDOH Lab Duplicate	Massachusetts APH	4.5 "Hg	15 psi
03A	FV-GP-08-HDOH	Massachusetts APH	2.0 "Hg	15 psi
04A	FV-GP-16R-HDOH	Massachusetts APH	5.5 "Hg	15 psi
05A	FV-GP-17-HDOH	Massachusetts APH	5.5 "Hg	15 psi
06A	G-IPB20-HDOH	Massachusetts APH	6.5 "Hg	15 psi
07A	G-IPH11-HDOH	Massachusetts APH	4.0 "Hg	15 psi
08A	G-IPL19-HDOH	Massachusetts APH	5.0 "Hg	15 psi
09A	G-IP28-HDOH	Massachusetts APH	9.5 "Hg	15 psi
10A	G-SG12-HDOH	Massachusetts APH	4.0 "Hg	15 psi
11A	Lab Blank	Massachusetts APH	NA	NA
11B	Lab Blank	Massachusetts APH	NA	NA
12A	CCV	Massachusetts APH	NA	NA
12B	CCV	Massachusetts APH	NA	NA
13A	LCS	Massachusetts APH	NA	NA
13B	LCS	Massachusetts APH	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 06/21/11

Laboratory Director

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Massachusetts DEP APH
Tetra Tech EM, Inc.
Workorder# 1105519A

Ten 1 Liter Summa Canister (MA APH Certified) samples were received on May 26, 2011. The laboratory performed analysis via Massachusetts DEP APH method using GC/MS in the full scan mode. The method involves concentrating up to 0.5 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis. This method is designed to measure gaseous phase aliphatic and aromatic compounds in ambient air and soil gas collected in stainless steel Summa canisters. The volatile aliphatic hydrocarbons are collectively quantified within the C5 to C8 range and within the C9 to C12 range. Additionally, the volatile aromatic hydrocarbons are collectively quantified within the C9 to C10 range.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The reported LCS for each daily batch has been derived from more than one analytical file.

The reported CCV for each daily batch may be derived from more than one analytical file due to the client's request for non-standard compounds.

Non-standard compounds may have different acceptance criteria than the standard TO-14A/TO-15 compound list as per contract or verbal agreement.

A dilution was performed on samples FV-GP-01-HDOH, FV-GP-08-HDOH, FV-GP-16R-HDOH, G-IPB20-HDOH, G-IPH11-HDOH, G-IP28-HDOH and G-SG12-HDOH due to the presence of high level target species.

The per analytical batch duplicate analysis for samples analyzed on 06/03/2011 required for this project is associated with work order 1105583D.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP-01-HDOH

Lab ID#: 1105519A-01A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060214a**	**Date of Collection:**	**5/19/11 10:55:00 AM**
Dil. Factor:	**14.1**	**Date of Analysis:**	**6/2/11 02:42 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	13	Not Detected	28	Not Detected
Methyl tert-butyl ether	7.8	Not Detected	28	Not Detected
Benzene	8.9	Not Detected	28	Not Detected
Toluene	7.5	Not Detected	28	Not Detected
Ethyl Benzene	6.5	Not Detected	28	Not Detected
o-Xylene	6.5	Not Detected	28	Not Detected
m,p-Xylene	6.5	Not Detected	28	Not Detected
Naphthalene	28	Not Detected	150	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	101	70-130
Toluene-d8	107	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP-06R-HDOH

Lab ID#: 1105519A-02A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060216a**	**Date of Collection: 5/19/11 11:43:00 AM**	
Dil. Factor:	**2.38**	**Date of Analysis: 6/2/11 03:53 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	2.1	Not Detected	4.7	Not Detected
Methyl tert-butyl ether	1.3	Not Detected	4.7	Not Detected
Benzene	1.5	Not Detected	4.8	Not Detected
Toluene	1.3	Not Detected	4.8	Not Detected
Ethyl Benzene	1.1	Not Detected	4.8	Not Detected
o-Xylene	1.1	Not Detected	4.8	Not Detected
m,p-Xylene	1.1	Not Detected	4.8	Not Detected
Naphthalene	4.8	Not Detected	25	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	125	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	101	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP-06R-HDOH Lab Duplicate

Lab ID#: 1105519A-02AA

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060215a**	**Date of Collection: 5/19/11 11:43:00 AM**	
Dil. Factor:	**7.32**	**Date of Analysis: 6/2/11 03:20 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	6.6	Not Detected	14	Not Detected
Methyl tert-butyl ether	4.0	Not Detected	14	Not Detected
Benzene	4.6	Not Detected	15	Not Detected
Toluene	3.9	Not Detected	15	Not Detected
Ethyl Benzene	3.4	Not Detected	15	Not Detected
o-Xylene	3.4	Not Detected	15	Not Detected
m,p-Xylene	3.4	Not Detected	15	Not Detected
Naphthalene	15	Not Detected	77	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	114	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	104	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP-08-HDOH

Lab ID#: 1105519A-03A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060217a**	**Date of Collection: 5/19/11 10:27:00 AM**	
Dil. Factor:	**18.8**	**Date of Analysis: 6/2/11 04:25 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	17	Not Detected	37	Not Detected
Methyl tert-butyl ether	10	Not Detected	37	Not Detected
Benzene	12	16	38	50
Toluene	10	18	38	67
Ethyl Benzene	8.6	25	38	110
o-Xylene	8.6	Not Detected	38	Not Detected
m,p-Xylene	8.6	Not Detected	38	Not Detected
Naphthalene	38	120	200	600

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	112	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP-16R-HDOH

Lab ID#: 1105519A-04A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060219a**	**Date of Collection: 5/19/11 9:41:00 AM**	
Dil. Factor:	**247**	**Date of Analysis: 6/2/11 05:45 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	220	Not Detected	490	Not Detected
Methyl tert-butyl ether	140	Not Detected	490	Not Detected
Benzene	160	Not Detected	500	Not Detected
Toluene	130	Not Detected	490	Not Detected
Ethyl Benzene	110	Not Detected	490	Not Detected
o-Xylene	110	Not Detected	490	Not Detected
m,p-Xylene	110	Not Detected	490	Not Detected
Naphthalene	490	Not Detected	2600	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	104	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP-17-HDOH

Lab ID#: 1105519A-05A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060308a**	**Date of Collection: 5/19/11 11:24:00 AM**	
Dil. Factor:	**2.47**	**Date of Analysis: 6/3/11 10:36 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	2.2	Not Detected	4.9	Not Detected
Methyl tert-butyl ether	1.4	Not Detected	4.9	Not Detected
Benzene	1.6	Not Detected	5.0	Not Detected
Toluene	1.3	Not Detected	4.9	Not Detected
Ethyl Benzene	1.1	Not Detected	4.9	Not Detected
o-Xylene	1.1	Not Detected	4.9	Not Detected
m,p-Xylene	1.1	Not Detected	4.9	Not Detected
Naphthalene	4.9	Not Detected	26	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	126	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IPB20-HDOH

Lab ID#: 1105519A-06A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060223a**	**Date of Collection: 5/20/11 7:52:00 AM**	
Dil. Factor:	**73.7**	**Date of Analysis: 6/2/11 08:43 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	66	Not Detected	150	Not Detected
Methyl tert-butyl ether	40	Not Detected	150	Not Detected
Benzene	46	10000	150	34000
Toluene	39	1600	150	5900
Ethyl Benzene	34	36	150	160
o-Xylene	34	47	150	200
m,p-Xylene	34	98	150	430
Naphthalene	150	Not Detected	770	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	112	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	95	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IPH11-HDOH

Lab ID#: 1105519A-07A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060226a**	**Date of Collection: 5/20/11 7:37:00 AM**	
Dil. Factor:	**23300**	**Date of Analysis: 6/2/11 10:51 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	21000	Not Detected	46000	Not Detected
Methyl tert-butyl ether	13000	Not Detected	46000	Not Detected
Benzene	15000	3000000	47000	9700000
Toluene	12000	Not Detected	46000	Not Detected
Ethyl Benzene	11000	19000	46000	81000
o-Xylene	11000	Not Detected	46000	Not Detected
m,p-Xylene	11000	Not Detected	46000	Not Detected
Naphthalene	47000	Not Detected	240000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	101	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IPL19-HDOH

Lab ID#: 1105519A-08A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060309a**	**Date of Collection: 5/20/11 8:38:00 AM**	
Dil. Factor:	**2.42**	**Date of Analysis: 6/3/11 11:13 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	2.2	Not Detected	4.8	Not Detected
Methyl tert-butyl ether	1.3	Not Detected	4.8	Not Detected
Benzene	1.5	150	4.9	480
Toluene	1.3	14	4.8	51
Ethyl Benzene	1.1	2.7	4.8	12
o-Xylene	1.1	3.0	4.8	13
m,p-Xylene	1.1	5.2	4.8	23
Naphthalene	4.8	Not Detected	25	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	125	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IP28-HDOH

Lab ID#: 1105519A-09A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060312a**	**Date of Collection: 5/20/11 8:35:00 AM**	
Dil. Factor:	**39500**	**Date of Analysis: 6/3/11 01:13 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	36000	Not Detected	79000	Not Detected
Methyl tert-butyl ether	22000	Not Detected	78000	Not Detected
Benzene	25000	6800000	79000	22000000
Toluene	21000	160000	79000	620000
Ethyl Benzene	18000	Not Detected	79000	Not Detected
o-Xylene	18000	Not Detected	79000	Not Detected
m,p-Xylene	18000	Not Detected	79000	Not Detected
Naphthalene	79000	Not Detected	410000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	111	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-SG12-HDOH

Lab ID#: 1105519A-10A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060315a**	**Date of Collection: 5/20/11 9:21:00 AM**	
Dil. Factor:	**6.66**	**Date of Analysis: 6/3/11 02:56 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	6.0	Not Detected	13	Not Detected
Methyl tert-butyl ether	3.7	4.3	13	15
Benzene	4.2	Not Detected	13	Not Detected
Toluene	3.5	Not Detected	13	Not Detected
Ethyl Benzene	3.1	Not Detected	13	Not Detected
o-Xylene	3.1	Not Detected	13	Not Detected
m,p-Xylene	3.1	Not Detected	13	Not Detected
Naphthalene	13	Not Detected	70	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	117	70-130
Toluene-d8	107	70-130
4-Bromofluorobenzene	103	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1105519A-11A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060206a**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/2/11 09:28 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.90	Not Detected	2.0	Not Detected
Methyl tert-butyl ether	0.55	Not Detected	2.0	Not Detected
Benzene	0.63	Not Detected	2.0	Not Detected
Toluene	0.53	Not Detected	2.0	Not Detected
Ethyl Benzene	0.46	Not Detected	2.0	Not Detected
o-Xylene	0.46	Not Detected	2.0	Not Detected
m,p-Xylene	0.46	Not Detected	2.0	Not Detected
Naphthalene	2.0	Not Detected	10	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	116	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	104	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1105519A-11B

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060306a**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/3/11 09:11 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.90	Not Detected	2.0	Not Detected
Methyl tert-butyl ether	0.55	Not Detected	2.0	Not Detected
Benzene	0.63	Not Detected	2.0	Not Detected
Toluene	0.53	Not Detected	2.0	Not Detected
Ethyl Benzene	0.46	Not Detected	2.0	Not Detected
o-Xylene	0.46	Not Detected	2.0	Not Detected
m,p-Xylene	0.46	Not Detected	2.0	Not Detected
Naphthalene	2.0	Not Detected	10	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	121	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	101	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1105519A-12A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060204**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/2/11 08:02 AM**	

Compound	%Recovery
1,3-Butadiene	92
Methyl tert-butyl ether	96
Benzene	88
Toluene	82
Ethyl Benzene	90
o-Xylene	89
m,p-Xylene	86
Naphthalene	94
C5-C8 Aliphatic Hydrocarbons	90
C9-C12 Aliphatic Hydrocarbons	86
C9-C10 Aromatic Hydrocarbons	72

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	110	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	107	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1105519A-12B

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060304**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/3/11 07:50 AM**	

Compound	%Recovery
1,3-Butadiene	91
Methyl tert-butyl ether	100
Benzene	90
Toluene	85
Ethyl Benzene	84
o-Xylene	85
m,p-Xylene	80
Naphthalene	89
C5-C8 Aliphatic Hydrocarbons	92
C9-C12 Aliphatic Hydrocarbons	89
C9-C10 Aromatic Hydrocarbons	78

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	102	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1105519A-13A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060205**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/2/11 08:37 AM**	

Compound	%Recovery
1,3-Butadiene	124
Methyl tert-butyl ether	128
Benzene	114
Toluene	106
Ethyl Benzene	105
o-Xylene	104
m,p-Xylene	106
Naphthalene	97
C5-C8 Aliphatic Hydrocarbons	90
C9-C12 Aliphatic Hydrocarbons	95
C9-C10 Aromatic Hydrocarbons	80

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	110	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	103	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1105519A-13B

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2060305**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/3/11 08:27 AM**	

Compound	%Recovery
1,3-Butadiene	121
Methyl tert-butyl ether	127
Benzene	109
Toluene	101
Ethyl Benzene	102
o-Xylene	102
m,p-Xylene	102
Naphthalene	81
C5-C8 Aliphatic Hydrocarbons	93
C9-C12 Aliphatic Hydrocarbons	94
C9-C10 Aromatic Hydrocarbons	79

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	115	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	104	70-130

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**FV-GP-01-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1105519A-01A**		**NA**	
Bromochloroethane: %D from CCV: 9.0%	**Date Collected**		**5/19/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 3.4%	**Date Received**		**5/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 11%	**Date Analyzed**		**6/2/2011**		**NA**	
	Pre-Sample Vacuum (field)		**28**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**14.1**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**28**	**13**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**28**	**7.8**	**ND**	**ND**	**NA**	**NA**
Benzene	**28**	**8.8**	**ND**	**ND**	**NA**	**NA**
Toluene	**28**	**7.5**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**28**	**6.5**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**28**	**6.5**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**28**	**6.5**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**150**	**28**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**170**	**N/A**	**9400**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**170**	**N/A**	**79000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**140**	**N/A**	**1200**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/21/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**FV-GP-06R-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1105519A-02A**		**NA**	
Bromochloroethane: %D from CCV: 5.5%	**Date Collected**		**5/19/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 0.040%	**Date Received**		**5/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 3.3%	**Date Analyzed**		**6/2/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**2.38**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**4.8**	**2.2**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**4.8**	**1.3**	**ND**	**ND**	**NA**	**NA**
Benzene	**4.8**	**1.5**	**ND**	**ND**	**NA**	**NA**
Toluene	**4.8**	**1.3**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**4.8**	**1.1**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**4.8**	**1.1**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**4.8**	**1.1**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**25**	**4.8**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**28**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**28**	**N/A**	**610**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**24**	**N/A**	**72**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/21/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**FV-GP-06R-HDOH Lab Du**		**NA**	
Internal Standards:	**Lab ID**		**1105519A-02AA**		**NA**	
Bromochloroethane: %D from CCV: 0.25%	**Date Collected**		**5/19/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 1.0%	**Date Received**		**5/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 4.3%	**Date Analyzed**		**6/2/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**7.32**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**15**	**6.6**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**15**	**4.0**	**ND**	**ND**	**NA**	**NA**
Benzene	**15**	**4.6**	**ND**	**ND**	**NA**	**NA**
Toluene	**15**	**3.9**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**15**	**3.4**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**15**	**3.4**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**15**	**3.4**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**77**	**15**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**88**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**88**	**N/A**	**130**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**73**	**N/A**	**82**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/21/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**FV-GP-08-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1105519A-03A**		**NA**	
Bromochloroethane: %D from CCV: 0.58%	**Date Collected**		**5/19/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 5.6%	**Date Received**		**5/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 5.8%	**Date Analyzed**		**6/2/2011**		**NA**	
	Pre-Sample Vacuum (field)		**29**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**0**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**2.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**18.8**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**38**	**17**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**38**	**10**	**ND**	**ND**	**NA**	**NA**
Benzene	**38**	**12**	**50**	**16**	**NA**	**NA**
Toluene	**38**	**10**	**67**	**18**	**NA**	**NA**
Ethylbenzene	**38**	**8.7**	**110**	**25**	**NA**	**NA**
m- & p- Xylenes	**38**	**8.7**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**38**	**8.7**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**200**	**38**	**600**	**120**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**220**	**N/A**	**520000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**220**	**N/A**	**3200000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**190**	**N/A**	**61000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/21/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**FV-GP-16R-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1105519A-04A**		**NA**	
Bromochloroethane: %D from CCV: 34%	**Date Collected**		**5/19/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 30%	**Date Received**		**5/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 34%	**Date Analyzed**		**6/2/2011**		**NA**	
	Pre-Sample Vacuum (field)		**26**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**247**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**490**	**220**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**490**	**140**	**ND**	**ND**	**NA**	**NA**
Benzene	**490**	**150**	**ND**	**ND**	**NA**	**NA**
Toluene	**490**	**130**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**490**	**110**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**490**	**110**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**490**	**110**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**2600**	**490**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**3000**	**N/A**	**1100000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**3000**	**N/A**	**4800000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**2500**	**N/A**	**23000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/21/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**FV-GP-17-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1105519A-05A**		**NA**	
Bromochloroethane: %D from CCV: 9.5%	**Date Collected**		**5/19/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 1.6%	**Date Received**		**5/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 2.0%	**Date Analyzed**		**6/3/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**2.47**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**4.9**	**2.2**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**4.9**	**1.4**	**ND**	**ND**	**NA**	**NA**
Benzene	**4.9**	**1.5**	**ND**	**ND**	**NA**	**NA**
Toluene	**4.9**	**1.3**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**4.9**	**1.1**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**4.9**	**1.1**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**4.9**	**1.1**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**26**	**4.9**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**30**	**N/A**	**7000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**30**	**N/A**	**11000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**25**	**N/A**	**310**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

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SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/21/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**G-IPB20-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1105519A-06A**		**NA**	
Bromochloroethane: %D from CCV: 33%	**Date Collected**		**5/20/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 30%	**Date Received**		**5/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 39%	**Date Analyzed**		**6/2/2011**		**NA**	
	Pre-Sample Vacuum (field)		**29**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**6.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**73.7**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**150**	**67**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**150**	**40**	**ND**	**ND**	**NA**	**NA**
Benzene	**150**	**46**	**34000**	**10000**	**NA**	**NA**
Toluene	**150**	**39**	**5900**	**1600**	**NA**	**NA**
Ethylbenzene	**150**	**34**	**160**	**36**	**NA**	**NA**
m- & p- Xylenes	**150**	**34**	**430**	**98**	**NA**	**NA**
o-Xylene	**150**	**34**	**200**	**47**	**NA**	**NA**
Naphthalene	**770**	**150**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**880**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**880**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**740**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

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SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/21/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**G-IPH11-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1105519A-07A**		**NA**	
Bromochloroethane: %D from CCV: 3.1%	**Date Collected**		**5/20/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 0.43%	**Date Received**		**5/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 3.7%	**Date Analyzed**		**6/2/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**23300**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**47000**	**21000**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**47000**	**13000**	**ND**	**ND**	**NA**	**NA**
Benzene	**47000**	**14000**	**9700000**	**3000000**	**NA**	**NA**
Toluene	**47000**	**12000**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**47000**	**11000**	**81000**	**19000**	**NA**	**NA**
m- & p- Xylenes	**47000**	**11000**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**47000**	**11000**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**240000**	**47000**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**280000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**280000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**230000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

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PRINTED NAME: Linda L. Freeman DATE: 06/21/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**G-IPL19-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1105519A-08A**		**NA**	
Bromochloroethane: %D from CCV: 8.7%	**Date Collected**		**5/20/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 1.3%	**Date Received**		**5/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 4.1%	**Date Analyzed**		**6/3/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**2.42**		**NA**	
Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**4.8**	**2.2**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**4.8**	**1.3**	**ND**	**ND**	**NA**	**NA**
Benzene	**4.8**	**1.5**	**480**	**150**	**NA**	**NA**
Toluene	**4.8**	**1.3**	**51**	**14**	**NA**	**NA**
Ethylbenzene	**4.8**	**1.1**	**12**	**2.7**	**NA**	**NA**
m- & p- Xylenes	**4.8**	**1.1**	**23**	**5.2**	**NA**	**NA**
o-Xylene	**4.8**	**1.1**	**13**	**3.0**	**NA**	**NA**
Naphthalene	**25**	**4.8**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**29**	**N/A**	**540**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**29**	**N/A**	**120**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**24**	**N/A**	**29**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

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SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/21/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**G-IP28-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1105519A-09A**		**NA**	
Bromochloroethane: %D from CCV: 12%	**Date Collected**		**5/20/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 8.5%	**Date Received**		**5/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 12%	**Date Analyzed**		**6/3/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**8**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**9.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**39500**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**79000**	**36000**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**79000**	**22000**	**ND**	**ND**	**NA**	**NA**
Benzene	**79000**	**25000**	**22000000**	**6800000**	**NA**	**NA**
Toluene	**79000**	**21000**	**620000**	**160000**	**NA**	**NA**
Ethylbenzene	**79000**	**18000**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**79000**	**18000**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**79000**	**18000**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**410000**	**79000**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**470000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**470000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**400000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

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PRINTED NAME: Linda L. Freeman DATE: 06/21/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**G-SG12-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1105519A-10A**		**NA**	
Bromochloroethane: %D from CCV: 14%	**Date Collected**		**5/20/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 10%	**Date Received**		**5/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 11%	**Date Analyzed**		**6/3/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**6.66**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**13**	**6.0**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**13**	**3.7**	**15**	**4.3**	**NA**	**NA**
Benzene	**13**	**4.2**	**ND**	**ND**	**NA**	**NA**
Toluene	**13**	**3.5**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**13**	**3.1**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**13**	**3.1**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**13**	**3.1**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**70**	**13**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**80**	**N/A**	**2300**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**80**	**N/A**	**1600**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**67**	**N/A**	**320**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/21/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☑ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☐ Other
Sample Container(s)	☑ Canister(s):	☑ 6-L	☐ 15-L	☐ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☐ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Lab Blank**		**NA**	
Internal Standards:	**Lab ID**		**1105519A-11A**		**NA**	
Bromochloroethane: %D from CCV: 4.8%	**Date Collected**		**NA**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 2.4%	**Date Received**		**NA**		**NA**	
Chlorobenzene-d5: %D from CCV: 0.74%	**Date Analyzed**		**6/2/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**NA**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1**		**NA**	
Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**2.0**	**0.90**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**2.0**	**0.55**	**ND**	**ND**	**NA**	**NA**
Benzene	**2.0**	**0.63**	**ND**	**ND**	**NA**	**NA**
Toluene	**2.0**	**0.53**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**10**	**2.0**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**10**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No - Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No - Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes - Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/21/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☑ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☐ Other
Sample Container(s)	☑ Canister(s):	☑ 6-L	☐ 15-L	☐ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☐ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Lab Blank**		**NA**	
Internal Standards:	**Lab ID**		**1105519A-11B**		**NA**	
Bromochloroethane: %D from CCV: 5.2%	**Date Collected**		**NA**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 2.9%	**Date Received**		**NA**		**NA**	
Chlorobenzene-d5: %D from CCV: 4.0%	**Date Analyzed**		**6/3/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**NA**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1**		**NA**	

Target APH Analytes & Hydrocarbon Ranges	**Reporting Limit**		**Sample Results**		**Sample Results**	
	µg/m3	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**2.0**	**0.90**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**2.0**	**0.55**	**ND**	**ND**	**NA**	**NA**
Benzene	**2.0**	**0.63**	**ND**	**ND**	**NA**	**NA**
Toluene	**2.0**	**0.53**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**10**	**2.0**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**10**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/21/2011

Air Toxics LTD.
Laboratory Services Since 1989

6/27/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name: Aloha School Street
Project #:
Workorder #: 1106214A

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 6/9/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Massachusetts APH are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1106214A

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	Aloha School Street
DATE RECEIVED:	06/09/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	06/24/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	A-SV04-HDOH	Massachusetts APH	3.0 "Hg	15 psi
02A	A-SVO13-HDOH	Massachusetts APH	3.5"Hg	15 psi
03A	A-AS4-HDOH	Massachusetts APH	1.5"Hg	15 psi
04A	Diesel#1-HDOH	Massachusetts APH	5.0 "Hg	15 psi
04AA	Diesel#1-HDOH Lab Duplicate	Massachusetts APH	5.0 "Hg	15 psi
05A	Ambient#1-HDOH	Massachusetts APH	4.5 "Hg	15 psi
06A	Lab Blank	Massachusetts APH	NA	NA
07A	CCV	Massachusetts APH	NA	NA
08A	LCS	Massachusetts APH	NA	NA

CERTIFIED BY: Linda D. Fruman

Laboratory Director

DATE: 06/27/11

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Massachusetts DEP APH
Tetra Tech EM, Inc.
Workorder# 1106214A

Five 1 Liter Summa Canister (MA APH Certified) samples were received on June 09, 2011. The laboratory performed analysis via Massachusetts DEP APH method using GC/MS in the full scan mode. The method involves concentrating up to 0.5 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis. This method is designed to measure gaseous phase aliphatic and aromatic compounds in ambient air and soil gas collected in stainless steel Summa canisters. The volatile aliphatic hydrocarbons are collectively quantified within the C5 to C8 range and within the C9 to C12 range. Additionally, the volatile aromatic hydrocarbons are collectively quantified within the C9 to C10 range.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The reported LCS for each daily batch has been derived from more than one analytical file.

The reported CCV for each daily batch may be derived from more than one analytical file due to the client's request for non-standard compounds.

Non-standard compounds may have different acceptance criteria than the standard TO-14A/TO-15 compound list as per contract or verbal agreement.

A dilution was performed on samples Diesel#1-HDOH and Diesel#1-HDOH Lab Duplicate due to the presence of high level target species.

Dilution was performed on sample Ambient#1-HDOH due to the presence of high level non-target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV and/or LCS.

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-SV04-HDOH

Lab ID#: 1106214A-01A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2061508a**	**Date of Collection: 6/3/11 8:15:00 AM**	
Dil. Factor:	**2.24**	**Date of Analysis: 6/15/11 12:41 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	2.0	Not Detected	4.4	Not Detected
Methyl tert-butyl ether	1.2	Not Detected	4.4	Not Detected
Benzene	1.4	Not Detected	4.5	Not Detected
Toluene	1.2	Not Detected	4.5	Not Detected
Ethyl Benzene	1.0	Not Detected	4.5	Not Detected
o-Xylene	1.0	Not Detected	4.5	Not Detected
m,p-Xylene	1.0	Not Detected	4.5	Not Detected
Naphthalene	4.5	Not Detected	23	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	88	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	92	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-SVO13-HDOH

Lab ID#: 1106214A-02A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2061509a**	**Date of Collection: 6/3/11 8:44:00 AM**	
Dil. Factor:	**2.29**	**Date of Analysis: 6/15/11 01:17 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	2.1	Not Detected	4.6	Not Detected
Methyl tert-butyl ether	1.2	Not Detected	4.5	Not Detected
Benzene	1.4	3.2	4.6	10
Toluene	1.2	Not Detected	4.6	Not Detected
Ethyl Benzene	1.0	1.4	4.6	6.3
o-Xylene	1.0	Not Detected	4.6	Not Detected
m,p-Xylene	1.0	2.5	4.6	11
Naphthalene	4.6	Not Detected	24	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	90	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	92	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-AS4-HDOH

Lab ID#: 1106214A-03A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2061510a**	**Date of Collection: 6/3/11 8:58:00 AM**	
Dil. Factor:	**2.13**	**Date of Analysis: 6/15/11 01:53 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	1.9	Not Detected	4.2	Not Detected
Methyl tert-butyl ether	1.2	Not Detected	4.2	Not Detected
Benzene	1.3	Not Detected	4.3	Not Detected
Toluene	1.1	Not Detected	4.2	Not Detected
Ethyl Benzene	0.98	Not Detected	4.2	Not Detected
o-Xylene	0.98	Not Detected	4.2	Not Detected
m,p-Xylene	0.98	Not Detected	4.2	Not Detected
Naphthalene	4.3	Not Detected	22	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	86	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	90	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Diesel#1-HDOH

Lab ID#: 1106214A-04A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2061512a**	**Date of Collection: 6/3/11 2:09:00 PM**	
Dil. Factor:	**242**	**Date of Analysis: 6/15/11 03:12 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	220	Not Detected	480	Not Detected
Methyl tert-butyl ether	130	Not Detected	480	Not Detected
Benzene	150	5100	490	16000
Toluene	130	11000	480	42000
Ethyl Benzene	110	2200	480	9700
o-Xylene	110	2300	480	9800
m,p-Xylene	110	5200	480	22000
Naphthalene	480	Not Detected	2500	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	90	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	94	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Diesel#1-HDOH Lab Duplicate

Lab ID#: 1106214A-04AA

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2061511a**	**Date of Collection: 6/3/11 2:09:00 PM**	
Dil. Factor:	**48.4**	**Date of Analysis: 6/15/11 02:31 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	44	Not Detected	96	Not Detected
Methyl tert-butyl ether	27	Not Detected	96	Not Detected
Benzene	30	5400	97	17000
Toluene	26	11000 E	97	41000 E
Ethyl Benzene	22	2600	97	11000
o-Xylene	22	2800	97	12000
m,p-Xylene	22	6000	97	26000
Naphthalene	97	140	510	730

E = Exceeds instrument calibration range.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	88	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	104	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Ambient#1-HDOH

Lab ID#: 1106214A-05A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2061521a**	**Date of Collection: 6/3/11 2:09:00 PM**	
Dil. Factor:	**4.76**	**Date of Analysis: 6/15/11 09:25 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	4.3	Not Detected	9.5	Not Detected
Methyl tert-butyl ether	2.6	Not Detected	9.4	Not Detected
Benzene	3.0	Not Detected	9.6	Not Detected
Toluene	2.5	Not Detected	9.5	Not Detected
Ethyl Benzene	2.2	Not Detected	9.5	Not Detected
o-Xylene	2.2	Not Detected	9.5	Not Detected
m,p-Xylene	2.2	Not Detected	9.5	Not Detected
Naphthalene	9.5	Not Detected	50	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	83	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	81	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1106214A-06A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2061507d**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/15/11 11:57 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.90	Not Detected	2.0	Not Detected
Methyl tert-butyl ether	0.55	Not Detected	2.0	Not Detected
Benzene	0.63	Not Detected	2.0	Not Detected
Toluene	0.53	Not Detected	2.0	Not Detected
Ethyl Benzene	0.46	Not Detected	2.0	Not Detected
o-Xylene	0.46	Not Detected	2.0	Not Detected
m,p-Xylene	0.46	Not Detected	2.0	Not Detected
Naphthalene	2.0	Not Detected	10	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	91	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	91	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1106214A-07A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2061504**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/15/11 10:10 AM**	

Compound	%Recovery
1,3-Butadiene	81
Methyl tert-butyl ether	91
Benzene	98
Toluene	98
Ethyl Benzene	101
o-Xylene	100
m,p-Xylene	104
Naphthalene	123
C5-C8 Aliphatic Hydrocarbons	72
C9-C12 Aliphatic Hydrocarbons	79
C9-C10 Aromatic Hydrocarbons	91

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	88	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	102	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1106214A-08A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2061505**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/15/11 10:45 AM**	

Compound	**%Recovery**
1,3-Butadiene	91
Methyl tert-butyl ether	102
Benzene	111
Toluene	110
Ethyl Benzene	111
o-Xylene	111
m,p-Xylene	114
Naphthalene	125
C5-C8 Aliphatic Hydrocarbons	74
C9-C12 Aliphatic Hydrocarbons	78
C9-C10 Aromatic Hydrocarbons	90

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
1,2-Dichloroethane-d4	85	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	101	70-130

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☑ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☐ Other
Sample Container(s)	☑ Canister(s):	☑ 6-L	☐ 15-L	☐ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**A-SV04-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1106214A-01A**		**NA**	
Bromochloroethane: %D from CCV: 9.4%	**Date Collected**		**6/3/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 4.6%	**Date Received**		**6/9/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 4.5%	**Date Analyzed**		**6/15/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**3**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**3.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**2.24**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**4.5**	**2.0**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**4.5**	**1.2**	**ND**	**ND**	**NA**	**NA**
Benzene	**4.5**	**1.4**	**ND**	**ND**	**NA**	**NA**
Toluene	**4.5**	**1.2**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**4.5**	**1.0**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**4.5**	**1.0**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**4.5**	**1.0**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**4.5**	**0.86**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**27**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**27**	**N/A**	**27**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**22**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/27/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**A-SVO13-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1106214A-02A**		**NA**	
Bromochloroethane: %D from CCV: 9.0%	**Date Collected**		**6/3/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 3.3%	**Date Received**		**6/9/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 2.9%	**Date Analyzed**		**6/15/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30.**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4.5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**3.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**2.29**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**4.6**	**2.1**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**4.6**	**1.2**	**ND**	**ND**	**NA**	**NA**
Benzene	**4.6**	**1.4**	**10**	**3.2**	**NA**	**NA**
Toluene	**4.6**	**1.2**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**4.6**	**1.0**	**6.3**	**1.4**	**NA**	**NA**
m- & p- Xylenes	**4.6**	**1.0**	**11**	**2.5**	**NA**	**NA**
o-Xylene	**4.6**	**1.0**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**24**	**4.6**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**27**	**N/A**	**41**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**27**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**23**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/24/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**A-AS4-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1106214A-03A**		**NA**	
Bromochloroethane: %D from CCV: 8.7%	**Date Collected**		**6/3/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 5.5%	**Date Received**		**6/9/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 3.8%	**Date Analyzed**		**6/15/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**3**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**1.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**2.13**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**4.3**	**1.9**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**4.3**	**1.2**	**ND**	**ND**	**NA**	**NA**
Benzene	**4.3**	**1.3**	**ND**	**ND**	**NA**	**NA**
Toluene	**4.3**	**1.1**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**4.3**	**0.98**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**4.3**	**0.98**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**4.3**	**0.98**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**22**	**4.3**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**26**	**N/A**	**38**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**26**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**21**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/24/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Diesel#1-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1106214A-04A**		**NA**	
Bromochloroethane: %D from CCV: 2.1%	**Date Collected**		**6/3/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 3.3%	**Date Received**		**6/9/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 0.69%	**Date Analyzed**		**6/15/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**242**		**NA**	
Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**480**	**220**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**480**	**130**	**ND**	**ND**	**NA**	**NA**
Benzene	**480**	**150**	**16000**	**5100**	**NA**	**NA**
Toluene	**480**	**130**	**42000**	**11000**	**NA**	**NA**
Ethylbenzene	**480**	**110**	**9700**	**2200**	**NA**	**NA**
m- & p- Xylenes	**480**	**110**	**22000**	**5200**	**NA**	**NA**
o-Xylene	**480**	**110**	**9800**	**2300**	**NA**	**NA**
Naphthalene	**2500**	**480**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**2900**	**N/A**	**1000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**2900**	**N/A**	**170000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**2400**	**N/A**	**25000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/24/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Diesel#1-HDOH Lab Dupli**		**NA**	
Internal Standards:	**Lab ID**		**1106214A-04AA**		**NA**	
Bromochloroethane: %D from CCV: 9.1%	**Date Collected**		**6/3/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 3.2%	**Date Received**		**6/9/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 7.8%	**Date Analyzed**		**6/15/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**48.4**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**97**	**44**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**97**	**27**	**ND**	**ND**	**NA**	**NA**
Benzene	**97**	**30**	**17000**	**5400**	**NA**	**NA**
Toluene	**97**	**26**	**41000 E**	**11000 E**	**NA**	**NA**
Ethylbenzene	**97**	**22**	**11000**	**2600**	**NA**	**NA**
m- & p- Xylenes	**97**	**22**	**26000**	**6000**	**NA**	**NA**
o-Xylene	**97**	**22**	**12000**	**2800**	**NA**	**NA**
Naphthalene	**510**	**97**	**730**	**140**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**580**	**N/A**	**1000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**580**	**N/A**	**230000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**480**	**N/A**	**34000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/24/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Ambient#1-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1106214A-05A**		**NA**	
Bromochloroethane: %D from CCV: 18%	**Date Collected**		**6/3/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 17%	**Date Received**		**6/9/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 18%	**Date Analyzed**		**6/15/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**4.76**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**9.5**	**4.3**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**9.5**	**2.6**	**ND**	**ND**	**NA**	**NA**
Benzene	**9.5**	**3.0**	**ND**	**ND**	**NA**	**NA**
Toluene	**9.5**	**2.5**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**9.5**	**2.2**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**9.5**	**2.2**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**9.5**	**2.2**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**50**	**9.5**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**57**	**N/A**	**58**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**57**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**48**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/24/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☑ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☐ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☐ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☐ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Lab Blank**		**NA**	
Internal Standards:	**Lab ID**		**1106214A-06A**		**NA**	
Bromochloroethane: %D from CCV: 8.7%	**Date Collected**		**NA**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 4.2%	**Date Received**		**NA**		**NA**	
Chlorobenzene-d5: %D from CCV: 2.0%	**Date Analyzed**		**6/15/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**NA**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**2.0**	**0.90**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**2.0**	**0.55**	**ND**	**ND**	**NA**	**NA**
Benzene	**2.0**	**0.63**	**ND**	**ND**	**NA**	**NA**
Toluene	**2.0**	**0.53**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**10**	**2.0**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**10**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No - Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No - Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes - Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/24/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Diesel#1-HDOH**		**NA**	
Internal Standards:	**Lab ID**		**1106214A-04A**		**NA**	
Bromochloroethane: %D from CCV: 2.1%	**Date Collected**		**6/3/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 3.3%	**Date Received**		**6/9/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 0.69%	**Date Analyzed**		**6/15/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**242**		**NA**	
Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**480**	**220**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**480**	**130**	**ND**	**ND**	**NA**	**NA**
Benzene	**480**	**150**	**16000**	**5100**	**NA**	**NA**
Toluene	**480**	**130**	**42000**	**11000**	**NA**	**NA**
Ethylbenzene	**480**	**110**	**9700**	**2200**	**NA**	**NA**
m- & p- Xylenes	**480**	**110**	**22000**	**5200**	**NA**	**NA**
o-Xylene	**480**	**110**	**9800**	**2300**	**NA**	**NA**
Naphthalene	**2500**	**480**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**2900**	**N/A**	**1000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**2900**	**N/A**	**170000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**2400**	**N/A**	**25000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/24/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Diesel#1-HDOH Lab Dupli**		**NA**	
Internal Standards:	**Lab ID**		**1106214A-04AA**		**NA**	
Bromochloroethane: %D from CCV: 9.1%	**Date Collected**		**6/3/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 3.2%	**Date Received**		**6/9/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 7.8%	**Date Analyzed**		**6/15/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**48.4**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**97**	**44**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**97**	**27**	**ND**	**ND**	**NA**	**NA**
Benzene	**97**	**30**	**17000**	**5400**	**NA**	**NA**
Toluene	**97**	**26**	**41000 E**	**11000 E**	**NA**	**NA**
Ethylbenzene	**97**	**22**	**11000**	**2600**	**NA**	**NA**
m- & p- Xylenes	**97**	**22**	**26000**	**6000**	**NA**	**NA**
o-Xylene	**97**	**22**	**12000**	**2800**	**NA**	**NA**
Naphthalene	**510**	**97**	**730**	**140**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**580**	**N/A**	**1000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**580**	**N/A**	**230000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**480**	**N/A**	**34000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 06/24/2011

Air Toxics LTD.
Laboratory Services Since 1989

7/11/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1106457A

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 6/21/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Massachusetts APH are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1106457A

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	06/21/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	07/11/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-VP26-B05(18)-HDOH	Massachusetts APH	5.0 "Hg	15 psi
02A	HAFB-VP26-B05(24)-HDOH	Massachusetts APH	5.0 "Hg	15 psi
03A	HAFB-VP26-B07(20)-HDOH	Massachusetts APH	3.5 "Hg	15 psi
03AA	HAFB-VP26-B07(20)-HDOH Lab Duplic	Massachusetts APH	3.5 "Hg	15 psi
04A	HAFB-VP26-B07(25)-HDOH	Massachusetts APH	3.5 "Hg	15 psi
05A	HAFB-VP26-B08(21)-HDOH	Massachusetts APH	4.0 "Hg	15 psi
06A	Lab Blank	Massachusetts APH	NA	NA
07A	CCV	Massachusetts APH	NA	NA
08A	LCS	Massachusetts APH	NA	NA

CERTIFIED BY: Linda J. Fruman DATE: 07/11/11

Laboratory Director

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Massachusetts DEP APH
Tetra Tech EM, Inc.
Workorder# 1106457A

Five 1 Liter Summa Canister (MA APH Certified) samples were received on June 21, 2011. The laboratory performed analysis via Massachusetts DEP APH method using GC/MS in the full scan mode. The method involves concentrating up to 0.5 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis. This method is designed to measure gaseous phase aliphatic and aromatic compounds in ambient air and soil gas collected in stainless steel Summa canisters. The volatile aliphatic hydrocarbons are collectively quantified within the C5 to C8 range and within the C9 to C12 range. Additionally, the volatile aromatic hydrocarbons are collectively quantified within the C9 to C10 range.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The reported CCV for each daily batch may be derived from more than one analytical file due to the client's request for non-standard compounds.

Non-standard compounds may have different acceptance criteria than the standard TO-14A/TO-15 compound list as per contract or verbal agreement.

The reported LCS for each daily batch has been derived from more than one analytical file.

Dilution was performed on samples HAFB-VP26-B05(18)-HDOH, HAFB-VP26-B05(24)-HDOH, HAFB-VP26-B07(20)-HDOH, HAFB-VP26-B07(20)-HDOH Lab Duplicate, HAFB-VP26-B07(25)-HDOH and HAFB-VP26-B08(21)-HDOH due to the presence of high level target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(18)-HDOH

Lab ID#: 1106457A-01A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2062817a**	**Date of Collection: 6/16/11 11:44:00 AM**	
Dil. Factor:	**2420**	**Date of Analysis: 6/29/11 06:53 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	2200	Not Detected	4800	Not Detected
Methyl tert-butyl ether	1300	Not Detected	4800	Not Detected
Benzene	1500	9100	4900	29000
Toluene	1300	Not Detected	4800	Not Detected
Ethyl Benzene	1100	3300	4800	14000
o-Xylene	1100	Not Detected	4800	Not Detected
m,p-Xylene	1100	Not Detected	4800	Not Detected
Naphthalene	4800	Not Detected	25000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	97	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(24)-HDOH

Lab ID#: 1106457A-02A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2062820a**	**Date of Collection: 6/16/11 12:32:00 PM**	
Dil. Factor:	**121000**	**Date of Analysis: 6/29/11 09:09 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	110000	Not Detected	240000	Not Detected
Methyl tert-butyl ether	66000	Not Detected	240000	Not Detected
Benzene	76000	150000	240000	470000
Toluene	64000	Not Detected	240000	Not Detected
Ethyl Benzene	56000	Not Detected	240000	Not Detected
o-Xylene	56000	Not Detected	240000	Not Detected
m,p-Xylene	56000	Not Detected	240000	Not Detected
Naphthalene	240000	Not Detected	1300000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	100	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(20)-HDOH

Lab ID#: 1106457A-03A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2062825a**	**Date of Collection: 6/16/11 12:42:00 PM**	
Dil. Factor:	**114**	**Date of Analysis: 6/29/11 12:11 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	100	Not Detected	230	Not Detected
Methyl tert-butyl ether	63	Not Detected	230	Not Detected
Benzene	72	18000	230	58000
Toluene	60	Not Detected	230	Not Detected
Ethyl Benzene	52	9200	230	40000
o-Xylene	52	Not Detected	230	Not Detected
m,p-Xylene	52	99	230	430
Naphthalene	230	Not Detected	1200	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	107	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(20)-HDOH Lab Duplicate

Lab ID#: 1106457A-03AA

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2062823a**	**Date of Collection: 6/16/11 12:42:00 PM**	
Dil. Factor:	**30.5**	**Date of Analysis: 6/29/11 10:46 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	27	Not Detected	61	Not Detected
Methyl tert-butyl ether	17	Not Detected	60	Not Detected
Benzene	19	17000 E	61	54000 E
Toluene	16	27	61	100
Ethyl Benzene	14	9800 E	61	42000 E
o-Xylene	14	Not Detected	61	Not Detected
m,p-Xylene	14	110	61	480
Naphthalene	61	Not Detected	320	Not Detected

E = Exceeds instrument calibration range.

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	129	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	114	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(25)-HDOH

Lab ID#: 1106457A-04A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2062822a**	**Date of Collection: 6/16/11 1:25:00 PM**	
Dil. Factor:	**2290**	**Date of Analysis: 6/29/11 10:17 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	2100	Not Detected	4600	Not Detected
Methyl tert-butyl ether	1200	Not Detected	4500	Not Detected
Benzene	1400	6000	4600	19000
Toluene	1200	Not Detected	4600	Not Detected
Ethyl Benzene	1000	2100	4600	9200
o-Xylene	1000	Not Detected	4600	Not Detected
m,p-Xylene	1000	Not Detected	4600	Not Detected
Naphthalene	4600	Not Detected	24000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B08(21)-HDOH

Lab ID#: 1106457A-05A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2062826a**	**Date of Collection: 6/16/11 11:18:00 AM**	
Dil. Factor:	**31.1**	**Date of Analysis: 6/29/11 12:48 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	28	Not Detected	62	Not Detected
Methyl tert-butyl ether	17	Not Detected	62	Not Detected
Benzene	20	180	62	570
Toluene	16	35	62	130
Ethyl Benzene	14	39	62	170
o-Xylene	14	Not Detected	62	Not Detected
m,p-Xylene	14	140	62	620
Naphthalene	62	Not Detected	330	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	99	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	122	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1106457A-06A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2062810e**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/11 07:35 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.90	Not Detected	2.0	Not Detected
Methyl tert-butyl ether	0.55	Not Detected	2.0	Not Detected
Benzene	0.63	Not Detected	2.0	Not Detected
Toluene	0.53	Not Detected	2.0	Not Detected
Ethyl Benzene	0.46	Not Detected	2.0	Not Detected
o-Xylene	0.46	Not Detected	2.0	Not Detected
m,p-Xylene	0.46	Not Detected	2.0	Not Detected
Naphthalene	2.0	Not Detected	10	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	91	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1106457A-07A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2062804**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/11 03:54 PM**	

Compound	%Recovery
1,3-Butadiene	82
Methyl tert-butyl ether	85
Benzene	87
Toluene	88
Ethyl Benzene	86
o-Xylene	87
m,p-Xylene	85
Naphthalene	123
C5-C8 Aliphatic Hydrocarbons	70
C9-C12 Aliphatic Hydrocarbons	70
C9-C10 Aromatic Hydrocarbons	76

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	97	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1106457A-08A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2062807**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/28/11 05:43 PM**	

Compound	%Recovery
1,3-Butadiene	81
Methyl tert-butyl ether	80
Benzene	80
Toluene	80
Ethyl Benzene	80
o-Xylene	81
m,p-Xylene	80
Naphthalene	91
C5-C8 Aliphatic Hydrocarbons	80
C9-C12 Aliphatic Hydrocarbons	74
C9-C10 Aromatic Hydrocarbons	81

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	100	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	101	70-130

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-VP26-B05(18)-HDO**		**NA**	
Internal Standards:	**Lab ID**		**1106457A-01A**		**NA**	
Bromochloroethane: %D from CCV: 7.9%	**Date Collected**		**6/16/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 3.0%	**Date Received**		**6/21/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 3.1%	**Date Analyzed**		**6/29/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**2420**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**4800**	**2200**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**4800**	**1300**	**ND**	**ND**	**NA**	**NA**
Benzene	**4800**	**1500**	**29000**	**9100**	**NA**	**NA**
Toluene	**4800**	**1300**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**4800**	**1100**	**14000**	**3300**	**NA**	**NA**
m- & p- Xylenes	**4800**	**1100**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**4800**	**1100**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**25000**	**4800**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**29000**	**N/A**	**18000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**29000**	**N/A**	**330000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**24000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 07/07/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-VP26-B05(24)-HDO**		**NA**	
Internal Standards:	**Lab ID**		**1106457A-02A**		**NA**	
Bromochloroethane: %D from CCV: 18%	**Date Collected**		**6/16/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 16%	**Date Received**		**6/21/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 15%	**Date Analyzed**		**6/29/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**3**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**121000**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**240000**	**110000**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**240000**	**66000**	**ND**	**ND**	**NA**	**NA**
Benzene	**240000**	**76000**	**470000**	**150000**	**NA**	**NA**
Toluene	**240000**	**64000**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**240000**	**56000**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**240000**	**56000**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**240000**	**56000**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**1300000**	**240000**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**1400000**	**N/A**	**160000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**1400000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**1200000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

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SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 07/07/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-VP26-B07(20)-HDO**		**NA**	
Internal Standards:	**Lab ID**		**1106457A-03A**		**NA**	
Bromochloroethane: %D from CCV: 15%	**Date Collected**		**6/16/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 13%	**Date Received**		**6/21/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 11%	**Date Analyzed**		**6/29/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**3.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**114**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**230**	**100**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**230**	**63**	**ND**	**ND**	**NA**	**NA**
Benzene	**230**	**71**	**58000**	**18000**	**NA**	**NA**
Toluene	**230**	**60**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**230**	**52**	**40000**	**9200**	**NA**	**NA**
m- & p- Xylenes	**230**	**52**	**430**	**99**	**NA**	**NA**
o-Xylene	**230**	**52**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**1200**	**230**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**1400**	**N/A**	**12000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**1400**	**N/A**	**220000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**1100**	**N/A**	**8000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 07/11/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-VP26-B07(20)-HDO**		**NA**	
Internal Standards:	**Lab ID**		**1106457A-03AA**		**NA**	
Bromochloroethane: %D from CCV: 18%	**Date Collected**		**6/16/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 14%	**Date Received**		**6/21/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 17%	**Date Analyzed**		**6/29/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**3.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**30.5**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**61**	**28**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**61**	**17**	**ND**	**ND**	**NA**	**NA**
Benzene	**61**	**19**	**54000**	**17000**	**NA**	**NA**
Toluene	**61**	**16**	**100**	**27**	**NA**	**NA**
Ethylbenzene	**61**	**14**	**42000**	**9800**	**NA**	**NA**
m- & p- Xylenes	**61**	**14**	**480**	**110**	**NA**	**NA**
o-Xylene	**61**	**14**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**320**	**61**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**370**	**N/A**	**8800000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**370**	**N/A**	**260000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**300**	**N/A**	**9800**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

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SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 07/11/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-VP26-B07(25)-HDO**		**NA**	
Internal Standards:	**Lab ID**		**1106457A-04A**		**NA**	
Bromochloroethane: %D from CCV: 14%	**Date Collected**		**6/16/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 13%	**Date Received**		**6/21/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 14%	**Date Analyzed**		**6/29/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**3**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**3.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**2290**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**4600**	**2100**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**4600**	**1200**	**ND**	**ND**	**NA**	**NA**
Benzene	**4600**	**1400**	**19000**	**6000**	**NA**	**NA**
Toluene	**4600**	**1200**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**4600**	**1000**	**9200**	**2100**	**NA**	**NA**
m- & p- Xylenes	**4600**	**1000**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**4600**	**1000**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**24000**	**4600**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**27000**	**N/A**	**58000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**27000**	**N/A**	**78000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**23000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

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SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 07/07/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-VP26-B08(21)-HDO**		**NA**	
Internal Standards:	**Lab ID**		**1106457A-05A**		**NA**	
Bromochloroethane: %D from CCV: 38%	**Date Collected**		**6/16/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 24%	**Date Received**		**6/21/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 7.5%	**Date Analyzed**		**6/29/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**31.1**		**NA**	
Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**62**	**28**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**62**	**17**	**ND**	**ND**	**NA**	**NA**
Benzene	**62**	**19**	**570**	**180**	**NA**	**NA**
Toluene	**62**	**16**	**130**	**35**	**NA**	**NA**
Ethylbenzene	**62**	**14**	**170**	**39**	**NA**	**NA**
m- & p- Xylenes	**62**	**14**	**620**	**140**	**NA**	**NA**
o-Xylene	**62**	**14**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**330**	**62**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**370**	**N/A**	**6700000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**370**	**N/A**	**920000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**310**	**N/A**	**10000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

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SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 07/11/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☑ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☐ Other
Sample Container(s)	☐ Canister(s):	☑ 6-L	☐ 15-L	☐ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☐ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Lab Blank**		**NA**	
Internal Standards:	**Lab ID**		**1106457A-06A**		**NA**	
Bromochloroethane: %D from CCV: 15%	**Date Collected**		**NA**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 9.2%	**Date Received**		**NA**		**NA**	
Chlorobenzene-d5: %D from CCV: 7.6%	**Date Analyzed**		**6/28/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**			**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1**		**NA**	

Target APH Analytes & Hydrocarbon Ranges	**Reporting Limit**		**Sample Results**		**Sample Results**	
	µg/m3	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**2.0**	**0.90**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**2.0**	**0.55**	**ND**	**ND**	**NA**	**NA**
Benzene	**2.0**	**0.63**	**ND**	**ND**	**NA**	**NA**
Toluene	**2.0**	**0.53**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**10**	**2.0**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**10**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No - Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No - Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes - Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 07/07/2011

Air Toxics LTD.
Laboratory Services Since 1989

8/2/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1107310A

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 7/19/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Massachusetts APH are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1107310A

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	07/19/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	08/02/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-ST03-B58 (347)	Massachusetts APH	5.5"Hg	15 psi
01AA	HAFB-ST03-B58 (347) Lab Duplicate	Massachusetts APH	5.5"Hg	15 psi
02A	HAFB-ST03-B58 (422)	Massachusetts APH	4.0"Hg	15 psi
03A	HAFB-ST03-B58 (492)	Massachusetts APH	5.0"Hg	15 psi
04A	HAFB-ST03-B58 (388)	Massachusetts APH	4.5"Hg	15 psi
05A	Lab Blank	Massachusetts APH	NA	NA
06A	CCV	Massachusetts APH	NA	NA
07A	LCS	Massachusetts APH	NA	NA

CERTIFIED BY: Linda D. Frumarn DATE: 08/02/11

Laboratory Director

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Massachusetts DEP APH
Tetra Tech EM, Inc.
Workorder# 1107310A

Four 1 Liter Summa Canister (MA APH Certified) samples were received on July 19, 2011. The laboratory performed analysis via Massachusetts DEP APH method using GC/MS in the full scan mode. The method involves concentrating up to 0.5 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis. This method is designed to measure gaseous phase aliphatic and aromatic compounds in ambient air and soil gas collected in stainless steel Summa canisters. The volatile aliphatic hydrocarbons are collectively quantified within the C5 to C8 range and within the C9 to C12 range. Additionally, the volatile aromatic hydrocarbons are collectively quantified within the C9 to C10 range.

Receiving Notes

The Chain of Custody (COC) information for samples HAFB-ST03-B58 (347) and HAFB-ST03-B58 (492) did not match the entries on the sample tags with regard to sample identification. Therefore the information on the COC was used to process and report the samples.

Analytical Notes

The reported CCV for each daily batch may be derived from more than one analytical file due to the client's request for non-standard compounds.

Non-standard compounds may have different acceptance criteria than the standard TO-14A/TO-15 compound list as per contract or verbal agreement.

The reported LCS for each daily batch has been derived from more than one analytical file.

Dilution was performed on samples HAFB-ST03-B58 (347), HAFB-ST03-B58 (347) Lab Duplicate, HAFB-ST03-B58 (422), HAFB-ST03-B58 (492) and HAFB-ST03-B58 (388) due to the presence of high level target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV and/or LCS.

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58 (347)

Lab ID#: 1107310A-01A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2072127a**	**Date of Collection: 7/14/11 10:47:00 AM**	
Dil. Factor:	**9.88**	**Date of Analysis: 7/21/11 09:52 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	8.9	Not Detected	20	Not Detected
Methyl tert-butyl ether	5.4	Not Detected	20	Not Detected
Benzene	6.2	6.8	20	22
Toluene	5.2	110	20	400
Ethyl Benzene	4.5	32	20	140
o-Xylene	4.5	28	20	120
m,p-Xylene	4.5	250	20	1100
Naphthalene	20	Not Detected	100	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	116	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58 (347) Lab Duplicate

Lab ID#: 1107310A-01AA

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2072124a**	**Date of Collection: 7/14/11 10:47:00 AM**	
Dil. Factor:	**32.9**	**Date of Analysis: 7/21/11 08:25 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	30	Not Detected	66	Not Detected
Methyl tert-butyl ether	18	Not Detected	65	Not Detected
Benzene	21	Not Detected	66	Not Detected
Toluene	17	130	66	490
Ethyl Benzene	15	37	66	160
o-Xylene	15	30	66	130
m,p-Xylene	15	280	66	1200
Naphthalene	66	Not Detected	340	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	95	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	112	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58 (422)

Lab ID#: 1107310A-02A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2072128a**	**Date of Collection: 7/14/11 11:00:00 AM**	
Dil. Factor:	**6.21**	**Date of Analysis: 7/21/11 10:21 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	5.6	Not Detected	12	Not Detected
Methyl tert-butyl ether	3.4	Not Detected	12	Not Detected
Benzene	3.9	4.4	12	14
Toluene	3.3	55	12	210
Ethyl Benzene	2.8	12	12	54
o-Xylene	2.8	11	12	49
m,p-Xylene	2.8	64	12	280
Naphthalene	12	Not Detected	65	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	95	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	114	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58 (492)

Lab ID#: 1107310A-03A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2072125a**	**Date of Collection: 7/14/11 11:55:00 AM**	
Dil. Factor:	**32.3**	**Date of Analysis: 7/21/11 08:53 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	29	Not Detected	64	Not Detected
Methyl tert-butyl ether	18	Not Detected	64	Not Detected
Benzene	20	25	65	79
Toluene	17	180	64	680
Ethyl Benzene	15	55	64	240
o-Xylene	15	50	64	220
m,p-Xylene	15	430	64	1900
Naphthalene	65	Not Detected	340	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	116	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58 (388)

Lab ID#: 1107310A-04A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2072126a**	**Date of Collection: 7/14/11 12:08:00 PM**	
Dil. Factor:	**31.7**	**Date of Analysis: 7/21/11 09:21 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	28	Not Detected	63	Not Detected
Methyl tert-butyl ether	17	Not Detected	63	Not Detected
Benzene	20	Not Detected	64	Not Detected
Toluene	17	140	63	550
Ethyl Benzene	14	39	63	170
o-Xylene	14	38	63	160
m,p-Xylene	14	210	63	920
Naphthalene	63	Not Detected	330	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	97	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	115	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1107310A-05A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2072110a**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/21/11 11:14 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.90	Not Detected	2.0	Not Detected
Methyl tert-butyl ether	0.55	Not Detected	2.0	Not Detected
Benzene	0.63	Not Detected	2.0	Not Detected
Toluene	0.53	Not Detected	2.0	Not Detected
Ethyl Benzene	0.46	Not Detected	2.0	Not Detected
o-Xylene	0.46	Not Detected	2.0	Not Detected
m,p-Xylene	0.46	Not Detected	2.0	Not Detected
Naphthalene	2.0	Not Detected	10	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	97	70-130
4-Bromofluorobenzene	103	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1107310A-06A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2072102**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/21/11 06:45 AM**	

Compound	%Recovery
1,3-Butadiene	83
Methyl tert-butyl ether	88
Benzene	82
Toluene	80
Ethyl Benzene	85
o-Xylene	92
m,p-Xylene	91
Naphthalene	91
C5-C8 Aliphatic Hydrocarbons	84
C9-C12 Aliphatic Hydrocarbons	81
C9-C10 Aromatic Hydrocarbons	103

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	98	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	108	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1107310A-07A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2072103**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/21/11 07:13 AM**	

Compound	%Recovery
1,3-Butadiene	84
Methyl tert-butyl ether	99
Benzene	89
Toluene	87
Ethyl Benzene	94
o-Xylene	102
m,p-Xylene	100
Naphthalene	132
C5-C8 Aliphatic Hydrocarbons	84
C9-C12 Aliphatic Hydrocarbons	79
C9-C10 Aromatic Hydrocarbons	102

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	109	70-130

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-ST03-B58 (347)**		**NA**	
Internal Standards:	**Lab ID**		**1107310A-01A**		**NA**	
Bromochloroethane: %D from CCV: 6.7%	**Date Collected**		**7/14/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 2.7%	**Date Received**		**7/19/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 2.8%	**Date Analyzed**		**7/21/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**9.88**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**20**	**8.9**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**20**	**5.4**	**ND**	**ND**	**NA**	**NA**
Benzene	**20**	**6.2**	**22**	**6.8**	**NA**	**NA**
Toluene	**20**	**5.2**	**400**	**110**	**NA**	**NA**
Ethylbenzene	**20**	**4.6**	**140**	**32**	**NA**	**NA**
m- & p- Xylenes	**20**	**4.6**	**1100**	**250**	**NA**	**NA**
o-Xylene	**20**	**4.6**	**120**	**28**	**NA**	**NA**
Naphthalene	**100**	**20**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**120**	**N/A**	**130000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**120**	**N/A**	**43000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**99**	**N/A**	**340**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 08/02/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-ST03-B58 (347) Lab**		**NA**	
Internal Standards:	**Lab ID**		**1107310A-01AA**		**NA**	
Bromochloroethane: %D from CCV: 3.0%	**Date Collected**		**7/14/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 0.80%	**Date Received**		**7/19/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 0.60%	**Date Analyzed**		**7/21/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**32.9**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**66**	**30**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**66**	**18**	**ND**	**ND**	**NA**	**NA**
Benzene	**66**	**20**	**ND**	**ND**	**NA**	**NA**
Toluene	**66**	**17**	**490**	**130**	**NA**	**NA**
Ethylbenzene	**66**	**15**	**160**	**37**	**NA**	**NA**
m- & p- Xylenes	**66**	**15**	**1200**	**280**	**NA**	**NA**
o-Xylene	**66**	**15**	**130**	**30**	**NA**	**NA**
Naphthalene	**340**	**66**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**390**	**N/A**	**150000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**390**	**N/A**	**38000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**330**	**N/A**	**370**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 08/02/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-ST03-B58 (422)**		**NA**	
Internal Standards:	**Lab ID**		**1107310A-02A**		**NA**	
Bromochloroethane: %D from CCV: 5.4%	**Date Collected**		**7/14/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 3.7%	**Date Received**		**7/19/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 3.2%	**Date Analyzed**		**7/21/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**3**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**6.21**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**12**	**5.6**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**12**	**3.4**	**ND**	**ND**	**NA**	**NA**
Benzene	**12**	**3.9**	**14**	**4.4**	**NA**	**NA**
Toluene	**12**	**3.3**	**210**	**55**	**NA**	**NA**
Ethylbenzene	**12**	**2.9**	**54**	**12**	**NA**	**NA**
m- & p- Xylenes	**12**	**2.9**	**280**	**64**	**NA**	**NA**
o-Xylene	**12**	**2.9**	**49**	**11**	**NA**	**NA**
Naphthalene	**65**	**12**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**74**	**N/A**	**64000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**74**	**N/A**	**16000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**62**	**N/A**	**200**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 08/02/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-ST03-B58 (492)**		**NA**	
Internal Standards:	**Lab ID**		**1107310A-03A**		**NA**	
Bromochloroethane: %D from CCV: 5.3%	**Date Collected**		**7/14/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 2.0%	**Date Received**		**7/19/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 0.50%	**Date Analyzed**		**7/21/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**32.3**		**NA**	
Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**65**	**29**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**65**	**18**	**ND**	**ND**	**NA**	**NA**
Benzene	**65**	**20**	**79**	**25**	**NA**	**NA**
Toluene	**65**	**17**	**680**	**180**	**NA**	**NA**
Ethylbenzene	**65**	**15**	**240**	**55**	**NA**	**NA**
m- & p- Xylenes	**65**	**15**	**1900**	**430**	**NA**	**NA**
o-Xylene	**65**	**15**	**220**	**50**	**NA**	**NA**
Naphthalene	**340**	**65**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**390**	**N/A**	**420000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**390**	**N/A**	**110000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**320**	**N/A**	**850**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 08/02/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☑ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-ST03-B58 (388)**		**NA**	
Internal Standards:	**Lab ID**		**1107310A-04A**		**NA**	
Bromochloroethane: %D from CCV: 9.2%	**Date Collected**		**7/14/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 2.2%	**Date Received**		**7/19/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 1.6%	**Date Analyzed**		**7/21/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**31.7**		**NA**	
Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**63**	**29**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**63**	**17**	**ND**	**ND**	**NA**	**NA**
Benzene	**63**	**20**	**ND**	**ND**	**NA**	**NA**
Toluene	**63**	**17**	**550**	**140**	**NA**	**NA**
Ethylbenzene	**63**	**15**	**170**	**39**	**NA**	**NA**
m- & p- Xylenes	**63**	**15**	**920**	**210**	**NA**	**NA**
o-Xylene	**63**	**15**	**160**	**38**	**NA**	**NA**
Naphthalene	**330**	**63**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**380**	**N/A**	**410000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**380**	**N/A**	**100000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**320**	**N/A**	**700**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 08/02/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☐ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☐ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☐ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Lab Blank**		**NA**	
Internal Standards:	**Lab ID**		**1107310A-05A**		**NA**	
Bromochloroethane: %D from CCV: 6.5%	**Date Collected**		**NA**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 3.2%	**Date Received**		**NA**		**NA**	
Chlorobenzene-d5: %D from CCV: 5.3%	**Date Analyzed**		**7/21/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**NA**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1**		**NA**	

Target APH Analytes & Hydrocarbon Ranges	**Reporting Limit**		**Sample Results**		**Sample Results**	
	µg/m3	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**2.0**	**0.90**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**2.0**	**0.55**	**ND**	**ND**	**NA**	**NA**
Benzene	**2.0**	**0.63**	**ND**	**ND**	**NA**	**NA**
Toluene	**2.0**	**0.53**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**10**	**2.0**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**10**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No - Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No - Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes - Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 08/02/2011

Air Toxics LTD.
Laboratory Services Since 1989

9/7/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1108544A

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 8/26/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Massachusetts APH are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1108544A

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	08/26/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	09/07/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HDOH-GASOLINE#1	Massachusetts APH	4.5 "Hg	15 psi
02A	HDOH-DIESEL#2	Massachusetts APH	4.0 "Hg	15 psi
02AA	HDOH-DIESEL#2 Lab Duplicate	Massachusetts APH	4.0 "Hg	15 psi
03A	Lab Blank	Massachusetts APH	NA	NA
04A	CCV	Massachusetts APH	NA	NA
05A	LCS	Massachusetts APH	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 09/07/11

Laboratory Director

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Massachusetts DEP APH
Tetra Tech EM, Inc.
Workorder# 1108544A

Two 1 Liter Summa Canister (MA APH Certified) samples were received on August 26, 2011. The laboratory performed analysis via Massachusetts DEP APH method using GC/MS in the full scan mode. The method involves concentrating up to 0.5 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis. This method is designed to measure gaseous phase aliphatic and aromatic compounds in ambient air and soil gas collected in stainless steel Summa canisters. The volatile aliphatic hydrocarbons are collectively quantified within the C5 to C8 range and within the C9 to C12 range. Additionally, the volatile aromatic hydrocarbons are collectively quantified within the C9 to C10 range.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The reported CCV for each daily batch may be derived from more than one analytical file due to the client's request for non-standard compounds.

Non-standard compounds may have different acceptance criteria than the standard TO-14A/TO-15 compound list as per contract or verbal agreement.

The reported LCS for each daily batch has been derived from more than one analytical file.

Dilution was performed on samples HDOH-GASOLINE#1, HDOH-DIESEL#2 and HDOH-DIESEL#2 Lab Duplicate due to the presence of high level target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HDOH-GASOLINE#1

Lab ID#: 1108544A-01A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2083020a**	**Date of Collection: 8/25/11 10:30:00 AM**	
Dil. Factor:	**47600**	**Date of Analysis: 8/30/11 09:37 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	43000	Not Detected	95000	Not Detected
Methyl tert-butyl ether	26000	Not Detected	94000	Not Detected
Benzene	30000	1600000	96000	5100000
Toluene	25000	7500000	95000	28000000
Ethyl Benzene	22000	480000	95000	2100000
o-Xylene	22000	490000	95000	2100000
m,p-Xylene	22000	1700000	95000	7400000
Naphthalene	95000	Not Detected	500000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	89	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	97	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HDOH-DIESEL#2

Lab ID#: 1108544A-02A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2083021a**	**Date of Collection: 8/25/11 10:30:00 AM**	
Dil. Factor:	**58.2**	**Date of Analysis: 8/30/11 11:16 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	52	Not Detected	120	Not Detected
Methyl tert-butyl ether	32	Not Detected	120	Not Detected
Benzene	37	900	120	2900
Toluene	31	5500	120	21000
Ethyl Benzene	27	1400	120	6000
o-Xylene	27	2700	120	12000
m,p-Xylene	27	5800	120	25000
Naphthalene	120	660	610	3500

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	89	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	112	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HDOH-DIESEL#2 Lab Duplicate

Lab ID#: 1108544A-02AA

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2083022a**	**Date of Collection: 8/25/11 10:30:00 AM**	
Dil. Factor:	**58.2**	**Date of Analysis: 8/31/11 12:07 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	52	Not Detected	120	Not Detected
Methyl tert-butyl ether	32	Not Detected	120	Not Detected
Benzene	37	810	120	2600
Toluene	31	5000	120	19000
Ethyl Benzene	27	1200	120	5400
o-Xylene	27	2400	120	10000
m,p-Xylene	27	5300	120	23000
Naphthalene	120	600	610	3200

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	86	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	112	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1108544A-03A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2083008e**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/30/11 09:51 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.90	Not Detected	2.0	Not Detected
Methyl tert-butyl ether	0.55	Not Detected	2.0	Not Detected
Benzene	0.63	Not Detected	2.0	Not Detected
Toluene	0.53	Not Detected	2.0	Not Detected
Ethyl Benzene	0.46	Not Detected	2.0	Not Detected
o-Xylene	0.46	Not Detected	2.0	Not Detected
m,p-Xylene	0.46	Not Detected	2.0	Not Detected
Naphthalene	2.0	Not Detected	10	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	96	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1108544A-04A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2083002**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/30/11 05:47 AM**	

Compound	%Recovery
1,3-Butadiene	92
Methyl tert-butyl ether	76
Benzene	92
Toluene	92
Ethyl Benzene	95
o-Xylene	102
m,p-Xylene	99
Naphthalene	96
C5-C8 Aliphatic Hydrocarbons	83
C9-C12 Aliphatic Hydrocarbons	81
C9-C10 Aromatic Hydrocarbons	107

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	106	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1108544A-05A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2083003**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/30/11 06:27 AM**	

Compound	%Recovery
1,3-Butadiene	92
Methyl tert-butyl ether	80
Benzene	95
Toluene	93
Ethyl Benzene	99
o-Xylene	108
m,p-Xylene	104
Naphthalene	118
C5-C8 Aliphatic Hydrocarbons	85
C9-C12 Aliphatic Hydrocarbons	82
C9-C10 Aromatic Hydrocarbons	103

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	91	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	109	70-130

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HDOH-GASOLINE#1**		**NA**	
Internal Standards:	**Lab ID**		**1108544A-01A**		**NA**	
Bromochloroethane: %D from CCV: 12%	**Date Collected**		**8/25/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 18%	**Date Received**		**8/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 12%	**Date Analyzed**		**8/30/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**3**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**47600**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**95000**	**43000**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**95000**	**26000**	**ND**	**ND**	**NA**	**NA**
Benzene	**95000**	**30000**	**5100000**	**1600000**	**NA**	**NA**
Toluene	**95000**	**25000**	**28000000**	**7500000**	**NA**	**NA**
Ethylbenzene	**95000**	**22000**	**2100000**	**480000**	**NA**	**NA**
m- & p- Xylenes	**95000**	**22000**	**7300000**	**1700000**	**NA**	**NA**
o-Xylene	**95000**	**22000**	**2100000**	**490000**	**NA**	**NA**
Naphthalene	**500000**	**95000**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**570000**	**N/A**	**260000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**570000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**480000**	**N/A**	**1700000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 09/07/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HDOH-DIESEL#2**		**NA**	
Internal Standards:	**Lab ID**		**1108544A-02A**		**NA**	
Bromochloroethane: %D from CCV: 14%	**Date Collected**		**8/25/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 22%	**Date Received**		**8/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 22%	**Date Analyzed**		**8/30/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**58.2**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**120**	**53**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**120**	**32**	**ND**	**ND**	**NA**	**NA**
Benzene	**120**	**36**	**2900**	**900**	**NA**	**NA**
Toluene	**120**	**31**	**21000**	**5500**	**NA**	**NA**
Ethylbenzene	**120**	**27**	**6000**	**1400**	**NA**	**NA**
m- & p- Xylenes	**120**	**27**	**25000**	**5800**	**NA**	**NA**
o-Xylene	**120**	**27**	**12000**	**2700**	**NA**	**NA**
Naphthalene	**610**	**120**	**3500**	**660**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**700**	**N/A**	**320000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**700**	**N/A**	**560000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**580**	**N/A**	**94000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 09/07/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HDOH-DIESEL#2 Lab Dup**		**NA**	
Internal Standards:	**Lab ID**		**1108544A-02AA**		**NA**	
Bromochloroethane: %D from CCV: 17%	**Date Collected**		**8/25/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 25%	**Date Received**		**8/26/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 25%	**Date Analyzed**		**8/31/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**58.2**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**120**	**53**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**120**	**32**	**ND**	**ND**	**NA**	**NA**
Benzene	**120**	**36**	**2600**	**810**	**NA**	**NA**
Toluene	**120**	**31**	**19000**	**5000**	**NA**	**NA**
Ethylbenzene	**120**	**27**	**5400**	**1200**	**NA**	**NA**
m- & p- Xylenes	**120**	**27**	**23000**	**5300**	**NA**	**NA**
o-Xylene	**120**	**27**	**10000**	**2400**	**NA**	**NA**
Naphthalene	**610**	**120**	**3200**	**600**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**700**	**N/A**	**290000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**700**	**N/A**	**500000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**580**	**N/A**	**83000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 09/07/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☑ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☐ Other
Sample Container(s)	☑ Canister(s):	☑ 6-L	☐ 15-L	☐ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☐ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Lab Blank**		**NA**	
Internal Standards:	**Lab ID**		**1108544A-03A**		**NA**	
Bromochloroethane: %D from CCV: 0.72%	**Date Collected**		**NA**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 3.9%	**Date Received**		**NA**		**NA**	
Chlorobenzene-d5: %D from CCV: 4.3%	**Date Analyzed**		**8/30/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**NA**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1**		**NA**	

Target APH Analytes & Hydrocarbon Ranges	**Reporting Limit**		**Sample Results**		**Sample Results**	
	µg/m3	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**2.0**	**0.90**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**2.0**	**0.55**	**ND**	**ND**	**NA**	**NA**
Benzene	**2.0**	**0.63**	**ND**	**ND**	**NA**	**NA**
Toluene	**2.0**	**0.53**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**10**	**2.0**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**10**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 09/07/2011

Air Toxics LTD.
Laboratory Services Since 1989

8/23/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1108300A

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 8/15/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Massachusetts APH are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1108300A

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	08/15/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	08/23/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HH-OUIC-MW10SG	Massachusetts APH	4.0 "Hg	15 psi
02A	HH-OUIC-MW22R	Massachusetts APH	5.0 "Hg	15 psi
03A	HH-OUIC-OTNS1	Massachusetts APH	3.2 "Hg	15 psi
03AA	HH-OUIC-OTNS1 Lab Duplicate	Massachusetts APH	3.2 "Hg	15 psi
04A	Lab Blank	Massachusetts APH	NA	NA
05A	CCV	Massachusetts APH	NA	NA
06A	LCS	Massachusetts APH	NA	NA

CERTIFIED BY: Linda D. Fruman

Laboratory Director

DATE: 08/23/11

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Massachusetts DEP APH
Tetra Tech EM, Inc.
Workorder# 1108300A

Three 1 Liter Summa Canister (MA APH Certified) samples were received on August 15, 2011. The laboratory performed analysis via Massachusetts DEP APH method using GC/MS in the full scan mode. The method involves concentrating up to 0.5 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis. This method is designed to measure gaseous phase aliphatic and aromatic compounds in ambient air and soil gas collected in stainless steel Summa canisters. The volatile aliphatic hydrocarbons are collectively quantified within the C5 to C8 range and within the C9 to C12 range. Additionally, the volatile aromatic hydrocarbons are collectively quantified within the C9 to C10 range.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The reported CCV for each daily batch may be derived from more than one analytical file due to the client's request for non-standard compounds.

Non-standard compounds may have different acceptance criteria than the standard TO-14A/TO-15 compound list as per contract or verbal agreement.

The reported LCS for each daily batch has been derived from more than one analytical file.

Dilution was performed on samples HH-OUIC-MW10SG, HH-OUIC-MW22R, HH-OUIC-OTNS1 and HH-OUIC-OTNS1 Lab Duplicate due to the presence of high level target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OUIC-MW10SG

Lab ID#: 1108300A-01A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2081927a**	**Date of Collection: 8/11/11 2:03:00 PM**	
Dil. Factor:	**1550**	**Date of Analysis: 8/19/11 11:20 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	1400	Not Detected	3100	Not Detected
Methyl tert-butyl ether	850	Not Detected	3100	Not Detected
Benzene	980	3700	3100	12000
Toluene	820	960	3100	3600
Ethyl Benzene	710	Not Detected	3100	Not Detected
o-Xylene	710	Not Detected	3100	Not Detected
m,p-Xylene	710	Not Detected	3100	Not Detected
Naphthalene	3100	Not Detected	16000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	93	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	109	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OUIC-MW22R

Lab ID#: 1108300A-02A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2081917a**	**Date of Collection: 8/11/11 1:38:00 PM**	
Dil. Factor:	**968**	**Date of Analysis: 8/19/11 03:18 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	870	Not Detected	1900	Not Detected
Methyl tert-butyl ether	530	Not Detected	1900	Not Detected
Benzene	610	2400	1900	7700
Toluene	510	Not Detected	1900	Not Detected
Ethyl Benzene	440	Not Detected	1900	Not Detected
o-Xylene	440	Not Detected	1900	Not Detected
m,p-Xylene	440	Not Detected	1900	Not Detected
Naphthalene	1900	Not Detected	10000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	92	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	106	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OUIC-OTNS1

Lab ID#: 1108300A-03A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2081916a**	**Date of Collection: 8/11/11 2:38:00 PM**	
Dil. Factor:	**151**	**Date of Analysis: 8/19/11 02:38 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	140	Not Detected	300	Not Detected
Methyl tert-butyl ether	83	Not Detected	300	Not Detected
Benzene	95	Not Detected	300	Not Detected
Toluene	80	Not Detected	300	Not Detected
Ethyl Benzene	69	Not Detected	300	Not Detected
o-Xylene	69	Not Detected	300	Not Detected
m,p-Xylene	69	Not Detected	300	Not Detected
Naphthalene	300	Not Detected	1600	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	98	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	105	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OUIC-OTNS1 Lab Duplicate

Lab ID#: 1108300A-03AA

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2081921a**	**Date of Collection: 8/11/11 2:38:00 PM**	
Dil. Factor:	**151**	**Date of Analysis: 8/19/11 06:02 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	140	Not Detected	300	Not Detected
Methyl tert-butyl ether	83	Not Detected	300	Not Detected
Benzene	95	Not Detected	300	Not Detected
Toluene	80	Not Detected	300	Not Detected
Ethyl Benzene	69	Not Detected	300	Not Detected
o-Xylene	69	Not Detected	300	Not Detected
m,p-Xylene	69	Not Detected	300	Not Detected
Naphthalene	300	Not Detected	1600	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	95	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	102	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1108300A-04A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2081909e**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/19/11 10:25 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.90	Not Detected	2.0	Not Detected
Methyl tert-butyl ether	0.55	Not Detected	2.0	Not Detected
Benzene	0.63	Not Detected	2.0	Not Detected
Toluene	0.53	Not Detected	2.0	Not Detected
Ethyl Benzene	0.46	Not Detected	2.0	Not Detected
o-Xylene	0.46	Not Detected	2.0	Not Detected
m,p-Xylene	0.46	Not Detected	2.0	Not Detected
Naphthalene	2.0	Not Detected	10	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	100	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1108300A-05A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2081906**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/19/11 08:45 AM**	

Compound	%Recovery
1,3-Butadiene	78
Methyl tert-butyl ether	71
Benzene	81
Toluene	83
Ethyl Benzene	86
o-Xylene	96
m,p-Xylene	93
Naphthalene	72
C5-C8 Aliphatic Hydrocarbons	86
C9-C12 Aliphatic Hydrocarbons	90
C9-C10 Aromatic Hydrocarbons	117

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	99	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	111	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1108300A-06A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2081907**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/19/11 09:13 AM**	

Compound	%Recovery
1,3-Butadiene	85
Methyl tert-butyl ether	80
Benzene	90
Toluene	89
Ethyl Benzene	97
o-Xylene	108
m,p-Xylene	106
Naphthalene	146
C5-C8 Aliphatic Hydrocarbons	86
C9-C12 Aliphatic Hydrocarbons	86
C9-C10 Aromatic Hydrocarbons	108

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	114	70-130

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HH-OUIC-MW10SG**		**NA**	
Internal Standards:	**Lab ID**		**1108300A-01A**		**NA**	
Bromochloroethane: %D from CCV: 13%	**Date Collected**		**8/11/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 19%	**Date Received**		**8/15/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 23%	**Date Analyzed**		**8/19/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**3**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1550**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**3100**	**1400**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**3100**	**850**	**ND**	**ND**	**NA**	**NA**
Benzene	**3100**	**970**	**12000**	**3700**	**NA**	**NA**
Toluene	**3100**	**820**	**3600**	**960**	**NA**	**NA**
Ethylbenzene	**3100**	**710**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**3100**	**710**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**3100**	**710**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**16000**	**3100**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**19000**	**N/A**	**62000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**19000**	**N/A**	**1800000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**16000**	**N/A**	**35000**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 08/23/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HH-OUIC-MW22R**		**NA**	
Internal Standards:	**Lab ID**		**1108300A-02A**		**NA**	
Bromochloroethane: %D from CCV: 10%	**Date Collected**		**8/11/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 14%	**Date Received**		**8/15/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 15%	**Date Analyzed**		**8/19/2011**		**NA**	
	Pre-Sample Vacuum (field)		**28**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**3**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**968**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**1900**	**880**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**1900**	**530**	**ND**	**ND**	**NA**	**NA**
Benzene	**1900**	**600**	**7700**	**2400**	**NA**	**NA**
Toluene	**1900**	**510**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**1900**	**450**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**1900**	**450**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**1900**	**450**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**10000**	**1900**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**12000**	**N/A**	**22000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**12000**	**N/A**	**1200000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**9700**	**N/A**	**17000**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 08/23/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HH-OUIC-OTNS1**		**NA**	
Internal Standards:	**Lab ID**		**1108300A-03A**		**NA**	
Bromochloroethane: %D from CCV: 2.9%	**Date Collected**		**8/11/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 5.8%	**Date Received**		**8/15/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 6.2%	**Date Analyzed**		**8/19/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**3**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**3.2**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**151**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**300**	**140**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**300**	**83**	**ND**	**ND**	**NA**	**NA**
Benzene	**300**	**94**	**ND**	**ND**	**NA**	**NA**
Toluene	**300**	**80**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**300**	**70**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**300**	**70**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**300**	**70**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**1600**	**300**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**1800**	**N/A**	**740000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**1800**	**N/A**	**160000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**1500**	**N/A**	**2700**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 08/23/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☐ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HH-OUIC-OTNS1 Lab Dup**		**NA**	
Internal Standards:	**Lab ID**		**1108300A-03AA**		**NA**	
Bromochloroethane: %D from CCV: 5.4%	**Date Collected**		**8/11/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 7.5%	**Date Received**		**8/15/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 8.0%	**Date Analyzed**		**8/19/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**3**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**3.2**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**151**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**300**	**140**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**300**	**83**	**ND**	**ND**	**NA**	**NA**
Benzene	**300**	**94**	**ND**	**ND**	**NA**	**NA**
Toluene	**300**	**80**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**300**	**70**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**300**	**70**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**300**	**70**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**1600**	**300**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**1800**	**N/A**	**640000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**1800**	**N/A**	**120000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**1500**	**N/A**	**2500**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 08/23/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☑ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☐ Other
Sample Container(s)	☐ Canister(s):	☑ 6-L	☐ 15-L	☐ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☐ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Lab Blank**		**NA**	
Internal Standards:	**Lab ID**		**1108300A-04A**		**NA**	
Bromochloroethane: %D from CCV: 4.0%	**Date Collected**		**NA**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 8.1%	**Date Received**		**NA**		**NA**	
Chlorobenzene-d5: %D from CCV: 6.9%	**Date Analyzed**		**8/19/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**NA**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1**		**NA**	

Target APH Analytes & Hydrocarbon Ranges	**Reporting Limit**		**Sample Results**		**Sample Results**	
	µg/m3	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**2.0**	**0.90**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**2.0**	**0.55**	**ND**	**ND**	**NA**	**NA**
Benzene	**2.0**	**0.63**	**ND**	**ND**	**NA**	**NA**
Toluene	**2.0**	**0.53**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**10**	**2.0**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**10**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 08/23/2011

Air Toxics LTD.
Laboratory Services Since 1989

10/21/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1110160A

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 10/8/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Massachusetts APH are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1110160A

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/08/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	10/20/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-SP43-VMP10	Massachusetts APH	5.2 "Hg	15psi
01AA	HAFB-SP43-VMP10 Lab Duplicate	Massachusetts APH	5.2 "Hg	15psi
02A	HAFB-SP43-VMP11	Massachusetts APH	5.0 "Hg	15psi
03A	HAFB-SP43-VMP12	Massachusetts APH	4.5 "Hg	15psi
04A	HAFB-SP43-VMP16	Massachusetts APH	6.0 "Hg	15psi
05A	HAFB-SP43-VMP17	Massachusetts APH	5.5 "Hg	15psi
06A	FV-GP01-HDOH#2	Massachusetts APH	4.0 "Hg	15psi
07A	FV-GP08-HDOH#2	Massachusetts APH	5.0 "Hg	15psi
08A	FV-GP16R-HDOH#2	Massachusetts APH	5.0 "Hg	15psi
09A	JP8#1	Massachusetts APH	4.0 "Hg	15psi
10A	Lab Blank	Massachusetts APH	NA	NA
11A	CCV	Massachusetts APH	NA	NA
12A	LCS	Massachusetts APH	NA	NA

CERTIFIED BY:  DATE: 10/21/11

Laboratory Director

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Massachusetts DEP APH
Tetra Tech EM, Inc.
Workorder# 1110160A

Nine 1 Liter Summa Canister (MA APH Certified) samples were received on October 08, 2011. The laboratory performed analysis via Massachusetts DEP APH method using GC/MS in the full scan mode. The method involves concentrating up to 0.5 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis. This method is designed to measure gaseous phase aliphatic and aromatic compounds in ambient air and soil gas collected in stainless steel Summa canisters. The volatile aliphatic hydrocarbons are collectively quantified within the C5 to C8 range and within the C9 to C12 range. Additionally, the volatile aromatic hydrocarbons are collectively quantified within the C9 to C10 range.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The reported CCV for each daily batch may be derived from more than one analytical file due to the client's request for non-standard compounds.

Non-standard compounds may have different acceptance criteria than the standard TO-14A/TO-15 compound list as per contract or verbal agreement.

The reported LCS for each daily batch has been derived from more than one analytical file.

The Pre and Post Sample Vacuum (field) noted for samples FV-GP08-HDOH#2, FV-GP16R-HDOH#2 and JP8#1 were not documented on the Chain of Custody, therefore this data was reported as NA on the final report.

Dilution was performed on samples HAFB-SP43-VMP10, HAFB-SP43-VMP10 Lab Duplicate, HAFB-SP43-VMP11, HAFB-SP43-VMP16, HAFB-SP43-VMP17, FV-GP08-HDOH#2, FV-GP16R-HDOH#2 and JP8#1 due to the presence of high level APH Hydrocarbons.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP10

Lab ID#: 1110160A-01A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2101216a**	**Date of Collection: 10/5/11 2:05:00 PM**	
Dil. Factor:	**244**	**Date of Analysis: 10/12/11 04:09 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	220	Not Detected	480	Not Detected
Methyl tert-butyl ether	130	Not Detected	480	Not Detected
Benzene	150	500	490	1600
Toluene	130	Not Detected	490	Not Detected
Ethyl Benzene	110	1700	490	7200
o-Xylene	110	Not Detected	490	Not Detected
m,p-Xylene	110	Not Detected	490	Not Detected
Naphthalene	490	760	2600	4000

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	104	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP10 Lab Duplicate

Lab ID#: 1110160A-01AA

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2101217a**	**Date of Collection: 10/5/11 2:05:00 PM**	
Dil. Factor:	**244**	**Date of Analysis: 10/12/11 04:52 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	220	Not Detected	480	Not Detected
Methyl tert-butyl ether	130	Not Detected	480	Not Detected
Benzene	150	500	490	1600
Toluene	130	Not Detected	490	Not Detected
Ethyl Benzene	110	1600	490	6700
o-Xylene	110	Not Detected	490	Not Detected
m,p-Xylene	110	Not Detected	490	Not Detected
Naphthalene	490	780	2600	4100

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	103	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP11

Lab ID#: 1110160A-02A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2101218a**	**Date of Collection: 10/5/11 1:15:00 PM**	
Dil. Factor:	**242**	**Date of Analysis: 10/12/11 05:31 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	220	Not Detected	480	Not Detected
Methyl tert-butyl ether	130	Not Detected	480	Not Detected
Benzene	150	Not Detected	490	Not Detected
Toluene	130	Not Detected	480	Not Detected
Ethyl Benzene	110	9500	480	41000
o-Xylene	110	120	480	510
m,p-Xylene	110	Not Detected	480	Not Detected
Naphthalene	480	490	2500	2600

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	103	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP12

Lab ID#: 1110160A-03A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2101222a**	**Date of Collection: 10/5/11 12:44:00 PM**	
Dil. Factor:	**2.38**	**Date of Analysis: 10/12/11 08:39 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	2.1	Not Detected	4.7	Not Detected
Methyl tert-butyl ether	1.3	Not Detected	4.7	Not Detected
Benzene	1.5	Not Detected	4.8	Not Detected
Toluene	1.3	Not Detected	4.8	Not Detected
Ethyl Benzene	1.1	Not Detected	4.8	Not Detected
o-Xylene	1.1	Not Detected	4.8	Not Detected
m,p-Xylene	1.1	Not Detected	4.8	Not Detected
Naphthalene	4.8	Not Detected	25	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	90	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP16

Lab ID#: 1110160A-04A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2101219a**	**Date of Collection: 10/5/11 1:42:00 PM**	
Dil. Factor:	**252**	**Date of Analysis: 10/12/11 06:13 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	230	Not Detected	500	Not Detected
Methyl tert-butyl ether	140	Not Detected	500	Not Detected
Benzene	160	480	510	1500
Toluene	130	Not Detected	500	Not Detected
Ethyl Benzene	120	370	500	1600
o-Xylene	120	Not Detected	500	Not Detected
m,p-Xylene	120	Not Detected	500	Not Detected
Naphthalene	500	Not Detected	2600	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	116	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	105	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP17

Lab ID#: 1110160A-05A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2101214a**	**Date of Collection: 10/5/11 11:52:00 AM**	
Dil. Factor:	**247**	**Date of Analysis: 10/12/11 01:43 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	220	Not Detected	490	Not Detected
Methyl tert-butyl ether	140	Not Detected	490	Not Detected
Benzene	160	Not Detected	500	Not Detected
Toluene	130	Not Detected	490	Not Detected
Ethyl Benzene	110	1400	490	6000
o-Xylene	110	Not Detected	490	Not Detected
m,p-Xylene	110	Not Detected	490	Not Detected
Naphthalene	490	Not Detected	2600	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	114	70-130
Toluene-d8	113	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP01-HDOH#2

Lab ID#: 1110160A-06A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2101223a**	**Date of Collection: 10/6/11 1:45:00 PM**	
Dil. Factor:	**2.33**	**Date of Analysis: 10/12/11 09:15 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	2.1	Not Detected	4.6	Not Detected
Methyl tert-butyl ether	1.3	Not Detected	4.6	Not Detected
Benzene	1.5	Not Detected	4.7	Not Detected
Toluene	1.2	Not Detected	4.6	Not Detected
Ethyl Benzene	1.1	Not Detected	4.6	Not Detected
o-Xylene	1.1	Not Detected	4.6	Not Detected
m,p-Xylene	1.1	Not Detected	4.6	Not Detected
Naphthalene	4.7	Not Detected	24	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	95	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP08-HDOH#2

Lab ID#: 1110160A-07A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2101215a**	**Date of Collection: 10/6/11 1:06:00 PM**	
Dil. Factor:	**24.2**	**Date of Analysis: 10/12/11 03:24 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	22	Not Detected	48	Not Detected
Methyl tert-butyl ether	13	Not Detected	48	Not Detected
Benzene	15	15	49	49
Toluene	13	13	48	51
Ethyl Benzene	11	Not Detected	48	Not Detected
o-Xylene	11	Not Detected	48	Not Detected
m,p-Xylene	11	Not Detected	48	Not Detected
Naphthalene	48	Not Detected	250	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	114	70-130
Toluene-d8	115	70-130
4-Bromofluorobenzene	102	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP16R-HDOH#2

Lab ID#: 1110160A-08A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2101224a**	**Date of Collection: 10/6/11 12:19:00 PM**	
Dil. Factor:	**247**	**Date of Analysis: 10/12/11 09:52 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	220	Not Detected	490	Not Detected
Methyl tert-butyl ether	140	Not Detected	490	Not Detected
Benzene	160	Not Detected	500	Not Detected
Toluene	130	Not Detected	490	Not Detected
Ethyl Benzene	110	Not Detected	490	Not Detected
o-Xylene	110	Not Detected	490	Not Detected
m,p-Xylene	110	Not Detected	490	Not Detected
Naphthalene	490	Not Detected	2600	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	97	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	99	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: JP8#1

Lab ID#: 1110160A-09A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2101220a**	**Date of Collection: 10/6/11 3:15:00 PM**	
Dil. Factor:	**233**	**Date of Analysis: 10/12/11 06:55 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	210	Not Detected	460	Not Detected
Methyl tert-butyl ether	130	Not Detected	460	Not Detected
Benzene	150	6200	470	20000
Toluene	120	16000	460	62000
Ethyl Benzene	110	5000	460	22000
o-Xylene	110	8300	460	36000
m,p-Xylene	110	18000	460	79000
Naphthalene	470	1200	2400	6100

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	94	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	98	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110160A-10A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2101213d**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/11 01:01 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.90	Not Detected	2.0	Not Detected
Methyl tert-butyl ether	0.55	Not Detected	2.0	Not Detected
Benzene	0.63	Not Detected	2.0	Not Detected
Toluene	0.53	Not Detected	2.0	Not Detected
Ethyl Benzene	0.46	Not Detected	2.0	Not Detected
o-Xylene	0.46	Not Detected	2.0	Not Detected
m,p-Xylene	0.46	Not Detected	2.0	Not Detected
Naphthalene	2.0	Not Detected	10	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	116	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	84	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1110160A-11A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2101206**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/11 07:49 AM**	

Compound	%Recovery
1,3-Butadiene	107
Methyl tert-butyl ether	108
Benzene	89
Toluene	86
Ethyl Benzene	92
o-Xylene	97
m,p-Xylene	94
Naphthalene	69
C5-C8 Aliphatic Hydrocarbons	99
C9-C12 Aliphatic Hydrocarbons	82
C9-C10 Aromatic Hydrocarbons	93

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	113	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110160A-12A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2101207**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/12/11 08:37 AM**	

Compound	%Recovery
1,3-Butadiene	110
Methyl tert-butyl ether	114
Benzene	94
Toluene	88
Ethyl Benzene	92
o-Xylene	99
m,p-Xylene	95
Naphthalene	73
C5-C8 Aliphatic Hydrocarbons	116
C9-C12 Aliphatic Hydrocarbons	100
C9-C10 Aromatic Hydrocarbons	112

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	94	70-130

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-SP43-VMP10**		**NA**	
Internal Standards:	**Lab ID**		**1110160A-01A**		**NA**	
Bromochloroethane: %D from CCV: 11%	**Date Collected**		**10/5/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 14%	**Date Received**		**10/8/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 20%	**Date Analyzed**		**10/12/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.2**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**244**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**490**	**220**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**490**	**130**	**ND**	**ND**	**NA**	**NA**
Benzene	**490**	**150**	**1600**	**500**	**NA**	**NA**
Toluene	**490**	**130**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**490**	**110**	**7200**	**1700**	**NA**	**NA**
m- & p- Xylenes	**490**	**110**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**490**	**110**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**2600**	**490**	**4000**	**760**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**2900**	**N/A**	**13000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**2900**	**N/A**	**6400000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**2400**	**N/A**	**120000**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 10/18/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-SP43-VMP10 Lab D**		**NA**	
Internal Standards:	**Lab ID**		**1110160A-01AA**		**NA**	
Bromochloroethane: %D from CCV: 16%	**Date Collected**		**10/5/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 19%	**Date Received**		**10/8/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 24%	**Date Analyzed**		**10/12/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.2**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**244**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**490**	**220**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**490**	**130**	**ND**	**ND**	**NA**	**NA**
Benzene	**490**	**150**	**1600**	**500**	**NA**	**NA**
Toluene	**490**	**130**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**490**	**110**	**6700**	**1600**	**NA**	**NA**
m- & p- Xylenes	**490**	**110**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**490**	**110**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**2600**	**490**	**4100**	**780**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**2900**	**N/A**	**12000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**2900**	**N/A**	**5900000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**2400**	**N/A**	**110000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No - Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No - Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes - Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 10/18/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-SP43-VMP11**		**NA**	
Internal Standards:	**Lab ID**		**1110160A-02A**		**NA**	
Bromochloroethane: %D from CCV: 21%	**Date Collected**		**10/5/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 25%	**Date Received**		**10/8/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 28%	**Date Analyzed**		**10/12/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**242**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**480**	**220**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**480**	**130**	**ND**	**ND**	**NA**	**NA**
Benzene	**480**	**150**	**ND**	**ND**	**NA**	**NA**
Toluene	**480**	**130**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**480**	**110**	**41000**	**9500**	**NA**	**NA**
m- & p- Xylenes	**480**	**110**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**480**	**110**	**510**	**120**	**NA**	**NA**
Naphthalene	**2500**	**480**	**2600**	**490**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**2900**	**N/A**	**14000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**2900**	**N/A**	**5900000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**2400**	**N/A**	**82000**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 10/18/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID	**HAFB-SP43-VMP12**		**NA**		
Internal Standards:	**Lab ID**	**1110160A-03A**		**NA**		
Bromochloroethane: %D from CCV: 11%	**Date Collected**	**10/5/2011**		**NA**		
1, 4-Difluorobenzene: %D from CCV: 18%	**Date Received**	**10/8/2011**		**NA**		
Chlorobenzene-d5: %D from CCV: 23%	**Date Analyzed**	**10/12/2011**		**NA**		
	Pre-Sample Vacuum (field)	**30**	**in. Hg**	**NA**	**in. Hg**	
MS Tuning Standard:	**Post-Sample Vacuum (field)**	**4**	**in. Hg**	**NA**	**in. Hg**	
Bromofluorobenzene	**Lab Receipt Vacuum**	**4.5**	**in. Hg**	**NA**	**in. Hg**	
	Dilution Factor	**2.38**		**NA**		

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**4.8**	**2.2**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**4.8**	**1.3**	**ND**	**ND**	**NA**	**NA**
Benzene	**4.8**	**1.5**	**ND**	**ND**	**NA**	**NA**
Toluene	**4.8**	**1.3**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**4.8**	**1.1**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**4.8**	**1.1**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**4.8**	**1.1**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**25**	**4.8**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**28**	**N/A**	**1500**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**28**	**N/A**	**630**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**24**	**N/A**	**28**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 10/20/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-SP43-VMP16**		**NA**	
Internal Standards:	**Lab ID**		**1110160A-04A**		**NA**	
Bromochloroethane: %D from CCV: 22%	**Date Collected**		**10/5/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 28%	**Date Received**		**10/8/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 33%	**Date Analyzed**		**10/12/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**6.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**252**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**500**	**230**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**500**	**140**	**ND**	**ND**	**NA**	**NA**
Benzene	**500**	**160**	**1500**	**480**	**NA**	**NA**
Toluene	**500**	**130**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**500**	**120**	**1600**	**370**	**NA**	**NA**
m- & p- Xylenes	**500**	**120**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**500**	**120**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**2600**	**500**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**3000**	**N/A**	**32000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**3000**	**N/A**	**5700000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**2500**	**N/A**	**130000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 10/20/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☐ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-SP43-VMP17**		**NA**	
Internal Standards:	**Lab ID**		**1110160A-05A**		**NA**	
Bromochloroethane: %D from CCV: 9.7%	**Date Collected**		**10/5/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 12%	**Date Received**		**10/8/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 2.2%	**Date Analyzed**		**10/12/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**247**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**490**	**220**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**490**	**140**	**ND**	**ND**	**NA**	**NA**
Benzene	**500**	**160**	**ND**	**ND**	**NA**	**NA**
Toluene	**490**	**130**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**490**	**110**	**6000**	**1400**	**NA**	**NA**
m- & p- Xylenes	**490**	**110**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**490**	**110**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**2600**	**490**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**3000**	**N/A**	**4600000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**3000**	**N/A**	**1900000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**2500**	**N/A**	**30000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 10/21/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**FV-GP01-HDOH#2**		**NA**	
Internal Standards:	**Lab ID**		**1110160A-06A**		**NA**	
Bromochloroethane: %D from CCV: 16%	**Date Collected**		**10/6/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 21%	**Date Received**		**10/8/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 24%	**Date Analyzed**		**10/12/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**2.33**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**4.7**	**2.1**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**4.7**	**1.3**	**ND**	**ND**	**NA**	**NA**
Benzene	**4.7**	**1.4**	**ND**	**ND**	**NA**	**NA**
Toluene	**4.7**	**1.2**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**4.7**	**1.1**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**4.7**	**1.1**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**4.7**	**1.1**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**24**	**4.7**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**28**	**N/A**	**8400**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**28**	**N/A**	**20000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**23**	**N/A**	**72**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 10/20/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**FV-GP08-HDOH#2**		**NA**	
Internal Standards:	**Lab ID**		**1110160A-07A**		**NA**	
Bromochloroethane: %D from CCV: 6.3%	**Date Collected**		**10/6/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 6.1%	**Date Received**		**10/8/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 7.0%	**Date Analyzed**		**10/12/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**24.2**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**48**	**22**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**48**	**13**	**ND**	**ND**	**NA**	**NA**
Benzene	**48**	**15**	**49**	**15**	**NA**	**NA**
Toluene	**48**	**13**	**51**	**13**	**NA**	**NA**
Ethylbenzene	**48**	**11**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**48**	**11**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**48**	**11**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**250**	**48**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**290**	**N/A**	**680000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**290**	**N/A**	**920000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**240**	**N/A**	**9700**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 10/20/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**FV-GP16R-HDOH#2**		**NA**	
Internal Standards:	**Lab ID**		**1110160A-08A**		**NA**	
Bromochloroethane: %D from CCV: 16%	**Date Collected**		**10/6/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 17%	**Date Received**		**10/8/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 22%	**Date Analyzed**		**10/12/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**247**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**490**	**220**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**490**	**140**	**ND**	**ND**	**NA**	**NA**
Benzene	**490**	**150**	**ND**	**ND**	**NA**	**NA**
Toluene	**490**	**130**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**490**	**110**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**490**	**110**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**490**	**110**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**2600**	**490**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**3000**	**N/A**	**1700000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**3000**	**N/A**	**5200000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**2500**	**N/A**	**17000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 10/20/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**JP8#1**		**NA**	
Internal Standards:	**Lab ID**		**1110160A-09A**		**NA**	
Bromochloroethane: %D from CCV: 23%	**Date Collected**		**10/6/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 29%	**Date Received**		**10/8/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 29%	**Date Analyzed**		**10/12/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**233**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**470**	**210**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**470**	**130**	**ND**	**ND**	**NA**	**NA**
Benzene	**470**	**140**	**20000**	**6200**	**NA**	**NA**
Toluene	**470**	**120**	**62000**	**16000**	**NA**	**NA**
Ethylbenzene	**470**	**110**	**22000**	**5000**	**NA**	**NA**
m- & p- Xylenes	**470**	**110**	**79000**	**18000**	**NA**	**NA**
o-Xylene	**470**	**110**	**36000**	**8300**	**NA**	**NA**
Naphthalene	**2400**	**470**	**6100**	**1200**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**2800**	**N/A**	**4500000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**2800**	**N/A**	**1300000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**2300**	**N/A**	**210000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 10/20/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☑ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☐ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☐ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Lab Blank**		**NA**	
Internal Standards:	**Lab ID**		**1110160A-10A**		**NA**	
Bromochloroethane: %D from CCV: 10%	**Date Collected**		**NA**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 22%	**Date Received**		**NA**		**NA**	
Chlorobenzene-d5: %D from CCV: 19%	**Date Analyzed**		**10/12/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**NA**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**2.0**	**0.90**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**2.0**	**0.55**	**ND**	**ND**	**NA**	**NA**
Benzene	**2.0**	**0.63**	**ND**	**ND**	**NA**	**NA**
Toluene	**2.0**	**0.53**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**10**	**2.0**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**10**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 10/20/2011

Air Toxics LTD.
Laboratory Services Since 1989

11/17/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1110413A

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 10/20/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Massachusetts APH are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

WORK ORDER #: 1110413A

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/20/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/09/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-VP26-B05(18)	Massachusetts APH	4.0 "Hg	5 psi
02A	HAFB-VP26-B05(24)	Massachusetts APH	3.5 "Hg	5 psi
03A	HAFB-VP26-B07(20)	Massachusetts APH	2.5 "Hg	5 psi
04A	HAFB-VP26-B07(25)	Massachusetts APH	4.5 "Hg	5 psi
05A	HAFB-ST03-B58(347)	Massachusetts APH	4.4 "Hg	5 psi
05AA	HAFB-ST03-B58(347) Lab Duplicate	Massachusetts APH	4.4 "Hg	5 psi
06A	HAFB-ST03-B58(422)	Massachusetts APH	5.0 "Hg	5 psi
07A	HAFB-ST03-B58(492)	Massachusetts APH	4.6 "Hg	5 psi
08A	HAFB-ST03-B59(388)	Massachusetts APH	5.0 "Hg	5 psi
09A	HH-OU1C-MW10SG	Massachusetts APH	6.0 "Hg	5 psi
10A	HH-OU1C-MW22R	Massachusetts APH	5.4 "Hg	5 psi
11A	HH-OU1C-OTNS1	Massachusetts APH	4.2 "Hg	5 psi
12A	GASOLINE#2	Massachusetts APH	2.6 "Hg	5 psi
12AA	GASOLINE#2 Lab Duplicate	Massachusetts APH	2.6 "Hg	5 psi
13A	DIESEL#3	Massachusetts APH	3.2 "Hg	5 psi
13AA	DIESEL#3 Lab Duplicate	Massachusetts APH	3.2 "Hg	5 psi
14A	GASOLINE-EXHAUST	Massachusetts APH	3.2 "Hg	5 psi

Continued on next page

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1110413A

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/20/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/09/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
15A	DIESEL-EXHAUST	Massachusetts APH	3.0 "Hg	5 psi
16A	Lab Blank	Massachusetts APH	NA	NA
16B	Lab Blank	Massachusetts APH	NA	NA
16C	Lab Blank	Massachusetts APH	NA	NA
17A	CCV	Massachusetts APH	NA	NA
17B	CCV	Massachusetts APH	NA	NA
17C	CCV	Massachusetts APH	NA	NA
18A	LCS	Massachusetts APH	NA	NA
18B	LCS	Massachusetts APH	NA	NA
18C	LCS	Massachusetts APH	NA	NA

CERTIFIED BY: Linda D. Fruman

Laboratory Director

DATE: 11/17/11

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Massachusetts DEP APH
Tetra Tech EM, Inc.
Workorder# 1110413A

Fifteen 1 Liter Summa Canister (MA APH Certified) samples were received on October 20, 2011. The laboratory performed analysis via Massachusetts DEP APH method using GC/MS in the full scan mode. The method involves concentrating up to 0.5 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis. This method is designed to measure gaseous phase aliphatic and aromatic compounds in ambient air and soil gas collected in stainless steel Summa canisters. The volatile aliphatic hydrocarbons are collectively quantified within the C5 to C8 range and within the C9 to C12 range. Additionally, the volatile aromatic hydrocarbons are collectively quantified within the C9 to C10 range.

Receiving Notes

The Chain of Custody (COC) information for sample HH-OU1C-MW22R and HH-OU1C-OTNS1 did not match the information on the canister with regard to canister identification. The client was notified of the discrepancy and the information on the canister was used to process and report the samples.

Analytical Notes

The reported CCV for each daily batch may be derived from more than one analytical file due to the client's request for non-standard compounds.

Non-standard compounds may have different acceptance criteria than the standard TO-14A/TO-15 compound list as per contract or verbal agreement.

The reported LCS for each daily batch has been derived from more than one analytical file.

A dilution was performed on samples HAFB-VP26-B05(18), HAFB-VP26-B05(24), HAFB-VP26-B07(20), HAFB-VP26-B07(25), HAFB-ST03-B58(347), HAFB-ST03-B58(347) Lab Duplicate, HAFB-ST03-B58(422), HAFB-ST03-B58(492), HAFB-ST03-B59(388), HH-OU1C-MW10SG, HH-OU1C-MW22R, GASOLINE#2, GASOLINE#2 Lab Duplicate, DIESEL#3, DIESEL#3 Lab Duplicate and GASOLINE-EXHAUST due to the presence of high level target species.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.
UJ- Non-detected compound associated with low bias in the CCV and/or LCS.
N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(18)

Lab ID#: 1110413A-01A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102425a**	**Date of Collection: 10/13/11 10:12:00 A**	
Dil. Factor:	**1030**	**Date of Analysis: 10/25/11 06:18 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	930	Not Detected	2000	Not Detected
Methyl tert-butyl ether	570	Not Detected	2000	Not Detected
Benzene	650	12000	2100	40000
Toluene	540	Not Detected	2000	Not Detected
Ethyl Benzene	470	4100	2000	18000
o-Xylene	470	Not Detected	2000	Not Detected
m,p-Xylene	470	Not Detected	2000	Not Detected
Naphthalene	2100	Not Detected	11000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	98	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(24)

Lab ID#: 1110413A-02A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102422a**	**Date of Collection: 10/13/11 10:46:00 A**	
Dil. Factor:	**25300**	**Date of Analysis: 10/24/11 10:46 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	23000	Not Detected	50000	Not Detected
Methyl tert-butyl ether	14000	Not Detected	50000	Not Detected
Benzene	16000	88000	51000	280000
Toluene	13000	Not Detected	50000	Not Detected
Ethyl Benzene	12000	Not Detected	50000	Not Detected
o-Xylene	12000	Not Detected	50000	Not Detected
m,p-Xylene	12000	Not Detected	50000	Not Detected
Naphthalene	51000	Not Detected	260000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	99	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	81	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(20)

Lab ID#: 1110413A-03A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102416a**	**Date of Collection: 10/13/11 11:23:00 A**	
Dil. Factor:	**1460**	**Date of Analysis: 10/24/11 05:47 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	1300	Not Detected	2900	Not Detected
Methyl tert-butyl ether	800	Not Detected	2900	Not Detected
Benzene	920	26000	2900	84000
Toluene	770	Not Detected	2900	Not Detected
Ethyl Benzene	670	8600	2900	37000
o-Xylene	670	Not Detected	2900	Not Detected
m,p-Xylene	670	Not Detected	2900	Not Detected
Naphthalene	2900	Not Detected	15000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	105	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	88	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(25)

Lab ID#: 1110413A-04A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102417a**	**Date of Collection: 10/13/11 11:49:00 A**	
Dil. Factor:	**3160**	**Date of Analysis: 10/24/11 06:32 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	2800	Not Detected	6300	Not Detected
Methyl tert-butyl ether	1700	Not Detected	6300	Not Detected
Benzene	2000	14000	6400	45000
Toluene	1700	Not Detected	6300	Not Detected
Ethyl Benzene	1400	4700	6300	20000
o-Xylene	1400	Not Detected	6300	Not Detected
m,p-Xylene	1400	Not Detected	6300	Not Detected
Naphthalene	6300	Not Detected	33000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	101	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	88	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(347)

Lab ID#: 1110413A-05A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102113a**	**Date of Collection: 10/14/11 9:35:00 AM**	
Dil. Factor:	**15.7**	**Date of Analysis: 10/21/11 04:24 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	14	Not Detected	31	Not Detected
Methyl tert-butyl ether	8.6	Not Detected	31	Not Detected
Benzene	9.9	Not Detected	32	Not Detected
Toluene	8.3	31	31	120
Ethyl Benzene	7.2	120	31	500
o-Xylene	7.2	290	31	1300
m,p-Xylene	7.2	2500	31	11000
Naphthalene	31	Not Detected	160	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	111	70-130
Toluene-d8	109	70-130
4-Bromofluorobenzene	93	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(347) Lab Duplicate

Lab ID#: 1110413A-05AA

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102114a**	**Date of Collection: 10/14/11 9:35:00 AM**	
Dil. Factor:	**15.7**	**Date of Analysis: 10/21/11 05:20 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	14	Not Detected	31	Not Detected
Methyl tert-butyl ether	8.6	Not Detected	31	Not Detected
Benzene	9.9	Not Detected	32	Not Detected
Toluene	8.3	30	31	110
Ethyl Benzene	7.2	120	31	510
o-Xylene	7.2	320	31	1400
m,p-Xylene	7.2	2800	31	12000
Naphthalene	31	Not Detected	160	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	112	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(422)

Lab ID#: 1110413A-06A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102115a**	**Date of Collection: 10/14/11 10:19:00 A**	
Dil. Factor:	**21.5**	**Date of Analysis: 10/21/11 06:08 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	19	Not Detected	43	Not Detected
Methyl tert-butyl ether	12	Not Detected	43	Not Detected
Benzene	14	Not Detected	43	Not Detected
Toluene	11	35	43	130
Ethyl Benzene	9.9	140	43	620
o-Xylene	9.9	370	43	1600
m,p-Xylene	9.9	3300	43	14000
Naphthalene	43	Not Detected	220	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	110	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(492)

Lab ID#: 1110413A-07A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102116a**	**Date of Collection:**	**10/14/11 10:36:00 A**
Dil. Factor:	**21.1**	**Date of Analysis:**	**10/21/11 06:58 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	19	Not Detected	42	Not Detected
Methyl tert-butyl ether	12	Not Detected	42	Not Detected
Benzene	13	Not Detected	42	Not Detected
Toluene	11	41	42	160
Ethyl Benzene	9.7	170	42	720
o-Xylene	9.7	450	42	2000
m,p-Xylene	9.7	3900	42	17000
Naphthalene	42	Not Detected	220	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	110	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B59(388)

Lab ID#: 1110413A-08A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102120a**	**Date of Collection: 10/14/11 11:03:00 A**	
Dil. Factor:	**2.77**	**Date of Analysis: 10/21/11 10:07 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	2.5	Not Detected	5.5	Not Detected
Methyl tert-butyl ether	1.5	22	5.5	78
Benzene	1.7	56	5.6	180
Toluene	1.5	97	5.5	360
Ethyl Benzene	1.3	29	5.5	120
o-Xylene	1.3	96	5.5	420
m,p-Xylene	1.3	450	5.5	2000
Naphthalene	5.5	26	29	140

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	109	70-130
4-Bromofluorobenzene	102	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-MW10SG

Lab ID#: 1110413A-09A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102419a**	**Date of Collection:**	**10/18/11 11:43:00 A**
Dil. Factor:	**3360**	**Date of Analysis:**	**10/24/11 08:07 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	3000	Not Detected	6700	Not Detected
Methyl tert-butyl ether	1800	Not Detected	6700	Not Detected
Benzene	2100	4900	6800	16000
Toluene	1800	Not Detected	6700	Not Detected
Ethyl Benzene	1500	Not Detected	6700	Not Detected
o-Xylene	1500	Not Detected	6700	Not Detected
m,p-Xylene	1500	Not Detected	6700	Not Detected
Naphthalene	6700	Not Detected	35000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	96	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	88	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-MW22R

Lab ID#: 1110413A-10A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102510a**	**Date of Collection: 10/18/11 11:09:00 A**	
Dil. Factor:	**8150**	**Date of Analysis: 10/25/11 12:28 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	7300	Not Detected	16000	Not Detected
Methyl tert-butyl ether	4500	Not Detected	16000	Not Detected
Benzene	5100	Not Detected	16000	Not Detected
Toluene	4300	Not Detected	16000	Not Detected
Ethyl Benzene	3700	Not Detected	16000	Not Detected
o-Xylene	3700	Not Detected	16000	Not Detected
m,p-Xylene	3700	Not Detected	16000	Not Detected
Naphthalene	16000	Not Detected	85000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	102	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	83	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-OTNS1

Lab ID#: 1110413A-11A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102117a**	**Date of Collection:**	**10/18/11 10:31:00 A**
Dil. Factor:	**1.56**	**Date of Analysis:**	**10/21/11 07:41 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	1.4	Not Detected	3.1	Not Detected
Methyl tert-butyl ether	0.86	Not Detected	3.1	Not Detected
Benzene	0.98	Not Detected	3.1	Not Detected
Toluene	0.83	Not Detected	3.1	Not Detected
Ethyl Benzene	0.72	Not Detected	3.1	Not Detected
o-Xylene	0.72	Not Detected	3.1	Not Detected
m,p-Xylene	0.72	Not Detected	3.1	Not Detected
Naphthalene	3.1	Not Detected	16	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	110	70-130
4-Bromofluorobenzene	90	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE#2

Lab ID#: 1110413A-12A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102512a**	**Date of Collection: 10/18/11 8:35:00 AM**	
Dil. Factor:	**2450**	**Date of Analysis: 10/25/11 01:45 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	2200	Not Detected	4900	Not Detected
Methyl tert-butyl ether	1300	Not Detected	4800	Not Detected
Benzene	1500	9200	4900	29000
Toluene	1300	34000	4900	130000
Ethyl Benzene	1100	2500	4900	11000
o-Xylene	1100	2600	4900	11000
m,p-Xylene	1100	8700	4900	38000
Naphthalene	4900	Not Detected	26000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	101	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	82	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE#2 Lab Duplicate

Lab ID#: 1110413A-12AA

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102511a**	**Date of Collection: 10/18/11 8:35:00 AM**	
Dil. Factor:	**7350**	**Date of Analysis: 10/25/11 01:06 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	6600	Not Detected	15000	Not Detected
Methyl tert-butyl ether	4000	Not Detected	14000	Not Detected
Benzene	4600	11000	15000	34000
Toluene	3900	40000	15000	150000
Ethyl Benzene	3400	Not Detected	15000	Not Detected
o-Xylene	3400	Not Detected	15000	Not Detected
m,p-Xylene	3400	9200	15000	40000
Naphthalene	15000	Not Detected	77000	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	100	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	81	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL#3

Lab ID#: 1110413A-13A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102412a**	**Date of Collection: 10/18/11 8:35:00 AM**	
Dil. Factor:	**10.0**	**Date of Analysis: 10/24/11 02:04 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	9.0	Not Detected	20	Not Detected
Methyl tert-butyl ether	5.5	Not Detected	20	Not Detected
Benzene	6.3	330	20	1000
Toluene	5.3	1100	20	4000
Ethyl Benzene	4.6	200	20	850
o-Xylene	4.6	250	20	1100
m,p-Xylene	4.6	630	20	2700
Naphthalene	20	24	100	120

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	110	70-130
Toluene-d8	107	70-130
4-Bromofluorobenzene	95	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL#3 Lab Duplicate

Lab ID#: 1110413A-13AA

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102413a**	**Date of Collection: 10/18/11 8:35:00 AM**	
Dil. Factor:	**10.0**	**Date of Analysis: 10/24/11 02:39 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	9.0	Not Detected	20	Not Detected
Methyl tert-butyl ether	5.5	Not Detected	20	Not Detected
Benzene	6.3	310	20	1000
Toluene	5.3	990	20	3700
Ethyl Benzene	4.6	190	20	810
o-Xylene	4.6	240	20	1000
m,p-Xylene	4.6	590	20	2600
Naphthalene	20	22	100	120

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	105	70-130
Toluene-d8	105	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE-EXHAUST

Lab ID#: 1110413A-14A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102411a**	**Date of Collection: 10/18/11 8:50:00 AM**	
Dil. Factor:	**15.0**	**Date of Analysis: 10/24/11 01:24 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	14	83	30	180
Methyl tert-butyl ether	8.2	Not Detected	30	Not Detected
Benzene	9.4	1500	30	4700
Toluene	8.0	1700	30	6400
Ethyl Benzene	6.9	240	30	1000
o-Xylene	6.9	320	30	1400
m,p-Xylene	6.9	880	30	3800
Naphthalene	30	Not Detected	160	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	89	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL-EXHAUST

Lab ID#: 1110413A-15A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102118a**	**Date of Collection: 10/18/11 8:45:00 AM**	
Dil. Factor:	**1.49**	**Date of Analysis: 10/21/11 08:27 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	1.3	2.6	3.0	5.8
Methyl tert-butyl ether	0.82	Not Detected	3.0	Not Detected
Benzene	0.94	4.5	3.0	14
Toluene	0.79	1.2	3.0	4.6
Ethyl Benzene	0.68	Not Detected	3.0	Not Detected
o-Xylene	0.68	Not Detected	3.0	Not Detected
m,p-Xylene	0.68	Not Detected	3.0	Not Detected
Naphthalene	3.0	Not Detected	16	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	108	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	87	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110413A-16A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102108a**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/21/11 12:01 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.90	Not Detected	2.0	Not Detected
Methyl tert-butyl ether	0.55	Not Detected	2.0	Not Detected
Benzene	0.63	Not Detected	2.0	Not Detected
Toluene	0.53	Not Detected	2.0	Not Detected
Ethyl Benzene	0.46	Not Detected	2.0	Not Detected
o-Xylene	0.46	Not Detected	2.0	Not Detected
m,p-Xylene	0.46	Not Detected	2.0	Not Detected
Naphthalene	2.0	Not Detected	10	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	113	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	81	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110413A-16B

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102409**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/24/11 11:33 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.90	Not Detected	2.0	Not Detected
Methyl tert-butyl ether	0.55	Not Detected	2.0	Not Detected
Benzene	0.63	Not Detected	2.0	Not Detected
Toluene	0.53	Not Detected	2.0	Not Detected
Ethyl Benzene	0.46	Not Detected	2.0	Not Detected
o-Xylene	0.46	Not Detected	2.0	Not Detected
m,p-Xylene	0.46	Not Detected	2.0	Not Detected
Naphthalene	2.0	Not Detected	10	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	81	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110413A-16C

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102509**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/25/11 11:49 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
1,3-Butadiene	0.90	Not Detected	2.0	Not Detected
Methyl tert-butyl ether	0.55	Not Detected	2.0	Not Detected
Benzene	0.63	Not Detected	2.0	Not Detected
Toluene	0.53	Not Detected	2.0	Not Detected
Ethyl Benzene	0.46	Not Detected	2.0	Not Detected
o-Xylene	0.46	Not Detected	2.0	Not Detected
m,p-Xylene	0.46	Not Detected	2.0	Not Detected
Naphthalene	2.0	Not Detected	10	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	107	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	82	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1110413A-17A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102102**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/21/11 07:54 AM**	

Compound	%Recovery
1,3-Butadiene	118
Methyl tert-butyl ether	106
Benzene	101
Toluene	101
Ethyl Benzene	106
o-Xylene	117
m,p-Xylene	112
Naphthalene	108
C5-C8 Aliphatic Hydrocarbons	101
C9-C12 Aliphatic Hydrocarbons	94
C9-C10 Aromatic Hydrocarbons	100

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	116	70-130
Toluene-d8	107	70-130
4-Bromofluorobenzene	100	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1110413A-17B

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102405**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/24/11 08:59 AM**	

Compound	%Recovery
1,3-Butadiene	120
Methyl tert-butyl ether	119
Benzene	101
Toluene	94
Ethyl Benzene	104
o-Xylene	111
m,p-Xylene	110
Naphthalene	116
C5-C8 Aliphatic Hydrocarbons	99
C9-C12 Aliphatic Hydrocarbons	81
C9-C10 Aromatic Hydrocarbons	101

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1110413A-17C

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102503**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/25/11 08:25 AM**	

Compound	%Recovery
1,3-Butadiene	112
Methyl tert-butyl ether	118
Benzene	98
Toluene	91
Ethyl Benzene	101
o-Xylene	107
m,p-Xylene	106
Naphthalene	101
C5-C8 Aliphatic Hydrocarbons	92
C9-C12 Aliphatic Hydrocarbons	85
C9-C10 Aromatic Hydrocarbons	95

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	98	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	96	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110413A-18A

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102103**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/21/11 08:40 AM**	

Compound	%Recovery
1,3-Butadiene	115
Methyl tert-butyl ether	106
Benzene	97
Toluene	95
Ethyl Benzene	100
o-Xylene	112
m,p-Xylene	107
Naphthalene	87
C5-C8 Aliphatic Hydrocarbons	94
C9-C12 Aliphatic Hydrocarbons	89
C9-C10 Aromatic Hydrocarbons	92

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	111	70-130
Toluene-d8	108	70-130
4-Bromofluorobenzene	98	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110413A-18B

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102406**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/24/11 09:37 AM**	

Compound	%Recovery
1,3-Butadiene	111
Methyl tert-butyl ether	117
Benzene	96
Toluene	88
Ethyl Benzene	96
o-Xylene	106
m,p-Xylene	104
Naphthalene	93
C5-C8 Aliphatic Hydrocarbons	73
C9-C12 Aliphatic Hydrocarbons	89
C9-C10 Aromatic Hydrocarbons	90

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	98	70-130

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110413A-18C

AIR PHASE PETROLEUM HYDROCARBONS BY GC/MS

File Name:	**2102504**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/25/11 08:58 AM**	

Compound	%Recovery
1,3-Butadiene	102
Methyl tert-butyl ether	114
Benzene	93
Toluene	85
Ethyl Benzene	93
o-Xylene	98
m,p-Xylene	98
Naphthalene	94
C5-C8 Aliphatic Hydrocarbons	85
C9-C12 Aliphatic Hydrocarbons	77
C9-C10 Aromatic Hydrocarbons	84

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	98	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	94	70-130

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-VP26-B05(18)**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-01A**		**NA**	
Bromochloroethane: %D from CCV: 2.8%	**Date Collected**		**10/13/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 9.6%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 14%	**Date Analyzed**		**10/25/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**3**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1030**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**2000**	**930**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**2000**	**570**	**ND**	**ND**	**NA**	**NA**
Benzene	**2100**	**650**	**40000**	**12000**	**NA**	**NA**
Toluene	**2000**	**540**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**2000**	**470**	**18000**	**4100**	**NA**	**NA**
m- & p- Xylenes	**2000**	**470**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**2000**	**470**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**11000**	**2100**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**12000**	**N/A**	**48000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**12000**	**N/A**	**1400000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**10000**	**N/A**	**12000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-VP26-B05(24)**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-02A**		**NA**	
Bromochloroethane: %D from CCV: 3.0%	**Date Collected**		**10/13/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 13%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 7.9%	**Date Analyzed**		**10/24/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**3.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**25300**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**50000**	**23000**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**50000**	**14000**	**ND**	**ND**	**NA**	**NA**
Benzene	**51000**	**16000**	**280000**	**88000**	**NA**	**NA**
Toluene	**50000**	**13000**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**50000**	**12000**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**50000**	**12000**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**50000**	**12000**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**260000**	**51000**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**300000**	**N/A**	**94000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**300000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**250000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-VP26-B07(20)**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-03A**		**NA**	
Bromochloroethane: %D from CCV: 3.9%	**Date Collected**		**10/13/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 16%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 16%	**Date Analyzed**		**10/24/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**2.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1460**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**2900**	**1300**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**2900**	**800**	**ND**	**ND**	**NA**	**NA**
Benzene	**2900**	**920**	**84000**	**26000**	**NA**	**NA**
Toluene	**2900**	**770**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**2900**	**670**	**37000**	**8600**	**NA**	**NA**
m- & p- Xylenes	**2900**	**670**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**2900**	**670**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**15000**	**2900**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**18000**	**N/A**	**38000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**18000**	**N/A**	**260000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**15000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-VP26-B07(25)**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-04A**		**NA**	
Bromochloroethane: %D from CCV: 8.9%	**Date Collected**		**10/13/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 20%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 20%	**Date Analyzed**		**10/24/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.5**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**3160**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**6300**	**2800**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**6300**	**1700**	**ND**	**ND**	**NA**	**NA**
Benzene	**6400**	**2000**	**45000**	**14000**	**NA**	**NA**
Toluene	**6300**	**1700**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**6300**	**1400**	**20000**	**4700**	**NA**	**NA**
m- & p- Xylenes	**6300**	**1400**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**6300**	**1400**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**33000**	**6300**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**38000**	**N/A**	**100000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**38000**	**N/A**	**380000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**32000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-ST03-B58(347)**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-05A**		**NA**	
Bromochloroethane: %D from CCV: 7.8%	**Date Collected**		**10/14/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 11%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 20%	**Date Analyzed**		**10/21/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.4**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**15.7**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**31**	**14**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**31**	**8.6**	**ND**	**ND**	**NA**	**NA**
Benzene	**32**	**9.9**	**ND**	**ND**	**NA**	**NA**
Toluene	**31**	**8.3**	**120**	**31**	**NA**	**NA**
Ethylbenzene	**31**	**7.2**	**500**	**120**	**NA**	**NA**
m- & p- Xylenes	**31**	**7.2**	**11000**	**2500**	**NA**	**NA**
o-Xylene	**31**	**7.2**	**1300**	**290**	**NA**	**NA**
Naphthalene	**160**	**31**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**190**	**N/A**	**310000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**190**	**N/A**	**220000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**160**	**N/A**	**32000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-ST03-B58(347) Lab**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-05AA**		**NA**	
Bromochloroethane: %D from CCV: 12%	**Date Collected**		**10/14/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 18%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 30%	**Date Analyzed**				**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.4**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**15.7**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**31**	**14**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**31**	**8.6**	**ND**	**ND**	**NA**	**NA**
Benzene	**32**	**9.9**	**ND**	**ND**	**NA**	**NA**
Toluene	**31**	**8.3**	**110**	**30**	**NA**	**NA**
Ethylbenzene	**31**	**7.2**	**510**	**120**	**NA**	**NA**
m- & p- Xylenes	**31**	**7.2**	**12000**	**2800**	**NA**	**NA**
o-Xylene	**31**	**7.2**	**1400**	**320**	**NA**	**NA**
Naphthalene	**160**	**31**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**190**	**N/A**	**320000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**190**	**N/A**	**260000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**160**	**N/A**	**44000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-ST03-B58(422)**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-06A**		**NA**	
Bromochloroethane: %D from CCV: 18%	**Date Collected**		**10/14/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 33%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 44%	**Date Analyzed**		**10/21/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**21.5**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**43**	**19**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**43**	**12**	**ND**	**ND**	**NA**	**NA**
Benzene	**43**	**14**	**ND**	**ND**	**NA**	**NA**
Toluene	**43**	**11**	**130**	**35**	**NA**	**NA**
Ethylbenzene	**43**	**9.9**	**620**	**140**	**NA**	**NA**
m- & p- Xylenes	**43**	**9.9**	**14000**	**3300**	**NA**	**NA**
o-Xylene	**43**	**9.9**	**1600**	**370**	**NA**	**NA**
Naphthalene	**220**	**43**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**260**	**N/A**	**450000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**260**	**N/A**	**450000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**220**	**N/A**	**44000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/17/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-ST03-B58(492)**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-07A**		**NA**	
Bromochloroethane: %D from CCV: 8.7%	**Date Collected**		**10/14/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 18%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 29%	**Date Analyzed**		**10/21/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.6**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**21.1**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**42**	**19**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**42**	**12**	**ND**	**ND**	**NA**	**NA**
Benzene	**42**	**13**	**ND**	**ND**	**NA**	**NA**
Toluene	**42**	**11**	**160**	**41**	**NA**	**NA**
Ethylbenzene	**42**	**9.7**	**720**	**170**	**NA**	**NA**
m- & p- Xylenes	**42**	**9.7**	**17000**	**3900**	**NA**	**NA**
o-Xylene	**42**	**9.7**	**2000**	**450**	**NA**	**NA**
Naphthalene	**220**	**40**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**250**	**N/A**	**460000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**250**	**N/A**	**380000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**210**	**N/A**	**58000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HAFB-ST03-B59(388)**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-08A**		**NA**	
Bromochloroethane: %D from CCV: 19%	**Date Collected**		**10/14/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 27%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 32%	**Date Analyzed**		**10/21/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**4**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**2.77**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**5.5**	**2.5**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**5.5**	**1.5**	**78**	**22**	**NA**	**NA**
Benzene	**5.6**	**1.7**	**180**	**56**	**NA**	**NA**
Toluene	**5.5**	**1.5**	**360**	**97**	**NA**	**NA**
Ethylbenzene	**5.5**	**1.3**	**120**	**29**	**NA**	**NA**
m- & p- Xylenes	**5.5**	**1.3**	**2000**	**450**	**NA**	**NA**
o-Xylene	**5.5**	**1.3**	**420**	**96**	**NA**	**NA**
Naphthalene	**29**	**5.5**	**140**	**26**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**33**	**N/A**	**30000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**33**	**N/A**	**32000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**28**	**N/A**	**10000**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HH-OU1C-MW10SG**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-09A**		**NA**	
Bromochloroethane: %D from CCV: 21%	**Date Collected**		**10/18/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 32%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 29%	**Date Analyzed**		**10/24/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**3**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**6.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**3360**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**6700**	**3000**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**6700**	**1800**	**ND**	**ND**	**NA**	**NA**
Benzene	**6800**	**2100**	**16000**	**4900**	**NA**	**NA**
Toluene	**6700**	**1800**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**6700**	**1500**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**6700**	**1500**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**6700**	**1500**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**35000**	**6700**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**40000**	**N/A**	**66000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**40000**	**N/A**	**1000000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**34000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HH-OU1C-MW22R**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-10A**		**NA**	
Bromochloroethane: %D from CCV: 3.4%	**Date Collected**		**10/18/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 12%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 12%	**Date Analyzed**		**10/25/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**5.4**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**8150**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**16000**	**7300**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**16000**	**4500**	**ND**	**ND**	**NA**	**NA**
Benzene	**16000**	**5100**	**ND**	**ND**	**NA**	**NA**
Toluene	**16000**	**4300**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**16000**	**3700**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**16000**	**3700**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**16000**	**3700**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**85000**	**16000**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**98000**	**N/A**	**63000000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**98000**	**N/A**	**2300000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**82000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**HH-OU1C-OTNS1**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-11A**		**NA**	
Bromochloroethane: %D from CCV: 11%	**Date Collected**		**10/18/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 11%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 14%	**Date Analyzed**		**10/21/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**4.2**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1.56**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**3.1**	**1.4**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**3.1**	**0.86**	**ND**	**ND**	**NA**	**NA**
Benzene	**3.1**	**0.98**	**ND**	**ND**	**NA**	**NA**
Toluene	**3.1**	**0.83**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**3.1**	**0.72**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**3.1**	**0.72**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**3.1**	**0.72**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**16**	**3.1**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**19**	**N/A**	**620**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**19**	**N/A**	**71**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**16**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**GASOLINE#2**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-12A**		**NA**	
Bromochloroethane: %D from CCV: 4.8%	**Date Collected**		**10/18/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 0.22%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 2.9%	**Date Analyzed**		**10/25/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**2.6**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**2450**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**4900**	**2200**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**4800**	**1300**	**ND**	**ND**	**NA**	**NA**
Benzene	**4900**	**1500**	**29000**	**9200**	**NA**	**NA**
Toluene	**4900**	**1300**	**130000**	**34000**	**NA**	**NA**
Ethylbenzene	**4900**	**1100**	**11000**	**2500**	**NA**	**NA**
m- & p- Xylenes	**4900**	**1100**	**38000**	**8700**	**NA**	**NA**
o-Xylene	**4900**	**1100**	**11000**	**2600**	**NA**	**NA**
Naphthalene	**26000**	**4900**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**29000**	**N/A**	**8200000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**29000**	**N/A**	**130000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**24000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**GASOLINE#2 Lab Duplica**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-12AA**		**NA**	
Bromochloroethane: %D from CCV: 6.5%	**Date Collected**		**10/18/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 3.6%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 1.3%	**Date Analyzed**		**10/25/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**2.6**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**7350**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**15000**	**6600**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**14000**	**4000**	**ND**	**ND**	**NA**	**NA**
Benzene	**15000**	**4600**	**34000**	**11000**	**NA**	**NA**
Toluene	**15000**	**3900**	**150000**	**40000**	**NA**	**NA**
Ethylbenzene	**15000**	**3400**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**15000**	**3400**	**40000**	**9200**	**NA**	**NA**
o-Xylene	**15000**	**3400**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**77000**	**15000**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**88000**	**N/A**	**9500000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**88000**	**N/A**	**130000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**74000**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**DIESEL#3**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-13A**		**NA**	
Bromochloroethane: %D from CCV: 9.8%	**Date Collected**		**10/18/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 3.5%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 7.4%	**Date Analyzed**		**10/24/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**3.2**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**10**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**20**	**9.0**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**20**	**5.5**	**ND**	**ND**	**NA**	**NA**
Benzene	**20**	**6.3**	**1000**	**330**	**NA**	**NA**
Toluene	**20**	**5.3**	**4000**	**1100**	**NA**	**NA**
Ethylbenzene	**20**	**4.6**	**850**	**200**	**NA**	**NA**
m- & p- Xylenes	**20**	**4.6**	**2700**	**630**	**NA**	**NA**
o-Xylene	**20**	**4.6**	**1100**	**250**	**NA**	**NA**
Naphthalene	**100**	**20**	**120**	**24**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1 2]	**120**	**N/A**	**160000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1 3]	**120**	**N/A**	**43000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**100**	**N/A**	**5200**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**DIESEL#3 Lab Duplicate**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-13AA**		**NA**	
Bromochloroethane: %D from CCV: 3.3%	**Date Collected**		**10/18/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 4.1%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 12%	**Date Analyzed**		**10/24/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**3.2**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**10**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**20**	**9.0**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**20**	**5.5**	**ND**	**ND**	**NA**	**NA**
Benzene	**20**	**6.3**	**1000**	**310**	**NA**	**NA**
Toluene	**20**	**5.3**	**3700**	**990**	**NA**	**NA**
Ethylbenzene	**20**	**4.6**	**810**	**190**	**NA**	**NA**
m- & p- Xylenes	**20**	**4.6**	**2600**	**590**	**NA**	**NA**
o-Xylene	**20**	**4.6**	**1000**	**240**	**NA**	**NA**
Naphthalene	**100**	**20**	**120**	**22**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**120**	**N/A**	**150000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**120**	**N/A**	**40000**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**100**	**N/A**	**4800**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**GASOLINE-EXHAUST**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-14A**		**NA**	
Bromochloroethane: %D from CCV: 8.4%	**Date Collected**		**10/18/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 7.2%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 6.4%	**Date Analyzed**		**10/24/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**3.2**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**15**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**30**	**14**	**180**	**83**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**30**	**8.2**	**ND**	**ND**	**NA**	**NA**
Benzene	**30**	**9.4**	**4700**	**1500**	**NA**	**NA**
Toluene	**30**	**8.0**	**6400**	**1700**	**NA**	**NA**
Ethylbenzene	**30**	**6.9**	**1000**	**240**	**NA**	**NA**
m- & p- Xylenes	**30**	**6.9**	**3800**	**880**	**NA**	**NA**
o-Xylene	**30**	**6.9**	**1400**	**320**	**NA**	**NA**
Naphthalene	**160**	**30**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**180**	**N/A**	**25000**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**180**	**N/A**	**340**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**150**	**N/A**	**2200**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/10/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☐ Grab	☑ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☑ Other
Sample Container(s)	☑ Canister(s):	☐ 6-L	☐ 15-L	☑ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☑ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☑ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**DIESEL-EXHAUST**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-15A**		**NA**	
Bromochloroethane: %D from CCV: 5.3%	**Date Collected**		**10/18/2011**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 0.35%	**Date Received**		**10/20/2011**		**NA**	
Chlorobenzene-d5: %D from CCV: 3.9%	**Date Analyzed**		**10/21/2011**		**NA**	
	Pre-Sample Vacuum (field)		**30**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**5**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**3.0**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1.49**		**NA**	

Target APH Analytes &	**Reporting Limit**		**Sample Results**		**Sample Results**	
Hydrocarbon Ranges	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**3.0**	**1.3**	**5.8**	**2.6**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**3.0**	**0.82**	**ND**	**ND**	**NA**	**NA**
Benzene	**3.0**	**0.94**	**14**	**4.5**	**NA**	**NA**
Toluene	**3.0**	**0.79**	**4.6**	**1.2**	**NA**	**NA**
Ethylbenzene	**3.0**	**0.68**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**3.0**	**0.68**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**3.0**	**0.68**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**16**	**3.0**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**18**	**N/A**	**45**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**18**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**15**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1]Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2]C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3]C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/17/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☑ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☐ Other
Sample Container(s)	☑ Canister(s):	☑ 6-L	☐ 15-L	☐ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☐ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Lab Blank**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-16A**		**NA**	
Bromochloroethane: %D from CCV: 0.36%	**Date Collected**		**NA**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 12%	**Date Received**		**NA**		**NA**	
Chlorobenzene-d5: %D from CCV: 8.5%	**Date Analyzed**		**10/21/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**NA**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1**		**NA**	

Target APH Analytes & Hydrocarbon Ranges	**Reporting Limit**		**Sample Results**		**Sample Results**	
	µg/m3	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**2.0**	**0.90**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**2.0**	**0.55**	**ND**	**ND**	**NA**	**NA**
Benzene	**2.0**	**0.63**	**ND**	**ND**	**NA**	**NA**
Toluene	**2.0**	**0.53**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**10**	**2.0**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**10**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

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SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/17/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☑ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☐ Other
Sample Container(s)	☑ Canister(s):	☑ 6-L	☐ 15-L	☐ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☐ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Lab Blank**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-16B**		**NA**	
Bromochloroethane: %D from CCV: 0.36%	**Date Collected**		**NA**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 12%	**Date Received**		**NA**		**NA**	
Chlorobenzene-d5: %D from CCV: 8.5%	**Date Analyzed**		**10/24/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**NA**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1**		**NA**	

Target APH Analytes & Hydrocarbon Ranges	**Reporting Limit**		**Sample Results**		**Sample Results**	
	µg/m3	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**2.0**	**0.90**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**2.0**	**0.55**	**ND**	**ND**	**NA**	**NA**
Benzene	**2.0**	**0.63**	**ND**	**ND**	**NA**	**NA**
Toluene	**2.0**	**0.53**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**10**	**2.0**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**10**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

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SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/17/2011

APH DATA REPORTING INFORMATION

SAMPLE INFORMATION (check all that apply)

Sample Type(s)	☑ Grab	☐ Time-integrated:	☐ 2 hour	☐ 4 hour	☐ 8 hour	☐ 24 hour	☐ Other
Sample Container(s)	☑ Canister(s):	☑ 6-L	☐ 15-L	☐ Other	0	0	0
Sampling Flow Controller(s)	☐ Mechanical	☐ Fixed-Orifice	☐ Electronic	☐ Other			
Sampling Flow Meter(s)	RPD of pre & post-sampling calibration check(s):			☐ <=20%	☐ >20%		

APH ANALYTICAL RESULTS

	Client ID		**Lab Blank**		**NA**	
Internal Standards:	**Lab ID**		**1110413A-16C**		**NA**	
Bromochloroethane: %D from CCV: 13%	**Date Collected**		**NA**		**NA**	
1, 4-Difluorobenzene: %D from CCV: 13%	**Date Received**		**NA**		**NA**	
Chlorobenzene-d5: %D from CCV: 12%	**Date Analyzed**		**10/25/2011**		**NA**	
	Pre-Sample Vacuum (field)		**NA**	**in. Hg**	**NA**	**in. Hg**
MS Tuning Standard:	**Post-Sample Vacuum (field)**		**NA**	**in. Hg**	**NA**	**in. Hg**
Bromofluorobenzene	**Lab Receipt Vacuum**		**NA**	**in. Hg**	**NA**	**in. Hg**
	Dilution Factor		**1**		**NA**	

Target APH Analytes & Hydrocarbon Ranges	**Reporting Limit**		**Sample Results**		**Sample Results**	
	µg/m3	**ppb v/v**	**µg/m3**	**ppb v/v**	**µg/m3**	**ppb v/v**
1,3-Butadiene	**2.0**	**0.90**	**ND**	**ND**	**NA**	**NA**
Methyl tertiary butyl ether (MTBE)	**2.0**	**0.55**	**ND**	**ND**	**NA**	**NA**
Benzene	**2.0**	**0.63**	**ND**	**ND**	**NA**	**NA**
Toluene	**2.0**	**0.53**	**ND**	**ND**	**NA**	**NA**
Ethylbenzene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
m- & p- Xylenes	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
o-Xylene	**2.0**	**0.46**	**ND**	**ND**	**NA**	**NA**
Naphthalene	**10**	**2.0**	**ND**	**ND**	**NA**	**NA**
C5-C8 Aliphatic Hydrocarbons [1] [2]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C12 Aliphatic Hydrocarbons [1] [3]	**12**	**N/A**	**ND**	**N/A**	**NA**	**N/A**
C9-C10 Aromatic Hydrocarbons	**10**	**N/A**	**ND**	**N/A**	**NA**	**N/A**

[1] Hydrocarbon Range data from total ion chromatogram excluding any internal/tuning standards eluting in that range

[2] C5-C8 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range

[3] C9-C12 aliphatic hydrocarbons excluding the concentration of Target TO-15/APH Analytes eluting in that range AND concentration of C9-C10 aromatic hydrocarbons

CERTIFICATION

Were all QA/QC procedures REQUIRED by the APH Method followed?	☑ Yes	☐ No	- Details Attached
Were all performance/acceptance standards for required QA/QC procedures achieved?	☑ Yes	☐ No	- Details Attached
Were any significant modifications made to the APH method, as specified in Sect 11.1.2?	☑ No	☐ Yes	- Details Attached

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Linda L. Freeman POSITION: Laboratory Director

PRINTED NAME: Linda L. Freeman DATE: 11/17/2011

Air Toxics LTD.
Laboratory Services Since 1989

2/1/2012
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1110157R1

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 10/8/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-17 VI are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

WORK ORDER #: 1110157R1

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/08/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/16/2011		
DATE REISSUED:	02/01/2012		

FRACTION #	NAME	TEST
01A	HAFB-SP43-VMP10(TO17A)	Modified TO-17 VI
02A	HAFB-SP43-VMP10(TO17B)	Modified TO-17 VI
03A	HAFB-SP43-VMP11(TO17A)	Modified TO-17 VI
04A	HAFB-SP43-VMP11(TO17B)	Modified TO-17 VI
05A	HAFB-SP43-VMP12(TO17A)	Modified TO-17 VI
06A	HAFB-SP43-VMP12(TO17B)	Modified TO-17 VI
07A	HAFB-SP43-VMP16(TO17A)	Modified TO-17 VI
08A	HAFB-SP43-VMP16(TO17B)	Modified TO-17 VI
09A	HAFB-SP43-VMP17(TO17A)	Modified TO-17 VI
10A	HAFB-SP43-VMP17(TO17B)	Modified TO-17 VI
11A	FV-GP01-HDOH#2(TO17A)	Modified TO-17 VI
12A	FV-GP01-HDOH#2(TO17B)	Modified TO-17 VI
13A	FV-GP08-HDOH#2(TO17A)	Modified TO-17 VI
14A	FV-GP08-HDOH#2(TO17B)	Modified TO-17 VI
15A	FV-GP16R-HDOH#2(TO17A)	Modified TO-17 VI
16A	FV-GP16R-HDOH#2(TO17B)	Modified TO-17 VI
17A	JP8#1(TO17A)	Modified TO-17 VI

Continued on next page

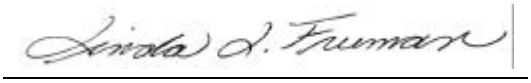
Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1110157R1

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/08/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/16/2011		
DATE REISSUED:	02/01/2012		

FRACTION #	NAME	TEST
18A	JP8#1(TO17B)	Modified TO-17 VI
19A	TRIP BLANK	Modified TO-17 VI
20A	Lab Blank	Modified TO-17 VI
20B	Lab Blank	Modified TO-17 VI
20C	Lab Blank	Modified TO-17 VI
21A	CCV	Modified TO-17 VI
21B	CCV	Modified TO-17 VI
21C	CCV	Modified TO-17 VI
22A	LCS	Modified TO-17 VI
22B	LCS	Modified TO-17 VI
22C	LCS	Modified TO-17 VI

CERTIFIED BY:  DATE: 02/01/12

Laboratory Director

Certfication numbers: AZ Licensure AZ0719, CA NELAP - 02110CA, LA NELAP - 02089,
NY NELAP - 11291, TX NELAP - T104704434-11-3, UT NELAP -CA009332011-1, WA NELAP - C935
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/11 , Expiration date: 06/30/12.
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
EPA Method TO-17
Tetra Tech EM, Inc.
Workorder# 1110157R1

Eighteen TO-17 VI Tube samples plus one Trip Blank were received on October 08, 2011. The laboratory performed the analysis via EPA Method TO-17 using GC/MS in the full scan mode. TO-17 sorbent tubes are thermally desorbed onto a secondary trap. The trap is thermally desorbed to elute the components into the GC/MS system for further separation.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The samples were analyzed following MA DEP APH methodology with several modifications to accommodate the project requirements. Sorbent tubes were used for sample collection instead of canisters as specified by the method. Additionally, the GC column used for this extended MA APH range had a smaller film thickness than what was required by the MA APH method. This modification allowed for higher GC temperatures which were necessary to effectively extend the target compound range to C24. However, the column was unable to resolve several aliphatic calibration compounds from internal standard and target compounds. This required a slight modification in the specific hydrocarbons utilized to generate calibration factors for the C5-C8 aliphatic and C9-C12 aliphatic ranges. No significant impact on data quality is expected.

The aliphatic range C13-C18 recovered below the laboratory acceptance limits of 60-140% in the daily CCV analyzed on 10/26/11 and 10/31/11. Associated detections and non-detections were flagged to indicate a potential low bias. Several components recovered above laboratory acceptance criterion for the CCV. Associated detections were flagged as estimated values.

The field surrogate Naphthalene-d8 exceeded laboratory limits of 50-150% due to high level matrix interference in samples HAFB-SP43-VMP10(TO-17A), HAFB-SP43-VMP11(TO17A), and HAFB-SP43-VMP16(TO17A).

TPH referenced to gasoline was calculated using a single point calibration.

Each sample was collected with 2 tubes in series with the TO17A designation indicating the front, or sample side, of the train. The TO17B designation indicated the back side of the train to measure potential breakthrough of unretained compounds. Several back tubes had detections above the reporting limit; however, the detections were not indicative of breakthrough based on the chromatographic pattern.

Samples HAFB-SP43-VMP10(TO-17A), HAFB-SP43-VMP11(TO17A), HAFB-SP43-VMP16(TO17A), and FV-GP16R-HDOH#2(TO17A) were analyzed at a higher split than the calibration due to high concentrations. The split used resulted in a 4-fold dilution and the reporting limit and calibration range were raised accordingly.

THE WORKORDER WAS REISSUED ON FEBRUARY 1, 2012 TO ADD TPH (DIESEL RANGE) PER CLIENT REQUEST. THE DIESEL RANGE WAS BRACKETED BY THE RETENTION TIME MARKERS C9 AND C24.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV and/or LCS.

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: HAFB-SP43-VMP10(TO17A)

Lab ID#: 1110157R1-01A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	84	1700
Ethyl Benzene	17	340	500	10000
m,p-Xylene	17	340	32	640
Naphthalene	8.0	160	100	2000
C5-C8 Aliphatic Hydrocarbons	92	1800	660000	13000000
C9-C12 Aliphatic Hydrocarbons	140	2800	320000	6500000
C13-C18 Aliphatic Hydrocarbons	400	8000	3300 J	66000 J
C9-C10 Aromatic Hydrocarbons	100	2000	9100	180000
Total TPH (C5-C24) ref to Gasoline	4000	80000	910000	18000000
TPH (Diesel Range)	4000	80000	36000	730000

Client Sample ID: HAFB-SP43-VMP10(TO17B)

Lab ID#: 1110157R1-02A

No Detections Were Found.

Client Sample ID: HAFB-SP43-VMP11(TO17A)

Lab ID#: 1110157R1-03A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	38	750
Ethyl Benzene	17	340	2000 E	39000 E
m,p-Xylene	17	340	50	1000
o-Xylene	17	340	34	680
Naphthalene	8.0	160	58	1200
C5-C8 Aliphatic Hydrocarbons	92	1800	850000	17000000
C9-C12 Aliphatic Hydrocarbons	140	2800	310000	6200000
C13-C18 Aliphatic Hydrocarbons	400	8000	5100 J	100000 J
C9-C10 Aromatic Hydrocarbons	100	2000	7000	140000
Total TPH (C5-C24) ref to Gasoline	4000	80000	230000	4600000
TPH (Diesel Range)	4000	80000	35000	710000

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: HAFB-SP43-VMP11(TO17B)

Lab ID#: 1110157R1-04A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
C5-C8 Aliphatic Hydrocarbons	23	460	24	480

Client Sample ID: HAFB-SP43-VMP12(TO17A)

Lab ID#: 1110157R1-05A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	4.0	80

Client Sample ID: HAFB-SP43-VMP12(TO17B)

Lab ID#: 1110157R1-06A

No Detections Were Found.

Client Sample ID: HAFB-SP43-VMP16(TO17A)

Lab ID#: 1110157R1-07A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	60	1200
Toluene	3.8	76	16	330
Ethyl Benzene	4.3	86	86	1700
m,p-Xylene	4.3	86	56	1100
o-Xylene	4.3	86	19	390
Naphthalene	2.0	40	9.8	200
C5-C8 Aliphatic Hydrocarbons	23	460	1300000	26000000
C9-C12 Aliphatic Hydrocarbons	35	700	230000	4600000
C13-C18 Aliphatic Hydrocarbons	100	2000	620 J	12000 J
C9-C10 Aromatic Hydrocarbons	25	500	6600	130000
Total TPH (C5-C24) ref to Gasoline	1000	20000	1300000	26000000
TPH (Diesel Range)	1000	20000	16000	320000

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: HAFB-SP43-VMP16(TO17B)

Lab ID#: 1110157R1-08A

No Detections Were Found.

Client Sample ID: HAFB-SP43-VMP17(TO17A)

Lab ID#: 1110157R1-09A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Naphthalene	2.0	33	12	200
C5-C8 Aliphatic Hydrocarbons	23	380	450	7500
C9-C12 Aliphatic Hydrocarbons	35	580	170 J	2800 J
Total TPH (C5-C24) ref to Gasoline	1000	17000	1200	20000

Client Sample ID: HAFB-SP43-VMP17(TO17B)

Lab ID#: 1110157R1-10A

No Detections Were Found.

Client Sample ID: FV-GP01-HDOH#2(TO17A)

Lab ID#: 1110157R1-11A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	53	6.3	100
m,p-Xylene	4.3	72	5.5	92
Hexane	3.5	58	3.5	59
C5-C8 Aliphatic Hydrocarbons	23	380	660	11000
C9-C12 Aliphatic Hydrocarbons	35	580	780 J	13000 J
Total TPH (C5-C24) ref to Gasoline	1000	17000	1600	27000

Client Sample ID: FV-GP01-HDOH#2(TO17B)

Lab ID#: 1110157R1-12A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Toluene	3.8	63	4.9	82
m,p-Xylene	4.3	72	5.0	84

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: FV-GP01-HDOH#2(TO17B)

Lab ID#: 1110157R1-12A

Naphthalene	2.0	33	64	1100
C9-C12 Aliphatic Hydrocarbons	35	580	71 J	1200 J
Total TPH (C5-C24) ref to Gasoline	1000	17000	1200	19000

Client Sample ID: FV-GP08-HDOH#2(TO17A)

Lab ID#: 1110157R1-13A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	16	320
Ethyl Benzene	4.3	86	4.5	90
m,p-Xylene	4.3	86	5.0	99
C5-C8 Aliphatic Hydrocarbons	23	460	45000	900000
C9-C12 Aliphatic Hydrocarbons	35	700	32000 J	640000 J
C13-C18 Aliphatic Hydrocarbons	100	2000	300 J	6000 J
C9-C10 Aromatic Hydrocarbons	25	500	540	11000
Total TPH (C5-C24) ref to Gasoline	1000	20000	43000	860000
TPH (Diesel Range)	1000	20000	6500	130000

Client Sample ID: FV-GP08-HDOH#2(TO17B)

Lab ID#: 1110157R1-14A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
C5-C8 Aliphatic Hydrocarbons	23	460	42	830
C9-C12 Aliphatic Hydrocarbons	35	700	37 J	750 J

Client Sample ID: FV-GP16R-HDOH#2(TO17A)

Lab ID#: 1110157R1-15A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
C5-C8 Aliphatic Hydrocarbons	92	1800	160000	3200000
C9-C12 Aliphatic Hydrocarbons	140	2800	270000	5500000
C13-C18 Aliphatic Hydrocarbons	400	8000	6300 J	130000 J
C9-C10 Aromatic Hydrocarbons	100	2000	1600	32000

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Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: FV-GP16R-HDOH#2(TO17A)

Lab ID#: 1110157R1-15A

Total TPH (C5-C24) ref to Gasoline	4000	80000	510000	10000000
TPH (Diesel Range)	4000	80000	44000	890000

Client Sample ID: FV-GP16R-HDOH#2(TO17B)

Lab ID#: 1110157R1-16A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
C5-C8 Aliphatic Hydrocarbons	23	460	80	1600
C9-C12 Aliphatic Hydrocarbons	35	700	45 J	890 J

Client Sample ID: JP8#1(TO17A)

Lab ID#: 1110157R1-17A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	76	7600
Toluene	3.8	380	300	30000
Ethyl Benzene	4.3	430	110	11000
m,p-Xylene	4.3	430	360	36000
o-Xylene	4.3	430	170 J	17000 J
Hexane	3.5	350	280	28000
Naphthalene	2.0	200	28	2800
C5-C8 Aliphatic Hydrocarbons	23	2300	18000	1800000
C9-C12 Aliphatic Hydrocarbons	35	3500	13000 J	1300000 J
C13-C18 Aliphatic Hydrocarbons	100	10000	1500	150000
C9-C10 Aromatic Hydrocarbons	25	2500	1900 J	190000 J
C11-C16 Aromatic Hydrocarbons	100	10000	170	17000
Total TPH (C5-C24) ref to Gasoline	1000	100000	21000	2100000
TPH (Diesel Range)	1000	100000	3800	380000

Client Sample ID: JP8#1(TO17B)

Lab ID#: 1110157R1-18A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: JP8#1(TO17B)

Lab ID#: 1110157R1-18A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Total TPH (C5-C24) ref to Gasoline	1000	100000	1200	120000

Client Sample ID: TRIP BLANK

Lab ID#: 1110157R1-19A

No Detections Were Found.

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Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP10(TO17A)

Lab ID#: 1110157R1-01A

EPA METHOD TO-17

File Name:	**j103135**	**Date of Extraction: NA**	**Date of Collection: 10/5/11 2:15:00 PM**
Dil. Factor:	**4.00**		**Date of Analysis: 11/1/11 06:12 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	84	1700
Toluene	15	300	Not Detected	Not Detected
Ethyl Benzene	17	340	500	10000
m,p-Xylene	17	340	32	640
o-Xylene	17	340	Not Detected	Not Detected
Hexane	14	280	Not Detected	Not Detected
Naphthalene	8.0	160	100	2000
C5-C8 Aliphatic Hydrocarbons	92	1800	660000	13000000
C9-C12 Aliphatic Hydrocarbons	140	2800	320000	6500000
C13-C18 Aliphatic Hydrocarbons	400	8000	3300 J	66000 J
C9-C10 Aromatic Hydrocarbons	100	2000	9100	180000
C11-C16 Aromatic Hydrocarbons	400	8000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	4000	80000	910000	18000000
TPH (Diesel Range)	4000	80000	36000	730000

J = Estimated value due to bias in the CCV.
Q = Exceeds Quality Control limits, possibly due to matrix effects.
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	122	50-150
Naphthalene-d8	206 Q	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP10(TO17B)

Lab ID#: 1110157R1-02A

EPA METHOD TO-17

File Name:	**j102720**	**Date of Extraction: NA**	**Date of Collection: 10/5/11 2:15:00 PM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 09:19 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	70	50-150
Naphthalene-d8	65	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP11(TO17A)

Lab ID#: 1110157R1-03A

EPA METHOD TO-17

File Name:	**j103126**	**Date of Extraction: NA**	**Date of Collection: 10/5/11 1:18:00 PM**
Dil. Factor:	**4.00**		**Date of Analysis: 11/1/11 01:01 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	38	750
Toluene	15	300	Not Detected	Not Detected
Ethyl Benzene	17	340	2000 E	39000 E
m,p-Xylene	17	340	50	1000
o-Xylene	17	340	34	680
Hexane	14	280	Not Detected	Not Detected
Naphthalene	8.0	160	58	1200
C5-C8 Aliphatic Hydrocarbons	92	1800	850000	17000000
C9-C12 Aliphatic Hydrocarbons	140	2800	310000	6200000
C13-C18 Aliphatic Hydrocarbons	400	8000	5100 J	100000 J
C9-C10 Aromatic Hydrocarbons	100	2000	7000	140000
C11-C16 Aromatic Hydrocarbons	400	8000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	4000	80000	230000	4600000
TPH (Diesel Range)	4000	80000	35000	710000

E = Exceeds instrument calibration range.
J = Estimated value due to bias in the CCV.
Q = Exceeds Quality Control limits, possibly due to matrix effects.
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	125	50-150
Naphthalene-d8	193 Q	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP11(TO17B)

Lab ID#: 1110157R1-04A

EPA METHOD TO-17

File Name:	**j102723**	**Date of Extraction: NA**	**Date of Collection: 10/5/11 1:18:00 PM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 11:07 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	24	480
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	67	50-150
Naphthalene-d8	70	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP12(TO17A)

Lab ID#: 1110157R1-05A

EPA METHOD TO-17

File Name:	**j102628**	**Date of Extraction: NA**	**Date of Collection: 10/5/11 12:45:00 PM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 02:53 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	4.0	80
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	114	50-150
Naphthalene-d8	116	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP12(TO17B)

Lab ID#: 1110157R1-06A

EPA METHOD TO-17

File Name:	**j102717**	**Date of Extraction: NA**	**Date of Collection: 10/5/11 12:45:00 PM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 07:31 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	75	50-150
Naphthalene-d8	63	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP16(TO17A)

Lab ID#: 1110157R1-07A

EPA METHOD TO-17

File Name:	**j103123**	**Date of Extraction: NA**	**Date of Collection: 10/5/11 1:45:00 PM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 11:20 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	60	1200
Toluene	3.8	76	16	330
Ethyl Benzene	4.3	86	86	1700
m,p-Xylene	4.3	86	56	1100
o-Xylene	4.3	86	19	390
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	9.8	200
C5-C8 Aliphatic Hydrocarbons	23	460	1300000	26000000
C9-C12 Aliphatic Hydrocarbons	35	700	230000	4600000
C13-C18 Aliphatic Hydrocarbons	100	2000	620 J	12000 J
C9-C10 Aromatic Hydrocarbons	25	500	6600	130000
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	1300000	26000000
TPH (Diesel Range)	1000	20000	16000	320000

J = Estimated value due to bias in the CCV.
Q = Exceeds Quality Control limits, possibly due to matrix effects.
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	123	50-150
Naphthalene-d8	172 Q	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP16(TO17B)

Lab ID#: 1110157R1-08A

EPA METHOD TO-17

File Name:	**j102721**	**Date of Extraction: NA**	**Date of Collection: 10/5/11 1:45:00 PM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 09:55 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	75	50-150
Naphthalene-d8	68	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP17(TO17A)

Lab ID#: 1110157R1-09A

EPA METHOD TO-17

File Name:	**j102710**	**Date of Extraction: NA**	**Date of Collection: 10/5/11 11:55:00 AM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 03:11 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	53	Not Detected	Not Detected
Toluene	3.8	63	Not Detected	Not Detected
Ethyl Benzene	4.3	72	Not Detected	Not Detected
m,p-Xylene	4.3	72	Not Detected	Not Detected
o-Xylene	4.3	72	Not Detected	Not Detected
Hexane	3.5	58	Not Detected	Not Detected
Naphthalene	2.0	33	12	200
C5-C8 Aliphatic Hydrocarbons	23	380	450	7500
C9-C12 Aliphatic Hydrocarbons	35	580	170 J	2800 J
C13-C18 Aliphatic Hydrocarbons	100	1700	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	420	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	1700	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	17000	1200	20000
TPH (Diesel Range)	1000	17000	Not Detected	Not Detected

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	96	50-150
Naphthalene-d8	85	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP17(TO17B)

Lab ID#: 1110157R1-10A

EPA METHOD TO-17

File Name:	**j102724**	**Date of Extraction: NA**	**Date of Collection: 10/5/11 11:55:00 AM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 11:43 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	53	Not Detected	Not Detected
Toluene	3.8	63	Not Detected	Not Detected
Ethyl Benzene	4.3	72	Not Detected	Not Detected
m,p-Xylene	4.3	72	Not Detected	Not Detected
o-Xylene	4.3	72	Not Detected	Not Detected
Hexane	3.5	58	Not Detected	Not Detected
Naphthalene	2.0	33	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	380	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	580	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	1700	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	420	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	1700	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	17000	Not Detected	Not Detected
TPH (Diesel Range)	1000	17000	Not Detected	Not Detected

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	79	50-150
Naphthalene-d8	78	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP01-HDOH#2(TO17A)

Lab ID#: 1110157R1-11A

EPA METHOD TO-17

File Name:	**j102629**	**Date of Extraction: NA**	**Date of Collection: 10/6/11 1:48:00 PM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 03:29 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	53	6.3	100
Toluene	3.8	63	Not Detected	Not Detected
Ethyl Benzene	4.3	72	Not Detected	Not Detected
m,p-Xylene	4.3	72	5.5	92
o-Xylene	4.3	72	Not Detected	Not Detected
Hexane	3.5	58	3.5	59
Naphthalene	2.0	33	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	380	660	11000
C9-C12 Aliphatic Hydrocarbons	35	580	780 J	13000 J
C13-C18 Aliphatic Hydrocarbons	100	1700	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	25	420	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	1700	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	17000	1600	27000
TPH (Diesel Range)	1000	17000	Not Detected	Not Detected

J = Estimated value due to bias in the CCV.
UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	117	50-150
Naphthalene-d8	123	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP01-HDOH#2(TO17B)

Lab ID#: 1110157R1-12A

EPA METHOD TO-17

File Name:	**j102722**	**Date of Extraction: NA**	**Date of Collection: 10/6/11 1:48:00 PM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 10:31 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	53	Not Detected	Not Detected
Toluene	3.8	63	4.9	82
Ethyl Benzene	4.3	72	Not Detected	Not Detected
m,p-Xylene	4.3	72	5.0	84
o-Xylene	4.3	72	Not Detected	Not Detected
Hexane	3.5	58	Not Detected	Not Detected
Naphthalene	2.0	33	64	1100
C5-C8 Aliphatic Hydrocarbons	23	380	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	580	71 J	1200 J
C13-C18 Aliphatic Hydrocarbons	100	1700	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	420	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	1700	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	17000	1200	19000
TPH (Diesel Range)	1000	17000	Not Detected	Not Detected

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	72	50-150
Naphthalene-d8	71	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP08-HDOH#2(TO17A)

Lab ID#: 1110157R1-13A

EPA METHOD TO-17

File Name:	**j102630**	**Date of Extraction: NA**	**Date of Collection: 10/6/11 1:10:00 PM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 04:06 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	16	320
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	4.5	90
m,p-Xylene	4.3	86	5.0	99
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	45000	900000
C9-C12 Aliphatic Hydrocarbons	35	700	32000 J	640000 J
C13-C18 Aliphatic Hydrocarbons	100	2000	300 J	6000 J
C9-C10 Aromatic Hydrocarbons	25	500	540	11000
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	43000	860000
TPH (Diesel Range)	1000	20000	6500	130000

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	92	50-150
Naphthalene-d8	123	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP08-HDOH#2(TO17B)

Lab ID#: 1110157R1-14A

EPA METHOD TO-17

File Name:	**j102718**	**Date of Extraction: NA**	**Date of Collection: 10/6/11 1:10:00 PM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 08:07 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	42	830
C9-C12 Aliphatic Hydrocarbons	35	700	37 J	750 J
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	79	50-150
Naphthalene-d8	77	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP16R-HDOH#2(TO17A)

Lab ID#: 1110157R1-15A

EPA METHOD TO-17

File Name:	**j103125**	**Date of Extraction: NA**	**Date of Collection: 10/6/11 12:19:00 PM**
Dil. Factor:	**4.00**		**Date of Analysis: 11/1/11 12:27 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	Not Detected	Not Detected
Toluene	15	300	Not Detected	Not Detected
Ethyl Benzene	17	340	Not Detected	Not Detected
m,p-Xylene	17	340	Not Detected	Not Detected
o-Xylene	17	340	Not Detected	Not Detected
Hexane	14	280	Not Detected	Not Detected
Naphthalene	8.0	160	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	92	1800	160000	3200000
C9-C12 Aliphatic Hydrocarbons	140	2800	270000	5500000
C13-C18 Aliphatic Hydrocarbons	400	8000	6300 J	130000 J
C9-C10 Aromatic Hydrocarbons	100	2000	1600	32000
C11-C16 Aromatic Hydrocarbons	400	8000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	4000	80000	510000	10000000
TPH (Diesel Range)	4000	80000	44000	890000

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	98	50-150
Naphthalene-d8	144	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP16R-HDOH#2(TO17B)

Lab ID#: 1110157R1-16A

EPA METHOD TO-17

File Name:	**j102719**	**Date of Extraction: NA**	**Date of Collection: 10/6/11 12:19:00 PM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 08:43 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	80	1600
C9-C12 Aliphatic Hydrocarbons	35	700	45 J	890 J
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	76	50-150
Naphthalene-d8	70	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: JP8#1(TO17A)

Lab ID#: 1110157R1-17A

EPA METHOD TO-17

File Name:	**j102713**	**Date of Extraction: NA**	**Date of Collection: 10/6/11 3:30:00 PM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 05:09 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	76	7600
Toluene	3.8	380	300	30000
Ethyl Benzene	4.3	430	110	11000
m,p-Xylene	4.3	430	360	36000
o-Xylene	4.3	430	170 J	17000 J
Hexane	3.5	350	280	28000
Naphthalene	2.0	200	28	2800
C5-C8 Aliphatic Hydrocarbons	23	2300	18000	1800000
C9-C12 Aliphatic Hydrocarbons	35	3500	13000 J	1300000 J
C13-C18 Aliphatic Hydrocarbons	100	10000	1500	150000
C9-C10 Aromatic Hydrocarbons	25	2500	1900 J	190000 J
C11-C16 Aromatic Hydrocarbons	100	10000	170	17000
Total TPH (C5-C24) ref to Gasoline	1000	100000	21000	2100000
TPH (Diesel Range)	1000	100000	3800	380000

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	98	50-150
Naphthalene-d8	114	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: JP8#1(TO17B)

Lab ID#: 1110157R1-18A

EPA METHOD TO-17

File Name:	**j102725**	**Date of Extraction: NA**	**Date of Collection: 10/6/11 3:30:00 PM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 12:19 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	Not Detected	Not Detected
Toluene	3.8	380	Not Detected	Not Detected
Ethyl Benzene	4.3	430	Not Detected	Not Detected
m,p-Xylene	4.3	430	Not Detected	Not Detected
o-Xylene	4.3	430	Not Detected	Not Detected
Hexane	3.5	350	Not Detected	Not Detected
Naphthalene	2.0	200	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	2300	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	3500	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	10000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	2500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	10000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	100000	1200	120000
TPH (Diesel Range)	1000	100000	Not Detected	Not Detected

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	68	50-150
Naphthalene-d8	65	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: TRIP BLANK

Lab ID#: 1110157R1-19A

EPA METHOD TO-17

File Name:	**j102716**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 06:55 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	53	Not Detected	Not Detected
Toluene	3.8	63	Not Detected	Not Detected
Ethyl Benzene	4.3	72	Not Detected	Not Detected
m,p-Xylene	4.3	72	Not Detected	Not Detected
o-Xylene	4.3	72	Not Detected	Not Detected
Hexane	3.5	58	Not Detected	Not Detected
Naphthalene	2.0	33	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	380	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	580	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	1700	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	420	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	1700	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	17000	Not Detected	Not Detected
TPH (Diesel Range)	1000	17000	Not Detected	Not Detected

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	76	50-150
Naphthalene-d8	61	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110157R1-20A

EPA METHOD TO-17

File Name:	**j102627**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 02:16 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	53	Not Detected	Not Detected
Toluene	3.8	63	Not Detected	Not Detected
Ethyl Benzene	4.3	72	Not Detected	Not Detected
m,p-Xylene	4.3	72	Not Detected	Not Detected
o-Xylene	4.3	72	Not Detected	Not Detected
Hexane	3.5	58	Not Detected	Not Detected
Naphthalene	2.0	33	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	380	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	580	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	1700	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	25	420	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	1700	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	17000	Not Detected	Not Detected
TPH (Diesel Range)	1000	17000	Not Detected	Not Detected

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	100	50-150
Naphthalene-d8	100	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110157R1-20B

EPA METHOD TO-17

File Name:	**j102709**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 02:32 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	53	Not Detected	Not Detected
Toluene	3.8	63	Not Detected	Not Detected
Ethyl Benzene	4.3	72	Not Detected	Not Detected
m,p-Xylene	4.3	72	Not Detected	Not Detected
o-Xylene	4.3	72	Not Detected	Not Detected
Hexane	3.5	58	Not Detected	Not Detected
Naphthalene	2.0	33	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	380	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	580	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	1700	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	420	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	1700	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	17000	Not Detected	Not Detected
TPH (Diesel Range)	1000	17000	Not Detected	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	89	50-150
Naphthalene-d8	100	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110157R1-20C

EPA METHOD TO-17

File Name:	**j103112**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 03:52 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	53	Not Detected	Not Detected
Toluene	3.8	63	Not Detected	Not Detected
Ethyl Benzene	4.3	72	Not Detected	Not Detected
m,p-Xylene	4.3	72	Not Detected	Not Detected
o-Xylene	4.3	72	Not Detected	Not Detected
Hexane	3.5	58	Not Detected	Not Detected
Naphthalene	2.0	33	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	380	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	580	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	1700	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	25	420	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	1700	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	17000	Not Detected	Not Detected
TPH (Diesel Range)	1000	17000	Not Detected	Not Detected

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	50-150
Naphthalene-d8	118	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1110157R1-21A

EPA METHOD TO-17

File Name:	**j102606**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/26/11 01:19 PM**

Compound	%Recovery
Benzene	106
Toluene	108
Ethyl Benzene	120
m,p-Xylene	117
o-Xylene	122
Hexane	102
Naphthalene	111
C5-C8 Aliphatic Hydrocarbons	82
C9-C12 Aliphatic Hydrocarbons	135 Q
C13-C18 Aliphatic Hydrocarbons	57 Q
C9-C10 Aromatic Hydrocarbons	129
C11-C16 Aromatic Hydrocarbons	118
Total TPH (C5-C24) ref to Gasoline	100
TPH (Diesel Range)	100

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	116	50-150
Naphthalene-d8	133	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1110157R1-21B

EPA METHOD TO-17

File Name:	**j102706**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 12:30 PM**

Compound	%Recovery
Benzene	92
Toluene	119
Ethyl Benzene	128
m,p-Xylene	125
o-Xylene	131 Q
Hexane	92
Naphthalene	78
C5-C8 Aliphatic Hydrocarbons	94
C9-C12 Aliphatic Hydrocarbons	138 Q
C13-C18 Aliphatic Hydrocarbons	65
C9-C10 Aromatic Hydrocarbons	143 Q
C11-C16 Aromatic Hydrocarbons	82
Total TPH (C5-C24) ref to Gasoline	107
TPH (Diesel Range)	100

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	71	50-150
Naphthalene-d8	112	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV

Lab ID#: 1110157R1-21C

EPA METHOD TO-17

File Name:	**j103102**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 08:21 AM**

Compound	%Recovery
Benzene	77
Toluene	90
Ethyl Benzene	95
m,p-Xylene	95
o-Xylene	96
Hexane	90
Naphthalene	137
C5-C8 Aliphatic Hydrocarbons	82
C9-C12 Aliphatic Hydrocarbons	121
C13-C18 Aliphatic Hydrocarbons	57 Q
C9-C10 Aromatic Hydrocarbons	106
C11-C16 Aromatic Hydrocarbons	95
Total TPH (C5-C24) ref to Gasoline	128
TPH (Diesel Range)	100

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110157R1-22A

EPA METHOD TO-17

File Name:	**j102605**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/26/11 12:35 PM**

Compound	**%Recovery**
Benzene	91
Toluene	112
Ethyl Benzene	125
m,p-Xylene	127
o-Xylene	127
Hexane	91
Naphthalene	124
C5-C8 Aliphatic Hydrocarbons	111
C9-C12 Aliphatic Hydrocarbons	124
C13-C18 Aliphatic Hydrocarbons	54
C9-C10 Aromatic Hydrocarbons	141 Q
C11-C16 Aromatic Hydrocarbons	134
Total TPH (C5-C24) ref to Gasoline	Not Spiked
TPH (Diesel Range)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Toluene-d8	117	50-150
Naphthalene-d8	122	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110157R1-22B

EPA METHOD TO-17

File Name:	**j102707**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 01:05 PM**

Compound	%Recovery
Benzene	82
Toluene	122
Ethyl Benzene	134
m,p-Xylene	140
o-Xylene	140
Hexane	88
Naphthalene	123
C5-C8 Aliphatic Hydrocarbons	112
C9-C12 Aliphatic Hydrocarbons	138
C13-C18 Aliphatic Hydrocarbons	56
C9-C10 Aromatic Hydrocarbons	154 Q
C11-C16 Aromatic Hydrocarbons	153 Q
Total TPH (C5-C24) ref to Gasoline	Not Spiked
TPH (Diesel Range)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	82	50-150
Naphthalene-d8	125	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110157R1-22C

EPA METHOD TO-17

File Name:	**j103105**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 11:35 AM**

Compound	%Recovery
Benzene	75
Toluene	120
Ethyl Benzene	127
m,p-Xylene	134
o-Xylene	132
Hexane	86
Naphthalene	137
C5-C8 Aliphatic Hydrocarbons	94
C9-C12 Aliphatic Hydrocarbons	134
C13-C18 Aliphatic Hydrocarbons	59
C9-C10 Aromatic Hydrocarbons	146
C11-C16 Aromatic Hydrocarbons	197 Q
Total TPH (C5-C24) ref to Gasoline	Not Spiked
TPH (Diesel Range)	Not Spiked

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	89	50-150
Naphthalene-d8	119	50-150

Air Toxics LTD.
Laboratory Services Since 1989

11/30/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1110412

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 10/20/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-17 VI are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

WORK ORDER #: 1110412

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/20/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/21/2011		

FRACTION #	NAME	TEST
01A	HAFB-ST03-B58(422)(TO17A)	Modified TO-17 VI
02A	HAFB-ST03-B58(422)(TO17B)	Modified TO-17 VI
03A	HAFB-ST03-B58(492)(TO17A)	Modified TO-17 VI
04A	HAFB-ST03-B58(492)(TO17B)	Modified TO-17 VI
05A	HAFB-ST03-B59(388)(TO17A)	Modified TO-17 VI
06A	HAFB-ST03-B59(388)(TO17B)	Modified TO-17 VI
07A	GASOLINE#2(TO17A)	Modified TO-17 VI
08A	GASOLINE#2(TO17B)	Modified TO-17 VI
09A	DIESEL#3(TO17A)	Modified TO-17 VI
10A	DIESEL#3(TO17B)	Modified TO-17 VI
11A	HH-OU1C-MW10SG(TO17A)	Modified TO-17 VI
12A	HH-OU1C-MW10SG(TO17B)	Modified TO-17 VI
13A	HH-OU1C-OTNS1(TO17A)	Modified TO-17 VI
14A	HH-OU1C-OTNS1(TO17B)	Modified TO-17 VI
15A	HH-OU1C-MW22R(TO17A)	Modified TO-17 VI
16A	HH-OU1C-MW22R(TO17B)	Modified TO-17 VI
17A	GASOLINE-EXHAUST (TO17A)	Modified TO-17 VI

Continued on next page

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1110412

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/20/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/21/2011		

FRACTION #	NAME	TEST
18A	GASOLINE-EXHAUST (TO17B)	Modified TO-17 VI
19A	DIESEL-EXHAUST (TO17A)	Modified TO-17 VI
20A	DIESEL-EXHAUST (TO17B)	Modified TO-17 VI
21A	TRIP BLANK	Modified TO-17 VI
22A	Lab Blank	Modified TO-17 VI
22B	Lab Blank	Modified TO-17 VI
22C	Lab Blank	Modified TO-17 VI
23A	CCV	Modified TO-17 VI
23B	CCV	Modified TO-17 VI
23C	CCV	Modified TO-17 VI
24A	LCS	Modified TO-17 VI
24B	LCS	Modified TO-17 VI
24C	LCS	Modified TO-17 VI

CERTIFIED BY: Linda D. Fruman DATE: 11/30/11

Laboratory Director

Certfication numbers: AZ Licensure AZ0719, CA NELAP - 02110CA, LA NELAP - 02089,
NY NELAP - 11291, TX NELAP - T104704434-11-3, UT NELAP -CA009332011-1, WA NELAP - C935
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/11 , Expiration date: 06/30/12.
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
EPA Method TO-17
Tetra Tech EM, Inc.
Workorder# 1110412

Twenty TO-17 VI Tube samples plus one Trip Blank were received on October 20, 2011. The laboratory performed the analysis via EPA Method TO-17 using GC/MS in the full scan mode. TO-17 sorbent tubes are thermally desorbed onto a secondary trap. The trap is thermally desorbed to elute the components into the GC/MS system for further separation.

Receiving Notes

The Chain of Custody (COC) information for the tube numbers associated with samples HH-OU1C-MW22R(TO17A), HH-OU1C-MW22R(TO17B), HH-OU1C-OTNS1(TO17A) and HH-OU1C-OTNS1(TO17B) did not match the information on the "Field Chart" provided by the client. Per client request, the information on the field chart was used to process and report the samples.

Analytical Notes

The samples were analyzed following MA DEP APH methodology with several modifications to accommodate the project requirements. Sorbent tubes were used for sample collection instead of canisters as specified by the method. Additionally, the GC column used for this extended MA APH range had a smaller film thickness than what was required by the MA APH method. This modification allowed for higher GC temperatures which were necessary to effectively extend the target compound range to C24. However, the column was unable to resolve several aliphatic calibration compounds from internal standard and target compounds. This required a slight modification in the specific hydrocarbons utilized to generate calibration factors for the C5-C8 aliphatic and C9-C12 aliphatic ranges. No significant impact on data quality is expected.

The aliphatic range C13-C18 recovered below the laboratory acceptance limits of 60-140% in the daily CCV analyzed on 10/31/11. Associated detections and non-detections were flagged to indicate a potential low bias. Several components recovered above laboratory acceptance criterion for the CCV. Associated detections were flagged as estimated values.

The field surrogate Toluene-d8 exceeded laboratory limits of 50-150% due to high level matrix interference in samples HAFB-ST03-B58(492)(TO-17A) and HAFB-ST03-B59(388)(TO17A).

TPH referenced to gasoline and diesel ware calculated using a single point calibration.

Each sample was collected with 2 tubes in series with the TO17A designation indicating the front, or sample side, of the train. The TO17B designation indicated the back side of the train to measure potential breakthrough of unretained compounds. Several back tubes had detections above the reporting limit; however, the detections were not indicative of breakthrough based on the chromatographic pattern.

Samples GASOLINE#2(TO17A), HH-OU1C-MW10SG(TO17A) and HH-OU1C-MW22R(TO17A) were analyzed at a higher split than the calibration due to high concentrations. The split used resulted in a

4-fold dilution and the reporting limit and calibration range were raised accordingly.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV and/or LCS.

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: HAFB-ST03-B58(422)(TO17A)

Lab ID#: 1110412-01A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	4.6	91
Toluene	3.8	76	14	290
Ethyl Benzene	4.3	86	56	1100
m,p-Xylene	4.3	86	960	19000
o-Xylene	4.3	86	130	2700
Hexane	3.5	70	28	550
Naphthalene	2.0	40	6.0	120
C5-C8 Aliphatic Hydrocarbons	23	460	43000	850000
C9-C12 Aliphatic Hydrocarbons	35	700	30000 J	590000 J
C13-C18 Aliphatic Hydrocarbons	100	2000	180	3600
C9-C10 Aromatic Hydrocarbons	25	500	4600	92000
Total TPH (C5-C24) ref to Gasoline	1000	20000	79000	1600000
TPH (Diesel Range)	1000	20000	55000	1100000

Client Sample ID: HAFB-ST03-B58(422)(TO17B)

Lab ID#: 1110412-02A

No Detections Were Found.

Client Sample ID: HAFB-ST03-B58(492)(TO17A)

Lab ID#: 1110412-03A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	6.5	130
Toluene	3.8	76	15	300
Ethyl Benzene	4.3	86	60	1200
m,p-Xylene	4.3	86	1000	20000
o-Xylene	4.3	86	150	3000
Hexane	3.5	70	25	500
C5-C8 Aliphatic Hydrocarbons	23	460	44000	870000
C9-C12 Aliphatic Hydrocarbons	35	700	32000 J	640000 J
C13-C18 Aliphatic Hydrocarbons	100	2000	350	7000

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: HAFB-ST03-B58(492)(TO17A)

Lab ID#: 1110412-03A

C9-C10 Aromatic Hydrocarbons	25	500	5200	100000
Total TPH (C5-C24) ref to Gasoline	1000	20000	80000	1600000
TPH (Diesel Range)	1000	20000	58000	1200000

Client Sample ID: HAFB-ST03-B58(492)(TO17B)

Lab ID#: 1110412-04A

No Detections Were Found.

Client Sample ID: HAFB-ST03-B59(388)(TO17A)

Lab ID#: 1110412-05A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	3.5	70
Toluene	3.8	76	7.8	160
Ethyl Benzene	4.3	86	4.6	91
m,p-Xylene	4.3	86	71	1400
o-Xylene	4.3	86	15	300
Hexane	3.5	70	5.8	120
C5-C8 Aliphatic Hydrocarbons	23	460	6100	120000
C9-C12 Aliphatic Hydrocarbons	35	700	1900 J	38000 J
C13-C18 Aliphatic Hydrocarbons	100	2000	120	2400
C9-C10 Aromatic Hydrocarbons	25	500	380	7600
Total TPH (C5-C24) ref to Gasoline	1000	20000	9200	180000
TPH (Diesel Range)	1000	20000	8700	170000

Client Sample ID: HAFB-ST03-B59(388)(TO17B)

Lab ID#: 1110412-06A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	4.8	97
Ethyl Benzene	4.3	86	9.0	180
C5-C8 Aliphatic Hydrocarbons	23	460	140	2800
C9-C12 Aliphatic Hydrocarbons	35	700	71 J	1400 J

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: GASOLINE#2(TO17A)

Lab ID#: 1110412-07A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	1300	3400	340000
Toluene	15	1500	>8000 S	>800000 S
Ethyl Benzene	17	1700	1900	190000
m,p-Xylene	17	1700	5700 E	570000 E
o-Xylene	17	1700	2200	220000
Hexane	14	1400	13000 E	1300000 E
C5-C8 Aliphatic Hydrocarbons	92	9200	160000	16000000
C9-C10 Aromatic Hydrocarbons	100	10000	3400	340000
Total TPH (C5-C24) ref to Gasoline	4000	400000	200000	20000000

Client Sample ID: GASOLINE#2(TO17B)

Lab ID#: 1110412-08A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	4.8	480

Client Sample ID: DIESEL#3(TO17A)

Lab ID#: 1110412-09A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	28	2800
Toluene	3.8	380	140	14000
Ethyl Benzene	4.3	430	31	3100
m,p-Xylene	4.3	430	87	8700
o-Xylene	4.3	430	35	3500
Hexane	3.5	350	140	14000
C5-C8 Aliphatic Hydrocarbons	23	2300	4700	470000
C9-C12 Aliphatic Hydrocarbons	35	3500	1900 J	190000 J
C13-C18 Aliphatic Hydrocarbons	100	10000	780	78000
C9-C10 Aromatic Hydrocarbons	25	2500	230	23000
Total TPH (C5-C24) ref to Gasoline	1000	100000	11000	1100000

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: DIESEL#3(TO17A)

Lab ID#: 1110412-09A

TPH (Diesel Range)	1000	100000	20000	2000000

Client Sample ID: DIESEL#3(TO17B)

Lab ID#: 1110412-10A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
C5-C8 Aliphatic Hydrocarbons	23	2300	110	11000

Client Sample ID: HH-OU1C-MW10SG(TO17A)

Lab ID#: 1110412-11A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	510	10000
Toluene	15	300	400	8000
Ethyl Benzene	17	340	400	8000
m,p-Xylene	17	340	290	5800
o-Xylene	17	340	85	1700
Hexane	14	280	26000 E	520000 E
C5-C8 Aliphatic Hydrocarbons	92	1800	1800000	35000000
C9-C12 Aliphatic Hydrocarbons	140	2800	95000	1900000
C13-C18 Aliphatic Hydrocarbons	400	8000	640 J	13000 J
C9-C10 Aromatic Hydrocarbons	100	2000	1600	31000
Total TPH (C5-C24) ref to Gasoline	4000	80000	1500000	30000000
TPH (Diesel Range)	4000	80000	8300	170000

Client Sample ID: HH-OU1C-MW10SG(TO17B)

Lab ID#: 1110412-12A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	5.6	110

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: HH-OU1C-OTNS1(TO17A)

Lab ID#: 1110412-13A

No Detections Were Found.

Client Sample ID: HH-OU1C-OTNS1(TO17B)

Lab ID#: 1110412-14A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	4.2	85

Client Sample ID: HH-OU1C-MW22R(TO17A)

Lab ID#: 1110412-15A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	180	3600
Toluene	15	300	150	3000
Ethyl Benzene	17	340	190	3800
m,p-Xylene	17	340	220	4400
o-Xylene	17	340	79	1600
Hexane	14	280	14000 E	280000 E
C5-C8 Aliphatic Hydrocarbons	92	1800	980000	20000000
C9-C12 Aliphatic Hydrocarbons	140	2800	140000	2800000
C13-C18 Aliphatic Hydrocarbons	400	8000	5900 J	120000 J
C9-C10 Aromatic Hydrocarbons	100	2000	5400	110000
Total TPH (C5-C24) ref to Gasoline	4000	80000	1400000	29000000
TPH (Diesel Range)	4000	80000	36000	710000

Client Sample ID: HH-OU1C-MW22R(TO17B)

Lab ID#: 1110412-16A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	3.8	76
C5-C8 Aliphatic Hydrocarbons	23	460	46	930
Total TPH (C5-C24) ref to Gasoline	1000	20000	2000	39000

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: GASOLINE-EXHAUST (TO17A)

Lab ID#: 1110412-17A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	39	3900
Toluene	3.8	380	27	2700
Ethyl Benzene	4.3	430	14	1400
m,p-Xylene	4.3	430	11	1100
o-Xylene	4.3	430	4.6	460
Hexane	3.5	350	11	1100
C5-C8 Aliphatic Hydrocarbons	23	2300	340	34000
C9-C12 Aliphatic Hydrocarbons	35	3500	340 J	34000 J
Total TPH (C5-C24) ref to Gasoline	1000	100000	1600	160000
TPH (Diesel Range)	1000	100000	3100	310000

Client Sample ID: GASOLINE-EXHAUST (TO17B)

Lab ID#: 1110412-18A

No Detections Were Found.

Client Sample ID: DIESEL-EXHAUST (TO17A)

Lab ID#: 1110412-19A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	4.3	430
TPH (Diesel Range)	1000	100000	1600	160000

Client Sample ID: DIESEL-EXHAUST (TO17B)

Lab ID#: 1110412-20A

No Detections Were Found.

Client Sample ID: TRIP BLANK

Lab ID#: 1110412-21A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: TRIP BLANK

Lab ID#: 1110412-21A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
C9-C12 Aliphatic Hydrocarbons	35	700	64	1300

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(422)(TO17A)

Lab ID#: 1110412-01A

EPA METHOD TO-17

File Name:	**j102821**	**Date of Extraction: NA**	**Date of Collection: 10/14/11 10:31:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 09:02 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	4.6	91
Toluene	3.8	76	14	290
Ethyl Benzene	4.3	86	56	1100
m,p-Xylene	4.3	86	960	19000
o-Xylene	4.3	86	130	2700
Hexane	3.5	70	28	550
Naphthalene	2.0	40	6.0	120
C5-C8 Aliphatic Hydrocarbons	23	460	43000	850000
C9-C12 Aliphatic Hydrocarbons	35	700	30000 J	590000 J
C13-C18 Aliphatic Hydrocarbons	100	2000	180	3600
C9-C10 Aromatic Hydrocarbons	25	500	4600	92000
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	79000	1600000
TPH (Diesel Range)	1000	20000	55000	1100000

Air Sample Volume(L): 0.0500

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	149	50-150
Naphthalene-d8	136	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(422)(TO17B)

Lab ID#: 1110412-02A

EPA METHOD TO-17

File Name:	**j102730**	**Date of Extraction: NA**	**Date of Collection: 10/14/11 10:31:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 03:23 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	119	50-150
Naphthalene-d8	119	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(492)(TO17A)

Lab ID#: 1110412-03A

EPA METHOD TO-17

File Name:	**j102820**	**Date of Extraction: NA**	**Date of Collection: 10/14/11 10:50:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 08:26 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	6.5	130
Toluene	3.8	76	15	300
Ethyl Benzene	4.3	86	60	1200
m,p-Xylene	4.3	86	1000	20000
o-Xylene	4.3	86	150	3000
Hexane	3.5	70	25	500
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	44000	870000
C9-C12 Aliphatic Hydrocarbons	35	700	32000 J	640000 J
C13-C18 Aliphatic Hydrocarbons	100	2000	350	7000
C9-C10 Aromatic Hydrocarbons	25	500	5200	100000
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	80000	1600000
TPH (Diesel Range)	1000	20000	58000	1200000

Air Sample Volume(L): 0.0500

J = Estimated value due to bias in the CCV.

Q = Exceeds Quality Control limits, possibly due to matrix effects.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	154 Q	50-150
Naphthalene-d8	140	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(492)(TO17B)

Lab ID#: 1110412-04A

EPA METHOD TO-17

File Name:	**j102731**	**Date of Extraction: NA**	**Date of Collection: 10/14/11 10:50:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 03:59 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	119	50-150
Naphthalene-d8	128	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B59(388)(TO17A)

Lab ID#: 1110412-05A

EPA METHOD TO-17

File Name:	**j102819**	**Date of Extraction: NA**	**Date of Collection: 10/14/11 11:16:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 07:49 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	3.5	70
Toluene	3.8	76	7.8	160
Ethyl Benzene	4.3	86	4.6	91
m,p-Xylene	4.3	86	71	1400
o-Xylene	4.3	86	15	300
Hexane	3.5	70	5.8	120
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	6100	120000
C9-C12 Aliphatic Hydrocarbons	35	700	1900 J	38000 J
C13-C18 Aliphatic Hydrocarbons	100	2000	120	2400
C9-C10 Aromatic Hydrocarbons	25	500	380	7600
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	9200	180000
TPH (Diesel Range)	1000	20000	8700	170000

Air Sample Volume(L): 0.0500

J = Estimated value due to bias in the CCV.

Q = Exceeds Quality Control limits, possibly due to matrix effects.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	164 Q	50-150
Naphthalene-d8	126	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B59(388)(TO17B)

Lab ID#: 1110412-06A

EPA METHOD TO-17

File Name:	**j102729**	**Date of Extraction: NA**	**Date of Collection: 10/14/11 11:16:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 02:46 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	4.8	97
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	9.0	180
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	140	2800
C9-C12 Aliphatic Hydrocarbons	35	700	71 J	1400 J
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	113	50-150
Naphthalene-d8	126	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE#2(TO17A)

Lab ID#: 1110412-07A

EPA METHOD TO-17

File Name:	**j103129**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 8:45:00 AM**
Dil. Factor:	**4.00**		**Date of Analysis: 11/1/11 02:43 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	1300	3400	340000
Toluene	15	1500	>8000 S	>800000 S
Ethyl Benzene	17	1700	1900	190000
m,p-Xylene	17	1700	5700 E	570000 E
o-Xylene	17	1700	2200	220000
Hexane	14	1400	13000 E	1300000 E
Naphthalene	8.0	800	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	92	9200	160000	16000000
C9-C12 Aliphatic Hydrocarbons	140	14000	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	400	40000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	100	10000	3400	340000
C11-C16 Aromatic Hydrocarbons	400	40000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	4000	400000	200000	20000000
TPH (Diesel Range)	4000	400000	Not Detected	Not Detected

Air Sample Volume(L): 0.0100

S = Saturated peak; data reported as estimated.
E = Exceeds instrument calibration range.
UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	102	50-150
Naphthalene-d8	101	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE#2(TO17B)

Lab ID#: 1110412-08A

EPA METHOD TO-17

File Name:	**j102732**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 8:45:00 AM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 04:36 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	4.8	480
Toluene	3.8	380	Not Detected	Not Detected
Ethyl Benzene	4.3	430	Not Detected	Not Detected
m,p-Xylene	4.3	430	Not Detected	Not Detected
o-Xylene	4.3	430	Not Detected	Not Detected
Hexane	3.5	350	Not Detected	Not Detected
Naphthalene	2.0	200	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	2300	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	3500	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	10000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	2500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	10000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	100000	Not Detected	Not Detected
TPH (Diesel Range)	1000	100000	Not Detected	Not Detected

Air Sample Volume(L): 0.0100
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	106	50-150
Naphthalene-d8	102	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL#3(TO17A)

Lab ID#: 1110412-09A

EPA METHOD TO-17

File Name:	**j102824**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 8:46:00 AM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 10:52 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	28	2800
Toluene	3.8	380	140	14000
Ethyl Benzene	4.3	430	31	3100
m,p-Xylene	4.3	430	87	8700
o-Xylene	4.3	430	35	3500
Hexane	3.5	350	140	14000
Naphthalene	2.0	200	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	2300	4700	470000
C9-C12 Aliphatic Hydrocarbons	35	3500	1900 J	190000 J
C13-C18 Aliphatic Hydrocarbons	100	10000	780	78000
C9-C10 Aromatic Hydrocarbons	25	2500	230	23000
C11-C16 Aromatic Hydrocarbons	100	10000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	100000	11000	1100000
TPH (Diesel Range)	1000	100000	20000	2000000

Air Sample Volume(L): 0.0100

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	122	50-150
Naphthalene-d8	101	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL#3(TO17B)

Lab ID#: 1110412-10A

EPA METHOD TO-17

File Name:	**j102733**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 8:46:00 AM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 05:13 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	Not Detected	Not Detected
Toluene	3.8	380	Not Detected	Not Detected
Ethyl Benzene	4.3	430	Not Detected	Not Detected
m,p-Xylene	4.3	430	Not Detected	Not Detected
o-Xylene	4.3	430	Not Detected	Not Detected
Hexane	3.5	350	Not Detected	Not Detected
Naphthalene	2.0	200	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	2300	110	11000
C9-C12 Aliphatic Hydrocarbons	35	3500	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	10000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	2500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	10000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	100000	Not Detected	Not Detected
TPH (Diesel Range)	1000	100000	Not Detected	Not Detected

Air Sample Volume(L): 0.0100
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	107	50-150
Naphthalene-d8	106	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-MW10SG(TO17A)

Lab ID#: 1110412-11A

EPA METHOD TO-17

File Name:	**j103127**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 11:52:00 A**
Dil. Factor:	**4.00**		**Date of Analysis: 11/1/11 01:35 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	510	10000
Toluene	15	300	400	8000
Ethyl Benzene	17	340	400	8000
m,p-Xylene	17	340	290	5800
o-Xylene	17	340	85	1700
Hexane	14	280	26000 E	520000 E
Naphthalene	8.0	160	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	92	1800	1800000	35000000
C9-C12 Aliphatic Hydrocarbons	140	2800	95000	1900000
C13-C18 Aliphatic Hydrocarbons	400	8000	640 J	13000 J
C9-C10 Aromatic Hydrocarbons	100	2000	1600	31000
C11-C16 Aromatic Hydrocarbons	400	8000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	4000	80000	1500000	30000000
TPH (Diesel Range)	4000	80000	8300	170000

Air Sample Volume(L): 0.0500

E = Exceeds instrument calibration range.

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	116	50-150
Naphthalene-d8	140	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-MW10SG(TO17B)

Lab ID#: 1110412-12A

EPA METHOD TO-17

File Name:	**j102817**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 11:52:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 06:36 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	5.6	110
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	126	50-150
Naphthalene-d8	84	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-OTNS1(TO17A)

Lab ID#: 1110412-13A

EPA METHOD TO-17

File Name:	**j102816**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 11:10:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 05:59 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	116	50-150
Naphthalene-d8	75	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-OTNS1(TO17B)

Lab ID#: 1110412-14A

EPA METHOD TO-17

File Name:	**j102727**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 11:10:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 01:32 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	4.2	85
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	83	50-150
Naphthalene-d8	82	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-MW22R(TO17A)

Lab ID#: 1110412-15A

EPA METHOD TO-17

File Name:	**j103128**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 11:32:00 A**
Dil. Factor:	**4.00**		**Date of Analysis: 11/1/11 02:09 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	180	3600
Toluene	15	300	150	3000
Ethyl Benzene	17	340	190	3800
m,p-Xylene	17	340	220	4400
o-Xylene	17	340	79	1600
Hexane	14	280	14000 E	280000 E
Naphthalene	8.0	160	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	92	1800	980000	20000000
C9-C12 Aliphatic Hydrocarbons	140	2800	140000	2800000
C13-C18 Aliphatic Hydrocarbons	400	8000	5900 J	120000 J
C9-C10 Aromatic Hydrocarbons	100	2000	5400	110000
C11-C16 Aromatic Hydrocarbons	400	8000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	4000	80000	1400000	29000000
TPH (Diesel Range)	4000	80000	36000	710000

Air Sample Volume(L): 0.0500

E = Exceeds instrument calibration range.

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	53	50-150
Naphthalene-d8	119	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-MW22R(TO17B)

Lab ID#: 1110412-16A

EPA METHOD TO-17

File Name:	**j102822**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 11:32:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 09:39 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	3.8	76
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	46	930
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	2000	39000
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	121	50-150
Naphthalene-d8	98	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE-EXHAUST (TO17A)

Lab ID#: 1110412-17A

EPA METHOD TO-17

File Name:	**j102828**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 8:53:00 AM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/29/11 01:18 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	39	3900
Toluene	3.8	380	27	2700
Ethyl Benzene	4.3	430	14	1400
m,p-Xylene	4.3	430	11	1100
o-Xylene	4.3	430	4.6	460
Hexane	3.5	350	11	1100
Naphthalene	2.0	200	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	2300	340	34000
C9-C12 Aliphatic Hydrocarbons	35	3500	340 J	34000 J
C13-C18 Aliphatic Hydrocarbons	100	10000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	2500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	10000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	100000	1600	160000
TPH (Diesel Range)	1000	100000	3100	310000

Air Sample Volume(L): 0.0100

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	140	50-150
Naphthalene-d8	118	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE-EXHAUST (TO17B)

Lab ID#: 1110412-18A

EPA METHOD TO-17

File Name:	**j102734**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 8:53:00 AM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 05:50 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	Not Detected	Not Detected
Toluene	3.8	380	Not Detected	Not Detected
Ethyl Benzene	4.3	430	Not Detected	Not Detected
m,p-Xylene	4.3	430	Not Detected	Not Detected
o-Xylene	4.3	430	Not Detected	Not Detected
Hexane	3.5	350	Not Detected	Not Detected
Naphthalene	2.0	200	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	2300	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	3500	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	10000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	2500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	10000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	100000	Not Detected	Not Detected
TPH (Diesel Range)	1000	100000	Not Detected	Not Detected

Air Sample Volume(L): 0.0100
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	109	50-150
Naphthalene-d8	102	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL-EXHAUST (TO17A)

Lab ID#: 1110412-19A

EPA METHOD TO-17

File Name:	**j102825**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 8:59:00 AM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 11:29 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	4.3	430
Toluene	3.8	380	Not Detected	Not Detected
Ethyl Benzene	4.3	430	Not Detected	Not Detected
m,p-Xylene	4.3	430	Not Detected	Not Detected
o-Xylene	4.3	430	Not Detected	Not Detected
Hexane	3.5	350	Not Detected	Not Detected
Naphthalene	2.0	200	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	2300	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	3500	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	10000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	2500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	10000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	100000	Not Detected	Not Detected
TPH (Diesel Range)	1000	100000	1600	160000

Air Sample Volume(L): 0.0100
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	131	50-150
Naphthalene-d8	111	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL-EXHAUST (TO17B)

Lab ID#: 1110412-20A

EPA METHOD TO-17

File Name:	**j102728**	**Date of Extraction: NA**	**Date of Collection: 10/18/11 8:59:00 AM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 02:08 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	320	Not Detected	Not Detected
Toluene	3.8	380	Not Detected	Not Detected
Ethyl Benzene	4.3	430	Not Detected	Not Detected
m,p-Xylene	4.3	430	Not Detected	Not Detected
o-Xylene	4.3	430	Not Detected	Not Detected
Hexane	3.5	350	Not Detected	Not Detected
Naphthalene	2.0	200	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	2300	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	3500	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	10000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	2500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	10000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	100000	Not Detected	Not Detected
TPH (Diesel Range)	1000	100000	Not Detected	Not Detected

Air Sample Volume(L): 0.0100
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	120	50-150
Naphthalene-d8	120	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: TRIP BLANK

Lab ID#: 1110412-21A

EPA METHOD TO-17

File Name:	**j103113**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 04:30 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	64	1300
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	89	50-150
Naphthalene-d8	109	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110412-22A

EPA METHOD TO-17

File Name:	**j102709A**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 02:32 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500
Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	89	50-150
Naphthalene-d8	100	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110412-22B

EPA METHOD TO-17

File Name:	**j102813A**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 04:18 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500
Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	107	50-150
Naphthalene-d8	91	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110412-22C

EPA METHOD TO-17

File Name:	**j103112A**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 03:52 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	50-150
Naphthalene-d8	118	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV
Lab ID#: 1110412-23A
EPA METHOD TO-17

File Name:	**j102706**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 12:30 PM**

Compound	%Recovery
Benzene	92
Toluene	112
Ethyl Benzene	128
m,p-Xylene	125
o-Xylene	131 Q
Hexane	92
Naphthalene	78
C5-C8 Aliphatic Hydrocarbons	94
C9-C12 Aliphatic Hydrocarbons	138 Q
C13-C18 Aliphatic Hydrocarbons	65
C9-C10 Aromatic Hydrocarbons	143 Q
C11-C16 Aromatic Hydrocarbons	118
Total TPH (C5-C24) ref to Gasoline	93
TPH (Diesel Range)	100

Air Sample Volume(L): 1.00
Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	71	50-150
Naphthalene-d8	112	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV
Lab ID#: 1110412-23B
EPA METHOD TO-17

File Name:	**j102806**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 11:05 AM**

Compound	%Recovery
Benzene	84
Toluene	98
Ethyl Benzene	106
m,p-Xylene	106
o-Xylene	111
Hexane	108
Naphthalene	117
C5-C8 Aliphatic Hydrocarbons	108
C9-C12 Aliphatic Hydrocarbons	171 Q
C13-C18 Aliphatic Hydrocarbons	83
C9-C10 Aromatic Hydrocarbons	125
C11-C16 Aromatic Hydrocarbons	64
Total TPH (C5-C24) ref to Gasoline	100
TPH (Diesel Range)	109

Air Sample Volume(L): 1.00
Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	110	50-150
Naphthalene-d8	132	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV
Lab ID#: 1110412-23C
EPA METHOD TO-17

File Name:	**j103102**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 08:21 AM**

Compound	%Recovery
Benzene	77
Toluene	90
Ethyl Benzene	95
m,p-Xylene	95
o-Xylene	96
Hexane	90
Naphthalene	137 Q
C5-C8 Aliphatic Hydrocarbons	82
C9-C12 Aliphatic Hydrocarbons	121
C13-C18 Aliphatic Hydrocarbons	57 Q
C9-C10 Aromatic Hydrocarbons	106
C11-C16 Aromatic Hydrocarbons	95
Total TPH (C5-C24) ref to Gasoline	128
TPH (Diesel Range)	100

Air Sample Volume(L): 1.00
Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS
Lab ID#: 1110412-24A
EPA METHOD TO-17

File Name:	**j102707**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/27/11 01:05 PM**

Compound	%Recovery
Benzene	82
Toluene	122
Ethyl Benzene	134
m,p-Xylene	140
o-Xylene	140
Hexane	88
Naphthalene	123
C5-C8 Aliphatic Hydrocarbons	112
C9-C12 Aliphatic Hydrocarbons	138
C13-C18 Aliphatic Hydrocarbons	56
C9-C10 Aromatic Hydrocarbons	154 Q
C11-C16 Aromatic Hydrocarbons	153 Q

Air Sample Volume(L): 1.00
Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	82	50-150
Naphthalene-d8	125	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS
Lab ID#: 1110412-24B
EPA METHOD TO-17

File Name:	**j102807**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 11:52 AM**

Compound	%Recovery
Benzene	89
Toluene	126
Ethyl Benzene	130
m,p-Xylene	135
o-Xylene	128
Hexane	131
Naphthalene	112
C5-C8 Aliphatic Hydrocarbons	122
C9-C12 Aliphatic Hydrocarbons	146
C13-C18 Aliphatic Hydrocarbons	59
C9-C10 Aromatic Hydrocarbons	141
C11-C16 Aromatic Hydrocarbons	116

Air Sample Volume(L): 1.00
Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	115	50-150
Naphthalene-d8	131	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS
Lab ID#: 1110412-24C
EPA METHOD TO-17

File Name:	**j103105**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 11:35 AM**

Compound	%Recovery
Benzene	75
Toluene	120
Ethyl Benzene	127
m,p-Xylene	134
o-Xylene	132
Hexane	86
Naphthalene	137
C5-C8 Aliphatic Hydrocarbons	94
C9-C12 Aliphatic Hydrocarbons	134
C13-C18 Aliphatic Hydrocarbons	59
C9-C10 Aromatic Hydrocarbons	146
C11-C16 Aromatic Hydrocarbons	198 Q

Air Sample Volume(L): 1.00
Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	89	50-150
Naphthalene-d8	119	50-150

Air Toxics LTD.
Laboratory Services Since 1989

12/1/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name: HI DOH Vapor
Project #:
Workorder #: 1110433

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 10/20/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified TO-17 VI are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1110433

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	HI DOH Vapor
DATE RECEIVED:	10/20/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/23/2011		

FRACTION #	NAME	TEST
01A	HAFB-VP26-B05(18)(TO17A)	Modified TO-17 VI
02A	HAFB-VP26-B05(18)(TO17B)	Modified TO-17 VI
03A	HAFB-VP26-B05(24)(TO17A)	Modified TO-17 VI
04A	HAFB-VP26-B05(24)(TO17B)	Modified TO-17 VI
05A	HAFB-VP26-B07(20)(TO17A)	Modified TO-17 VI
06A	HAFB-VP26-B07(20)(TO17B)	Modified TO-17 VI
07A	HAFB-VP26-B07(25)(TO17A)	Modified TO-17 VI
08A	HAFB-VP26-B07(25)(TO17B)	Modified TO-17 VI
09A	HAFB-ST03-B58(347)(TO17A)	Modified TO-17 VI
10A	HAFB-ST03-B58(347)(TO17B)	Modified TO-17 VI
11A	TRIP BLANK	Modified TO-17 VI
12A	Lab Blank	Modified TO-17 VI
12B	Lab Blank	Modified TO-17 VI
13A	CCV	Modified TO-17 VI
13B	CCV	Modified TO-17 VI
14A	LCS	Modified TO-17 VI
14B	LCS	Modified TO-17 VI

CERTIFIED BY: Linda D. Fruman DATE: 12/01/11

Laboratory Director

Certfication numbers: AZ Licensure AZ0719, CA NELAP - 02110CA, LA NELAP - 02089,
NY NELAP - 11291, TX NELAP - T104704434-11-3, UT NELAP -CA009332011-1, WA NELAP - C935
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/11 , Expiration date: 06/30/12.
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
EPA Method TO-17
Tetra Tech EM, Inc.
Workorder# 1110433

Ten TO-17 VI Tube samples were received on October 20, 2011. The laboratory performed the analysis via EPA Method TO-17 using GC/MS in the full scan mode. TO-17 sorbent tubes are thermally desorbed onto a secondary trap. The trap is thermally desorbed to elute the components into the GC/MS system for further separation.

Receiving Notes

The samples arrived at the laboratory without a Chain of Custody (COC). The client subsequently provided the COC by e-mail on 10/21/11.

Analytical Notes

The samples were analyzed following MA DEP APH methodology with several modifications to accommodate the project requirements. Sorbent tubes were used for sample collection instead of canisters as specified by the method. Additionally, the GC column used for this extended MA APH range had a smaller film thickness than what was required by the MA APH method. This modification allowed for higher GC temperatures which were necessary to effectively extend the target compound range to C24. However, the column was unable to resolve several aliphatic calibration compounds from internal standard and target compounds. This required a slight modification in the specific hydrocarbons utilized to generate calibration factors for the C5-C8 aliphatic and C9-C12 aliphatic ranges. No significant impact on data quality is expected.

The aliphatic range C13-C18 recovered below the laboratory acceptance limits of 60-140% in the daily CCV analyzed on 10/31/11. Associated detections and non-detections were flagged to indicate a potential low bias. The C9-C12 Aliphatic range recovered above laboratory acceptance criterion for the CCV on 10/28/11. Associated detections were flagged as estimated values.

Due to severe hydrocarbon interference, the field surrogate Toluene-d8 could not be reliably quantified for samples HAFB-VP26-B05(18)(TO-17A), HAFB-VP26-B05(24)(TO-17A), HAFB-VP26-B07(20)(TO-17A), and HAFB-VP26-B07(25)(TO-17A). Recovery was reported as 0% and was flagged as outside laboratory criterion of 50-150%.

Additionally, the significant interference in sample HAFB-VP26-B05(24)(TO17A) resulted in poor recovery of the internal standard 1,4-Difluorobenzene. Recovery was below the method acceptance criterion of 50% with a recovery of 22%. Benzene is quantified using this internal standard and is J-flagged to indicate bias. Additionally Benzene and Hexane are saturated and significant matrix is interfering with accurate quantification. The S-flag indicates saturation and the M-flag indicates matrix. The TPH-gasoline is saturated as well.

TPH referenced to gasoline and Diesel were calculated using a single point calibration.

Each sample was collected with 2 tubes in series with the TO17A designation indicating the front, or sample side, of the train. The TO17B designation indicated the back side of the train to measure potential breakthrough of unretained compounds. Several back tubes had detections above the reporting limit; however, the detections were not indicative of breakthrough based on the chromatographic pattern.

Samples HAFB-VP26-B05(18)(TO-17A), HAFB-VP26-B05(24)(TO-17A), HAFB-VP26-B07(20)(TO-17A), and HAFB-VP26-B07(25)(TO-17A) were analyzed at a higher split than the calibration due to high concentrations. The split used resulted in a 4-fold dilution and the reporting limit and calibration range were raised accordingly.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV and/or LCS.

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: HAFB-VP26-B05(18)(TO17A)

Lab ID#: 1110433-01A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	780	16000
Ethyl Benzene	17	340	490	9800
m,p-Xylene	17	340	58	1200
o-Xylene	17	340	18	360
Hexane	14	280	31000 E	630000 E
C5-C8 Aliphatic Hydrocarbons	92	1800	610000	12000000
C9-C12 Aliphatic Hydrocarbons	140	2800	38000	750000
C9-C10 Aromatic Hydrocarbons	100	2000	460	9300
Total TPH (C5-C24) ref to Gasoline	4000	80000	940000	19000000

Client Sample ID: HAFB-VP26-B05(18)(TO17B)

Lab ID#: 1110433-02A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	6.1	120
m,p-Xylene	4.3	86	5.1	100
Total TPH (C5-C24) ref to Gasoline	1000	20000	1600	33000

Client Sample ID: HAFB-VP26-B05(24)(TO17A)

Lab ID#: 1110433-03A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	>31000 SMJ	>620000 SMJ
Toluene	15	300	1000	21000
Ethyl Benzene	17	340	260	5300
m,p-Xylene	17	340	210	4200
o-Xylene	17	340	28	560
Hexane	14	280	>56000 SM	>1100000 SM
C5-C8 Aliphatic Hydrocarbons	92	1800	3200000	64000000
C9-C12 Aliphatic Hydrocarbons	140	2800	22000	430000
C9-C10 Aromatic Hydrocarbons	100	2000	870	17000

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: HAFB-VP26-B05(24)(TO17A)

Lab ID#: 1110433-03A

Total TPH (C5-C24) ref to Gasoline	4000	80000	>1800000 S	>37000000 S

Client Sample ID: HAFB-VP26-B05(24)(TO17B)

Lab ID#: 1110433-04A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	5.7	110
m,p-Xylene	4.3	86	7.4	150
C5-C8 Aliphatic Hydrocarbons	23	460	160	3200
C9-C12 Aliphatic Hydrocarbons	35	700	310	6100
C9-C10 Aromatic Hydrocarbons	25	500	70	1400

Client Sample ID: HAFB-VP26-B07(20)(TO17A)

Lab ID#: 1110433-05A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	1700	35000
Ethyl Benzene	17	340	1400	27000
m,p-Xylene	17	340	50	990
Hexane	14	280	2900	59000
C5-C8 Aliphatic Hydrocarbons	92	1800	670000	13000000
C9-C12 Aliphatic Hydrocarbons	140	2800	8900	180000
C9-C10 Aromatic Hydrocarbons	100	2000	270	5400
Total TPH (C5-C24) ref to Gasoline	4000	80000	690000	14000000

Client Sample ID: HAFB-VP26-B07(20)(TO17B)

Lab ID#: 1110433-06A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
C5-C8 Aliphatic Hydrocarbons	23	460	62	1200

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Laboratory Services Since 1989

Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: HAFB-VP26-B07(25)(TO17A)

Lab ID#: 1110433-07A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	1100	22000
Toluene	15	300	640	13000
Ethyl Benzene	17	340	490	9800
m,p-Xylene	17	340	120	2500
o-Xylene	17	340	36	720
C5-C8 Aliphatic Hydrocarbons	92	1800	1500000	29000000
C9-C12 Aliphatic Hydrocarbons	140	2800	11000	220000
C9-C10 Aromatic Hydrocarbons	100	2000	260	5200
Total TPH (C5-C24) ref to Gasoline	4000	80000	1500000	29000000

Client Sample ID: HAFB-VP26-B07(25)(TO17B)

Lab ID#: 1110433-08A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	5.1	100

Client Sample ID: HAFB-ST03-B58(347)(TO17A)

Lab ID#: 1110433-09A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	4.0	81
Toluene	3.8	76	13	260
Ethyl Benzene	4.3	86	58	1200
m,p-Xylene	4.3	86	940	19000
o-Xylene	4.3	86	150	3000
Hexane	3.5	70	20	390
C5-C8 Aliphatic Hydrocarbons	23	460	42000	830000
C9-C12 Aliphatic Hydrocarbons	35	700	29000 J	580000 J
C13-C18 Aliphatic Hydrocarbons	100	2000	240	4800
C9-C10 Aromatic Hydrocarbons	25	500	5400	110000
Total TPH (C5-C24) ref to Gasoline	1000	20000	79000	1600000

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Summary of Detected Compounds
EPA METHOD TO-17

Client Sample ID: HAFB-ST03-B58(347)(TO17A)

Lab ID#: 1110433-09A

TPH (Diesel Range)	1000	20000	62000	1200000

Client Sample ID: HAFB-ST03-B58(347)(TO17B)

Lab ID#: 1110433-10A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	13	250
m,p-Xylene	4.3	86	8.8	180
Total TPH (C5-C24) ref to Gasoline	1000	20000	1300	26000

Client Sample ID: TRIP BLANK

Lab ID#: 1110433-11A

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	6.8	140
Total TPH (C5-C24) ref to Gasoline	1000	20000	1400	28000

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(18)(TO17A)

Lab ID#: 1110433-01A

EPA METHOD TO-17

File Name:	**j103132**	**Date of Extraction: NA**	**Date of Collection: 10/13/11 10:15:00 A**
Dil. Factor:	**4.00**		**Date of Analysis: 11/1/11 04:25 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	780	16000
Toluene	15	300	Not Detected	Not Detected
Ethyl Benzene	17	340	490	9800
m,p-Xylene	17	340	58	1200
o-Xylene	17	340	18	360
Hexane	14	280	31000 E	630000 E
Naphthalene	8.0	160	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	92	1800	610000	12000000
C9-C12 Aliphatic Hydrocarbons	140	2800	38000	750000
C13-C18 Aliphatic Hydrocarbons	400	8000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	100	2000	460	9300
C11-C16 Aromatic Hydrocarbons	400	8000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	4000	80000	940000	19000000
TPH (Diesel Range)	4000	80000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500

E = Exceeds instrument calibration range.
UJ = Non-detected compound associated with low bias in the CCV and/or LCS.
Q = Exceeds Quality Control limits.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	0 U Q	50-150
Naphthalene-d8	101	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(18)(TO17B)

Lab ID#: 1110433-02A

EPA METHOD TO-17

File Name:	**j103120**	**Date of Extraction: NA**	**Date of Collection: 10/13/11 10:15:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 09:34 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	6.1	120
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	5.1	100
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	1600	33000
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	90	50-150
Naphthalene-d8	114	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(24)(TO17A)

Lab ID#: 1110433-03A

EPA METHOD TO-17

File Name:	**j103131**	**Date of Extraction: NA**	**Date of Collection: 10/13/11 10:48:00 A**
Dil. Factor:	**4.00**		**Date of Analysis: 11/1/11 03:51 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	>31000 SMJ	>620000 SMJ
Toluene	15	300	1000	21000
Ethyl Benzene	17	340	260	5300
m,p-Xylene	17	340	210	4200
o-Xylene	17	340	28	560
Hexane	14	280	>56000 SM	>1100000 SM
Naphthalene	8.0	160	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	92	1800	3200000	64000000
C9-C12 Aliphatic Hydrocarbons	140	2800	22000	430000
C13-C18 Aliphatic Hydrocarbons	400	8000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	100	2000	870	17000
C11-C16 Aromatic Hydrocarbons	400	8000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	4000	80000	>1800000 S	>37000000 S
TPH (Diesel Range)	4000	80000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500

S = Saturated peak; data reported as estimated.
M = Reported value may be biased due to apparent matrix interferences.
UJ = Non-detected compound associated with low bias in the CCV and/or LCS.
Q = Exceeds Quality Control limits.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	0 U Q	50-150
Naphthalene-d8	106	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(24)(TO17B)

Lab ID#: 1110433-04A

EPA METHOD TO-17

File Name:	**j103116**	**Date of Extraction: NA**	**Date of Collection: 10/13/11 10:48:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 06:59 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	5.7	110
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	7.4	150
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	160	3200
C9-C12 Aliphatic Hydrocarbons	35	700	310	6100
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	25	500	70	1400
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	100	50-150
Naphthalene-d8	109	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(20)(TO17A)

Lab ID#: 1110433-05A

EPA METHOD TO-17

File Name:	**j103133**	**Date of Extraction: NA**	**Date of Collection: 10/13/11 11:30:00 A**
Dil. Factor:	**4.00**		**Date of Analysis: 11/1/11 04:59 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	1700	35000
Toluene	15	300	Not Detected	Not Detected
Ethyl Benzene	17	340	1400	27000
m,p-Xylene	17	340	50	990
o-Xylene	17	340	Not Detected	Not Detected
Hexane	14	280	2900	59000
Naphthalene	8.0	160	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	92	1800	670000	13000000
C9-C12 Aliphatic Hydrocarbons	140	2800	8900	180000
C13-C18 Aliphatic Hydrocarbons	400	8000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	100	2000	270	5400
C11-C16 Aromatic Hydrocarbons	400	8000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	4000	80000	690000	14000000
TPH (Diesel Range)	4000	80000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Q = Exceeds Quality Control limits.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	0 U Q	50-150
Naphthalene-d8	124	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(20)(TO17B)

Lab ID#: 1110433-06A

EPA METHOD TO-17

File Name:	**j102831**	**Date of Extraction: NA**	**Date of Collection: 10/13/11 11:30:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/29/11 03:07 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	62	1200
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500
Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	114	50-150
Naphthalene-d8	101	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(25)(TO17A)

Lab ID#: 1110433-07A

EPA METHOD TO-17

File Name:	**j103130**	**Date of Extraction: NA**	**Date of Collection: 10/13/11 11:52:00 A**
Dil. Factor:	**4.00**		**Date of Analysis: 11/1/11 03:17 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	13	260	1100	22000
Toluene	15	300	640	13000
Ethyl Benzene	17	340	490	9800
m,p-Xylene	17	340	120	2500
o-Xylene	17	340	36	720
Hexane	14	280	Not Detected	Not Detected
Naphthalene	8.0	160	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	92	1800	1500000	29000000
C9-C12 Aliphatic Hydrocarbons	140	2800	11000	220000
C13-C18 Aliphatic Hydrocarbons	400	8000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	100	2000	260	5200
C11-C16 Aromatic Hydrocarbons	400	8000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	4000	80000	1500000	29000000
TPH (Diesel Range)	4000	80000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Q = Exceeds Quality Control limits.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	0 U Q	50-150
Naphthalene-d8	107	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(25)(TO17B)

Lab ID#: 1110433-08A

EPA METHOD TO-17

File Name:	**j103121**	**Date of Extraction: NA**	**Date of Collection: 10/13/11 11:52:00 A**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 10:10 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	5.1	100
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	97	50-150
Naphthalene-d8	106	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(347)(TO17A)

Lab ID#: 1110433-09A

EPA METHOD TO-17

File Name:	**j102830**	**Date of Extraction: NA**	**Date of Collection: 10/14/11 9:47:00 AM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/29/11 02:31 AM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	4.0	81
Toluene	3.8	76	13	260
Ethyl Benzene	4.3	86	58	1200
m,p-Xylene	4.3	86	940	19000
o-Xylene	4.3	86	150	3000
Hexane	3.5	70	20	390
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	42000	830000
C9-C12 Aliphatic Hydrocarbons	35	700	29000 J	580000 J
C13-C18 Aliphatic Hydrocarbons	100	2000	240	4800
C9-C10 Aromatic Hydrocarbons	25	500	5400	110000
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	79000	1600000
TPH (Diesel Range)	1000	20000	62000	1200000

Air Sample Volume(L): 0.0500

J = Estimated value due to bias in the CCV.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	146	50-150
Naphthalene-d8	142	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(347)(TO17B)

Lab ID#: 1110433-10A

EPA METHOD TO-17

File Name:	**j103122**	**Date of Extraction: NA**	**Date of Collection: 10/14/11 9:47:00 AM**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 10:47 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	13	250
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	8.8	180
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	1300	26000
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	90	50-150
Naphthalene-d8	109	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: TRIP BLANK

Lab ID#: 1110433-11A

EPA METHOD TO-17

File Name:	**j103114**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 05:07 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	6.8	140
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	1400	28000
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: TO-17 VI Tube

Surrogates	%Recovery	Method Limits
Toluene-d8	112	50-150
Naphthalene-d8	147	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110433-12A

EPA METHOD TO-17

File Name:	**j102813**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 04:18 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected	Not Detected
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500
Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	107	50-150
Naphthalene-d8	91	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110433-12B

EPA METHOD TO-17

File Name:	**j103112**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 03:52 PM**

Compound	Rpt. Limit (ng)	Rpt. Limit (ug/m3)	Amount (ng)	Amount (ug/m3)
Benzene	3.2	64	Not Detected	Not Detected
Toluene	3.8	76	Not Detected	Not Detected
Ethyl Benzene	4.3	86	Not Detected	Not Detected
m,p-Xylene	4.3	86	Not Detected	Not Detected
o-Xylene	4.3	86	Not Detected	Not Detected
Hexane	3.5	70	Not Detected	Not Detected
Naphthalene	2.0	40	Not Detected	Not Detected
C5-C8 Aliphatic Hydrocarbons	23	460	Not Detected	Not Detected
C9-C12 Aliphatic Hydrocarbons	35	700	Not Detected	Not Detected
C13-C18 Aliphatic Hydrocarbons	100	2000	Not Detected UJ	Not Detected UJ
C9-C10 Aromatic Hydrocarbons	25	500	Not Detected	Not Detected
C11-C16 Aromatic Hydrocarbons	100	2000	Not Detected	Not Detected
Total TPH (C5-C24) ref to Gasoline	1000	20000	Not Detected	Not Detected
TPH (Diesel Range)	1000	20000	Not Detected	Not Detected

Air Sample Volume(L): 0.0500

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	98	50-150
Naphthalene-d8	118	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV
Lab ID#: 1110433-13A
EPA METHOD TO-17

File Name:	**j102806**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 11:05 AM**

Compound	%Recovery
Benzene	84
Toluene	98
Ethyl Benzene	106
m,p-Xylene	106
o-Xylene	111
Hexane	108
Naphthalene	117
C5-C8 Aliphatic Hydrocarbons	108
C9-C12 Aliphatic Hydrocarbons	171 Q
C13-C18 Aliphatic Hydrocarbons	83
C9-C10 Aromatic Hydrocarbons	125
C11-C16 Aromatic Hydrocarbons	65
Total TPH (C5-C24) ref to Gasoline	100
TPH (Diesel Range)	109

Air Sample Volume(L): 1.00
Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	110	50-150
Naphthalene-d8	132	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: CCV
Lab ID#: 1110433-13B
EPA METHOD TO-17

File Name:	**j103102**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 08:21 AM**

Compound	%Recovery
Benzene	77
Toluene	90
Ethyl Benzene	95
m,p-Xylene	95
o-Xylene	96
Hexane	90
Naphthalene	136
C5-C8 Aliphatic Hydrocarbons	82
C9-C12 Aliphatic Hydrocarbons	121
C13-C18 Aliphatic Hydrocarbons	57 Q
C9-C10 Aromatic Hydrocarbons	106
C11-C16 Aromatic Hydrocarbons	95
Total TPH (C5-C24) ref to Gasoline	128
TPH (Diesel Range)	100

Air Sample Volume(L): 1.00
Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS
Lab ID#: 1110433-14A
EPA METHOD TO-17

File Name:	**j102807**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/28/11 11:52 AM**

Compound	%Recovery
Benzene	89
Toluene	126
Ethyl Benzene	130
m,p-Xylene	135 Q
o-Xylene	128
Hexane	131 Q
Naphthalene	112
C5-C8 Aliphatic Hydrocarbons	122
C9-C12 Aliphatic Hydrocarbons	146
C13-C18 Aliphatic Hydrocarbons	59
C9-C10 Aromatic Hydrocarbons	141
C11-C16 Aromatic Hydrocarbons	116

Air Sample Volume(L): 1.00
Q = Exceeds Quality Control limits.
Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	115	50-150
Naphthalene-d8	131	50-150

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS
Lab ID#: 1110433-14B
EPA METHOD TO-17

File Name:	**j103105**	**Date of Extraction: NA**	**Date of Collection: NA**
Dil. Factor:	**1.00**		**Date of Analysis: 10/31/11 11:35 AM**

Compound	%Recovery
Benzene	75
Toluene	120
Ethyl Benzene	127
m,p-Xylene	134 Q
o-Xylene	132 Q
Hexane	86
Naphthalene	137
C5-C8 Aliphatic Hydrocarbons	94
C9-C12 Aliphatic Hydrocarbons	134
C13-C18 Aliphatic Hydrocarbons	59
C9-C10 Aromatic Hydrocarbons	146
C11-C16 Aromatic Hydrocarbons	198 Q

Air Sample Volume(L): 1.00
Q = Exceeds Quality Control limits.
Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	89	50-150
Naphthalene-d8	119	50-150

Air Toxics LTD.
Laboratory Services Since 1989

6/3/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name: Fishing Village
Project #:
Workorder #: 1105519C

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 5/26/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1945 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1105519C

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	Fishing Village
DATE RECEIVED:	05/26/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	06/03/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	FV-GP-01-HDOH	Modified ASTM D-1945	5.5 "Hg	15 psi
02A	FV-GP-06R-HDOH	Modified ASTM D-1945	4.5 "Hg	15 psi
03A	FV-GP-08-HDOH	Modified ASTM D-1945	2.0 "Hg	15 psi
04A	FV-GP-16R-HDOH	Modified ASTM D-1945	5.5 "Hg	15 psi
05A	FV-GP-17-HDOH	Modified ASTM D-1945	5.5 "Hg	15 psi
06A	G-IPB20-HDOH	Modified ASTM D-1945	6.5 "Hg	15 psi
07A	G-IPH11-HDOH	Modified ASTM D-1945	4.0 "Hg	15 psi
08A	G-IPL19-HDOH	Modified ASTM D-1945	5.0 "Hg	15 psi
09A	G-IP28-HDOH	Modified ASTM D-1945	9.5 "Hg	15 psi
10A	G-SG12-HDOH	Modified ASTM D-1945	4.0 "Hg	15 psi
11A	Lab Blank	Modified ASTM D-1945	NA	NA
11B	Lab Blank	Modified ASTM D-1945	NA	NA
12A	LCS	Modified ASTM D-1945	NA	NA
12AA	LCSD	Modified ASTM D-1945	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 06/03/11

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/11
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-1945
Tetra Tech EM, Inc.
Workorder# 1105519C

Ten 1 Liter Summa Canister (MA APH Certified) samples were received on May 26, 2011. The laboratory performed analysis via modified ASTM Method D-1945 for Methane and fixed gases in natural gas using GC/FID or GC/TCD. The method involves direct injection of 1.0 mL of sample.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	*ASTM D-1945*	*ATL Modifications*
Normalization	Sum of original values should not differ from 100.0% by more than 1.0%.	Sum of original values may range between 85-115%. Normalization of data not performed.
Sample analysis	Equilibrate samples to 20-50° F. above source temperature at field sampling	No heating of samples is performed.
Sample calculation	Response factor is calculated using peak height for C5 and lighter compounds.	Peak areas are used for all target analytes to quantitate concentrations.
Reference Standard	Concentration should not be < half of nor differ by more than 2 X the concentration of the sample. Run 2 consecutive checks; must agree within 1%.	A minimum 3-point linear calibration is performed. The acceptance criterion is %RSD </= 15%. All target analytes must be within the linear range of calibration (with the exception of O2, N2, and C6+ Hydrocarbons).
Sample Injection Volume	0.50 mL to achieve Methane linearity.	1.0 mL.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

Per client's request, the carbon range of C2-C4 was quantified based on the response factor of Methane.

Definition of Data Qualifying Flags

Six qualifiers may have been used on the data analysis sheets and indicate as follows:
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: FV-GP-01-HDOH

Lab ID#: 1105519C-01A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.025	4.1
Methane	0.00025	0.20

Client Sample ID: FV-GP-06R-HDOH

Lab ID#: 1105519C-02A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.024	2.6

Client Sample ID: FV-GP-08-HDOH

Lab ID#: 1105519C-03A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.022	3.6
Methane	0.00022	1.0

Client Sample ID: FV-GP-16R-HDOH

Lab ID#: 1105519C-04A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.025	1.5
Methane	0.00025	28

Client Sample ID: FV-GP-17-HDOH

Lab ID#: 1105519C-05A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.025	7.5
Methane	0.00025	8.4

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: G-IPB20-HDOH

Lab ID#: 1105519C-06A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.026	0.056

Client Sample ID: G-IPH11-HDOH

Lab ID#: 1105519C-07A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.023	28
Methane	0.00023	0.46

Client Sample ID: G-IPL19-HDOH

Lab ID#: 1105519C-08A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.024	0.092
Methane	0.00024	0.00027

Client Sample ID: G-IP28-HDOH

Lab ID#: 1105519C-09A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.030	3.8
Methane	0.00030	0.26

Client Sample ID: G-SG12-HDOH

Lab ID#: 1105519C-10A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.023	20

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP-01-HDOH

Lab ID#: 1105519C-01A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060129**	**Date of Collection: 5/19/11 10:55:00 AM**	
Dil. Factor:	**2.47**	**Date of Analysis: 6/1/11 05:07 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.025	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.025	4.1
Methane	0.00025	0.20

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP-06R-HDOH

Lab ID#: 1105519C-02A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060130**	**Date of Collection: 5/19/11 11:43:00 AM**	
Dil. Factor:	**2.38**	**Date of Analysis: 6/1/11 05:29 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.024	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.024	2.6
Methane	0.00024	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP-08-HDOH

Lab ID#: 1105519C-03A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060131**	**Date of Collection: 5/19/11 10:27:00 AM**	
Dil. Factor:	**2.16**	**Date of Analysis: 6/1/11 05:52 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.022	Not Detected
Helium	0.11	Not Detected
Carbon Dioxide	0.022	3.6
Methane	0.00022	1.0

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP-16R-HDOH

Lab ID#: 1105519C-04A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060132**	**Date of Collection: 5/19/11 9:41:00 AM**	
Dil. Factor:	**2.47**	**Date of Analysis: 6/1/11 06:15 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.025	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.025	1.5
Methane	0.00025	28

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP-17-HDOH

Lab ID#: 1105519C-05A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060133**	**Date of Collection: 5/19/11 11:24:00 AM**	
Dil. Factor:	**2.47**	**Date of Analysis: 6/1/11 06:37 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.025	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.025	7.5
Methane	0.00025	8.4

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IPB20-HDOH

Lab ID#: 1105519C-06A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060134**	**Date of Collection: 5/20/11 7:52:00 AM**	
Dil. Factor:	**2.58**	**Date of Analysis: 6/1/11 07:01 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.026	Not Detected
Helium	0.13	Not Detected
Carbon Dioxide	0.026	0.056
Methane	0.00026	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IPH11-HDOH

Lab ID#: 1105519C-07A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060135**	**Date of Collection: 5/20/11 7:37:00 AM**	
Dil. Factor:	**2.33**	**Date of Analysis: 6/1/11 07:28 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.023	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.023	28
Methane	0.00023	0.46

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IPL19-HDOH

Lab ID#: 1105519C-08A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060136**	**Date of Collection: 5/20/01 8:38:00 AM**	
Dil. Factor:	**2.42**	**Date of Analysis: 6/1/11 08:20 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.024	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.024	0.092
Methane	0.00024	0.00027

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-IP28-HDOH

Lab ID#: 1105519C-09A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060138**	**Date of Collection: 5/20/11 8:35:00 AM**	
Dil. Factor:	**2.96**	**Date of Analysis: 6/1/11 09:03 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.030	Not Detected
Helium	0.15	Not Detected
Carbon Dioxide	0.030	3.8
Methane	0.00030	0.26

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: G-SG12-HDOH

Lab ID#: 1105519C-10A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060139**	**Date of Collection: 5/20/11 9:21:00 AM**	
Dil. Factor:	**2.33**	**Date of Analysis: 6/1/11 09:37 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.023	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.023	20
Methane	0.00023	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1105519C-11A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060128**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/1/11 04:29 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.010	Not Detected
Carbon Dioxide	0.010	Not Detected
Methane	0.00010	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1105519C-11B

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060127b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/1/11 04:06 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.050	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1105519C-12A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060151**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/2/11 12:15 PM**	

Compound	%Recovery
Helium	94
Carbon Dioxide	103
Methane	98
Ethane	101
Ethene	99
Butane	101
Acetylene	95
Propane	95
Isobutane	101

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1105519C-12AA

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9060152**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/2/11 12:37 PM**	

Compound	%Recovery
Helium	95
Carbon Dioxide	102
Methane	97
Ethane	100
Ethene	98
Acetylene	93
Propane	94
Butane	99
Isobutane	99

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

6/16/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name: Aloha School Street
Project #:
Workorder #: 1106214C

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 6/9/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1945 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1106214C

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	Aloha School Street
DATE RECEIVED:	06/09/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	06/16/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	A-SV04-HDOH	Modified ASTM D-1945	3.0 "Hg	15 psi
02A	A-SV013-HDOH	Modified ASTM D-1945	3.5 "Hg	15 psi
03A	A-AS4-HDOH	Modified ASTM D-1945	1.5 "Hg	15 psi
04A	Diesel#1-HDOH	Modified ASTM D-1945	5.0 "Hg	15 psi
05A	Ambient#1-HDOH	Modified ASTM D-1945	4.5 "Hg	15 psi
06A	Lab Blank	Modified ASTM D-1945	NA	NA
06B	Lab Blank	Modified ASTM D-1945	NA	NA
07A	LCS	Modified ASTM D-1945	NA	NA
07AA	LCSD	Modified ASTM D-1945	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 06/16/11

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/11
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-1945
Tetra Tech EM, Inc.
Workorder# 1106214C

Five 1 Liter Summa Canister (MA APH Certified) samples were received on June 09, 2011. The laboratory performed analysis via modified ASTM Method D-1945 for Methane and fixed gases in natural gas using GC/FID or GC/TCD. The method involves direct injection of 1.0 mL of sample.

On the analytical column employed for this analysis, Oxygen coelutes with Argon. The corresponding peak is quantitated as Oxygen.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***ASTM D-1945***	***ATL Modifications***
Normalization	Sum of original values should not differ from 100.0% by more than 1.0%.	Sum of original values may range between 85-115%. Normalization of data not performed.
Sample analysis	Equilibrate samples to 20-50° F. above source temperature at field sampling	No heating of samples is performed.
Sample calculation	Response factor is calculated using peak height for C5 and lighter compounds.	Peak areas are used for all target analytes to quantitate concentrations.
Reference Standard	Concentration should not be < half of nor differ by more than 2 X the concentration of the sample. Run 2 consecutive checks; must agree within 1%.	A minimum 3-point linear calibration is performed. The acceptance criterion is %RSD </= 15%. All target analytes must be within the linear range of calibration (with the exception of O2, N2, and C6+ Hydrocarbons).
Sample Injection Volume	0.50 mL to achieve Methane linearity.	1.0 mL.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

Per client's request, the carbon range of C2-C4 was quantified based on the response factor of Methane.

Definition of Data Qualifying Flags

Six qualifiers may have been used on the data analysis sheets and indicate as follows:
J - Estimated value.

E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: A-SV04-HDOH

Lab ID#: 1106214C-01A

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.11	0.18
Carbon Dioxide	0.022	5.0

Client Sample ID: A-SV013-HDOH

Lab ID#: 1106214C-02A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.023	2.6

Client Sample ID: A-AS4-HDOH

Lab ID#: 1106214C-03A

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.11	2.0
Carbon Dioxide	0.021	1.1
Methane	0.00021	0.0012

Client Sample ID: Diesel#1-HDOH

Lab ID#: 1106214C-04A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.024	0.10

Client Sample ID: Ambient#1-HDOH

Lab ID#: 1106214C-05A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.024	0.040

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-SV04-HDOH

Lab ID#: 1106214C-01A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061022**	**Date of Collection: 6/3/11 8:15:00 AM**	
Dil. Factor:	**2.24**	**Date of Analysis: 6/10/11 04:59 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.022	Not Detected
Helium	0.11	0.18
Carbon Dioxide	0.022	5.0
Methane	0.00022	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-SV013-HDOH

Lab ID#: 1106214C-02A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061023**	**Date of Collection: 6/3/11 8:58:00 AM**	
Dil. Factor:	**2.29**	**Date of Analysis: 6/10/11 05:24 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.023	Not Detected
Helium	0.11	Not Detected
Carbon Dioxide	0.023	2.6
Methane	0.00023	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-AS4-HDOH

Lab ID#: 1106214C-03A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061024**	**Date of Collection: 6/3/11 8:44:00 AM**	
Dil. Factor:	**2.13**	**Date of Analysis: 6/10/11 05:45 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.021	Not Detected
Helium	0.11	2.0
Carbon Dioxide	0.021	1.1
Methane	0.00021	0.0012

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Diesel#1-HDOH

Lab ID#: 1106214C-04A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061025**	**Date of Collection: 6/3/11 2:09:00 PM**	
Dil. Factor:	**2.42**	**Date of Analysis: 6/10/11 06:06 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.024	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.024	0.10
Methane	0.00024	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Ambient#1-HDOH

Lab ID#: 1106214C-05A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061026**	**Date of Collection: 6/3/11 2:09:00 PM**	
Dil. Factor:	**2.38**	**Date of Analysis: 6/10/11 07:36 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.024	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.024	0.040
Methane	0.00024	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1106214C-06A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061006**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/11 08:29 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.010	Not Detected
Carbon Dioxide	0.010	Not Detected
Methane	0.00010	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1106214C-06B

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061005b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/11 08:06 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.050	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1106214C-07A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061002**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/11 06:43 AM**	

Compound	%Recovery
Helium	94
Carbon Dioxide	102
Methane	97
Ethane	99
Ethene	98
Butane	100
Acetylene	94
Propane	94
Isobutane	100

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1106214C-07AA

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061027**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/11 08:00 PM**	

Compound	%Recovery
Helium	94
Carbon Dioxide	102
Methane	98
Ethane	100
Ethene	99
Acetylene	95
Propane	95
Butane	101
Isobutane	101

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

6/28/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1106457C

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 6/21/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1945 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1106457C

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	06/21/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	06/28/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-VP26-B05(18)-HDOH	Modified ASTM D-1945	5.0 "Hg	15 psi
02A	HAFB-VP26-B05(24)-HDOH	Modified ASTM D-1945	5.0 "Hg	15 psi
03A	HAFB-VP26-B07(20)-HDOH	Modified ASTM D-1945	3.5 "Hg	15 psi
04A	HAFB-VP26-B07(25)-HDOH	Modified ASTM D-1945	3.5 "Hg	15 psi
05A	HAFB-VP26-B08(21)-HDOH	Modified ASTM D-1945	4.0 "Hg	15 psi
06A	Lab Blank	Modified ASTM D-1945	NA	NA
06B	Lab Blank	Modified ASTM D-1945	NA	NA
07A	LCS	Modified ASTM D-1945	NA	NA
07AA	LCSD	Modified ASTM D-1945	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 06/28/11

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/11
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-1945
Tetra Tech EM, Inc.
Workorder# 1106457C

Five 1 Liter Summa Canister (MA APH Certified) samples were received on June 21, 2011. The laboratory performed analysis via modified ASTM Method D-1945 for Methane and fixed gases in natural gas using GC/FID or GC/TCD. The method involves direct injection of 1.0 mL of sample.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	*ASTM D-1945*	*ATL Modifications*
Normalization	Sum of original values should not differ from 100.0% by more than 1.0%.	Sum of original values may range between 85-115%. Normalization of data not performed.
Sample analysis	Equilibrate samples to 20-50° F. above source temperature at field sampling	No heating of samples is performed.
Sample calculation	Response factor is calculated using peak height for C5 and lighter compounds.	Peak areas are used for all target analytes to quantitate concentrations.
Reference Standard	Concentration should not be < half of nor differ by more than 2 X the concentration of the sample. Run 2 consecutive checks; must agree within 1%.	A minimum 3-point linear calibration is performed. The acceptance criterion is %RSD </= 15%. All target analytes must be within the linear range of calibration (with the exception of O2, N2, and C6+ Hydrocarbons).
Sample Injection Volume	0.50 mL to achieve Methane linearity.	1.0 mL.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

Per client's request, the carbon range of C2-C4 was quantified based on the response factor of Methane.

Definition of Data Qualifying Flags

Six qualifiers may have been used on the data analysis sheets and indicate as follows:
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: HAFB-VP26-B05(18)-HDOH

Lab ID#: 1106457C-01A

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.12	0.16
Carbon Dioxide	0.024	11
Methane	0.00024	7.5

Client Sample ID: HAFB-VP26-B05(24)-HDOH

Lab ID#: 1106457C-02A

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.024	4.0
Carbon Dioxide	0.024	3.0
Methane	0.00024	50

Client Sample ID: HAFB-VP26-B07(20)-HDOH

Lab ID#: 1106457C-03A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.023	19
Methane	0.00023	11

Client Sample ID: HAFB-VP26-B07(25)-HDOH

Lab ID#: 1106457C-04A

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.023	0.24
Carbon Dioxide	0.023	11
Methane	0.00023	43

Client Sample ID: HAFB-VP26-B08(21)-HDOH

Lab ID#: 1106457C-05A

Compound	Rpt. Limit (%)	Amount (%)

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: HAFB-VP26-B08(21)-HDOH

Lab ID#: 1106457C-05A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.023	12
Methane	0.00023	0.086

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(18)-HDOH

Lab ID#: 1106457C-01A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9062410**	**Date of Collection: 6/16/11 11:44:00 AM**	
Dil. Factor:	**2.42**	**Date of Analysis: 6/24/11 11:06 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.024	Not Detected
Helium	0.12	0.16
Carbon Dioxide	0.024	11
Methane	0.00024	7.5

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(24)-HDOH

Lab ID#: 1106457C-02A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9062411**	**Date of Collection: 6/16/11 12:32:00 PM**	
Dil. Factor:	**2.42**	**Date of Analysis: 6/24/11 11:36 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.024	4.0
Helium	0.12	Not Detected
Carbon Dioxide	0.024	3.0
Methane	0.00024	50

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(20)-HDOH

Lab ID#: 1106457C-03A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9062412**	**Date of Collection: 6/16/11 12:42:00 PM**	
Dil. Factor:	**2.29**	**Date of Analysis: 6/24/11 12:04 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.023	Not Detected
Helium	0.11	Not Detected
Carbon Dioxide	0.023	19
Methane	0.00023	11

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(25)-HDOH

Lab ID#: 1106457C-04A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9062413**	**Date of Collection: 6/16/11 1:25:00 PM**	
Dil. Factor:	**2.29**	**Date of Analysis: 6/24/11 12:35 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.023	0.24
Helium	0.11	Not Detected
Carbon Dioxide	0.023	11
Methane	0.00023	43

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B08(21)-HDOH

Lab ID#: 1106457C-05A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9062414**	**Date of Collection: 6/16/11 11:18:00 AM**	
Dil. Factor:	**2.33**	**Date of Analysis: 6/24/11 01:01 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.023	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.023	12
Methane	0.00023	0.086

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1106457C-06A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9062405**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/24/11 07:55 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.010	Not Detected
Carbon Dioxide	0.010	Not Detected
Methane	0.00010	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1106457C-06B

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9062404b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/24/11 07:18 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.050	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1106457C-07A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9062402**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/24/11 06:30 AM**	

Compound	%Recovery
Helium	96
Carbon Dioxide	99
Methane	98
Ethane	100
Ethene	99
Butane	100
Acetylene	95
Propane	94
Isobutane	101

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1106457C-07AA

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9062434**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/24/11 09:48 PM**	

Compound	%Recovery
Helium	96
Carbon Dioxide	100
Methane	98
Ethane	101
Ethene	99
Propane	95
Butane	101
Acetylene	95
Isobutane	101

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

6/16/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name: Aloha School Street
Project #:
Workorder #: 1106214C

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 6/9/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1945 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1106214C

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	Aloha School Street
DATE RECEIVED:	06/09/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	06/16/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	A-SV04-HDOH	Modified ASTM D-1945	3.0 "Hg	15 psi
02A	A-SV013-HDOH	Modified ASTM D-1945	3.5 "Hg	15 psi
03A	A-AS4-HDOH	Modified ASTM D-1945	1.5 "Hg	15 psi
04A	Diesel#1-HDOH	Modified ASTM D-1945	5.0 "Hg	15 psi
05A	Ambient#1-HDOH	Modified ASTM D-1945	4.5 "Hg	15 psi
06A	Lab Blank	Modified ASTM D-1945	NA	NA
06B	Lab Blank	Modified ASTM D-1945	NA	NA
07A	LCS	Modified ASTM D-1945	NA	NA
07AA	LCSD	Modified ASTM D-1945	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 06/16/11

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/11
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-1945
Tetra Tech EM, Inc.
Workorder# 1106214C

Five 1 Liter Summa Canister (MA APH Certified) samples were received on June 09, 2011. The laboratory performed analysis via modified ASTM Method D-1945 for Methane and fixed gases in natural gas using GC/FID or GC/TCD. The method involves direct injection of 1.0 mL of sample.

On the analytical column employed for this analysis, Oxygen coelutes with Argon. The corresponding peak is quantitated as Oxygen.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***ASTM D-1945***	***ATL Modifications***
Normalization	Sum of original values should not differ from 100.0% by more than 1.0%.	Sum of original values may range between 85-115%. Normalization of data not performed.
Sample analysis	Equilibrate samples to 20-50° F. above source temperature at field sampling	No heating of samples is performed.
Sample calculation	Response factor is calculated using peak height for C5 and lighter compounds.	Peak areas are used for all target analytes to quantitate concentrations.
Reference Standard	Concentration should not be < half of nor differ by more than 2 X the concentration of the sample. Run 2 consecutive checks; must agree within 1%.	A minimum 3-point linear calibration is performed. The acceptance criterion is %RSD </= 15%. All target analytes must be within the linear range of calibration (with the exception of O2, N2, and C6+ Hydrocarbons).
Sample Injection Volume	0.50 mL to achieve Methane linearity.	1.0 mL.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

Per client's request, the carbon range of C2-C4 was quantified based on the response factor of Methane.

Definition of Data Qualifying Flags

Six qualifiers may have been used on the data analysis sheets and indicate as follows:
J - Estimated value.

E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: A-SV04-HDOH

Lab ID#: 1106214C-01A

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.11	0.18
Carbon Dioxide	0.022	5.0

Client Sample ID: A-SV013-HDOH

Lab ID#: 1106214C-02A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.023	2.6

Client Sample ID: A-AS4-HDOH

Lab ID#: 1106214C-03A

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.11	2.0
Carbon Dioxide	0.021	1.1
Methane	0.00021	0.0012

Client Sample ID: Diesel#1-HDOH

Lab ID#: 1106214C-04A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.024	0.10

Client Sample ID: Ambient#1-HDOH

Lab ID#: 1106214C-05A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.024	0.040

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-SV04-HDOH

Lab ID#: 1106214C-01A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061022**	**Date of Collection: 6/3/11 8:15:00 AM**	
Dil. Factor:	**2.24**	**Date of Analysis: 6/10/11 04:59 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.022	Not Detected
Helium	0.11	0.18
Carbon Dioxide	0.022	5.0
Methane	0.00022	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-SV013-HDOH

Lab ID#: 1106214C-02A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061023**	**Date of Collection: 6/3/11 8:58:00 AM**	
Dil. Factor:	**2.29**	**Date of Analysis: 6/10/11 05:24 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.023	Not Detected
Helium	0.11	Not Detected
Carbon Dioxide	0.023	2.6
Methane	0.00023	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: A-AS4-HDOH

Lab ID#: 1106214C-03A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061024**	**Date of Collection: 6/3/11 8:44:00 AM**	
Dil. Factor:	**2.13**	**Date of Analysis: 6/10/11 05:45 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.021	Not Detected
Helium	0.11	2.0
Carbon Dioxide	0.021	1.1
Methane	0.00021	0.0012

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Diesel#1-HDOH

Lab ID#: 1106214C-04A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061025**	**Date of Collection: 6/3/11 2:09:00 PM**	
Dil. Factor:	**2.42**	**Date of Analysis: 6/10/11 06:06 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.024	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.024	0.10
Methane	0.00024	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Ambient#1-HDOH

Lab ID#: 1106214C-05A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061026**	**Date of Collection: 6/3/11 2:09:00 PM**	
Dil. Factor:	**2.38**	**Date of Analysis: 6/10/11 07:36 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.024	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.024	0.040
Methane	0.00024	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1106214C-06A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061006**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/11 08:29 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.010	Not Detected
Carbon Dioxide	0.010	Not Detected
Methane	0.00010	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1106214C-06B

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061005b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/11 08:06 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.050	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1106214C-07A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061002**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/11 06:43 AM**	

Compound	%Recovery
Helium	94
Carbon Dioxide	102
Methane	97
Ethane	99
Ethene	98
Butane	100
Acetylene	94
Propane	94
Isobutane	100

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1106214C-07AA

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9061027**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 6/10/11 08:00 PM**	

Compound	%Recovery
Helium	94
Carbon Dioxide	102
Methane	98
Ethane	100
Ethene	99
Acetylene	95
Propane	95
Butane	101
Isobutane	101

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

8/2/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1107310C

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 7/19/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1945 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1107310C

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	07/19/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	08/02/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-ST03-B58 (347)	Modified ASTM D-1945	5.5"Hg	15 psi
02A	HAFB-ST03-B58 (422)	Modified ASTM D-1945	4.0"Hg	15 psi
03A	HAFB-ST03-B58 (492)	Modified ASTM D-1945	5.0"Hg	15 psi
04A	HAFB-ST03-B58 (388)	Modified ASTM D-1945	4.5"Hg	15 psi
05A	Lab Blank	Modified ASTM D-1945	NA	NA
05B	Lab Blank	Modified ASTM D-1945	NA	NA
06A	LCS	Modified ASTM D-1945	NA	NA
06AA	LCSD	Modified ASTM D-1945	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 08/02/11

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/11
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-1945
Tetra Tech EM, Inc.
Workorder# 1107310C

Four 1 Liter Summa Canister (MA APH Certified) samples were received on July 19, 2011. The laboratory performed analysis via modified ASTM Method D-1945 for Methane and fixed gases in natural gas using GC/FID or GC/TCD. The method involves direct injection of 1.0 mL of sample.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	*ASTM D-1945*	*ATL Modifications*
Normalization	Sum of original values should not differ from 100.0% by more than 1.0%.	Sum of original values may range between 85-115%. Normalization of data not performed.
Sample analysis	Equilibrate samples to 20-50° F. above source temperature at field sampling	No heating of samples is performed.
Sample calculation	Response factor is calculated using peak height for C5 and lighter compounds.	Peak areas are used for all target analytes to quantitate concentrations.
Reference Standard	Concentration should not be < half of nor differ by more than 2 X the concentration of the sample. Run 2 consecutive checks; must agree within 1%.	A minimum 3-point linear calibration is performed. The acceptance criterion is %RSD </= 15%. All target analytes must be within the linear range of calibration (with the exception of O2, N2, and C6+ Hydrocarbons).
Sample Injection Volume	0.50 mL to achieve Methane linearity.	1.0 mL.

Receiving Notes

The Chain of Custody (COC) information for samples HAFB-ST03-B58 (347) and HAFB-ST03-B58 (492) did not match the entries on the sample tags with regard to sample identification. Therefore the information on the COC was used to process and report the samples.

Analytical Notes

Per client's request, the carbon range of C2-C4 was quantified based on the response factor of Methane.

Definition of Data Qualifying Flags

Six qualifiers may have been used on the data analysis sheets and indicate as follows:
J - Estimated value.
E - Exceeds instrument calibration range.

S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: HAFB-ST03-B58 (347)

Lab ID#: 1107310C-01A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.025	5.5
Methane	0.00025	0.0011

Client Sample ID: HAFB-ST03-B58 (422)

Lab ID#: 1107310C-02A

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.12	19
Carbon Dioxide	0.023	4.0
Methane	0.00023	0.00065

Client Sample ID: HAFB-ST03-B58 (492)

Lab ID#: 1107310C-03A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.024	9.5
Methane	0.00024	0.042

Client Sample ID: HAFB-ST03-B58 (388)

Lab ID#: 1107310C-04A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.024	6.7
Methane	0.00024	0.0075

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58 (347)

Lab ID#: 1107310C-01A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9072219**	**Date of Collection: 7/14/11 10:47:00 AM**	
Dil. Factor:	**2.47**	**Date of Analysis: 7/22/11 04:15 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.025	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.025	5.5
Methane	0.00025	0.0011

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58 (422)

Lab ID#: 1107310C-02A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9072222**	**Date of Collection: 7/14/11 11:00:00 AM**	
Dil. Factor:	**2.33**	**Date of Analysis: 7/22/11 05:31 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.023	Not Detected
Helium	0.12	19
Carbon Dioxide	0.023	4.0
Methane	0.00023	0.00065

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58 (492)

Lab ID#: 1107310C-03A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9072223**	**Date of Collection: 7/14/11 11:55:00 AM**	
Dil. Factor:	**2.42**	**Date of Analysis: 7/22/11 05:53 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.024	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.024	9.5
Methane	0.00024	0.042

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58 (388)

Lab ID#: 1107310C-04A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9072224**	**Date of Collection: 7/14/11 12:08:00 PM**	
Dil. Factor:	**2.38**	**Date of Analysis: 7/22/11 06:31 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.024	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.024	6.7
Methane	0.00024	0.0075

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1107310C-05A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9072206**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/22/11 10:35 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.010	Not Detected
Carbon Dioxide	0.010	Not Detected
Methane	0.00010	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1107310C-05B

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9072205b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/22/11 10:13 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.050	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1107310C-06A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9072202**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/22/11 08:51 AM**	

Compound	%Recovery
Helium	94
Carbon Dioxide	100
Methane	100
Ethane	103
Ethene	102
Butane	104
Acetylene	98
Propane	98
Isobutane	104

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1107310C-06AA

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9072227**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 7/22/11 07:59 PM**	

Compound	%Recovery
Helium	95
Carbon Dioxide	100
Methane	101
Ethane	104
Ethene	102
Acetylene	98
Propane	98
Butane	104
Isobutane	104

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

9/9/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1108544C

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 8/26/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1945 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1108544C

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	08/26/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	09/09/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HDOH-GASOLINE#1	Modified ASTM D-1945	4.5 "Hg	15 psi
02A	HDOH-DIESEL#2	Modified ASTM D-1945	4.0 "Hg	15 psi
03A	Lab Blank	Modified ASTM D-1945	NA	NA
03B	Lab Blank	Modified ASTM D-1945	NA	NA
04A	LCS	Modified ASTM D-1945	NA	NA
04AA	LCSD	Modified ASTM D-1945	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 09/09/11

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/11
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-1945
Tetra Tech EM, Inc.
Workorder# 1108544C

Two 1 Liter Summa Canister (MA APH Certified) samples were received on August 26, 2011. The laboratory performed analysis via modified ASTM Method D-1945 for Methane and fixed gases in natural gas using GC/FID or GC/TCD. The method involves direct injection of 1.0 mL of sample.

On the analytical column employed for this analysis, Oxygen coelutes with Argon. The corresponding peak is quantitated as Oxygen.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***ASTM D-1945***	***ATL Modifications***
Normalization	Sum of original values should not differ from 100.0% by more than 1.0%.	Sum of original values may range between 85-115%. Normalization of data not performed.
Sample analysis	Equilibrate samples to 20-50° F. above source temperature at field sampling	No heating of samples is performed.
Sample calculation	Response factor is calculated using peak height for C5 and lighter compounds.	Peak areas are used for all target analytes to quantitate concentrations.
Reference Standard	Concentration should not be < half of nor differ by more than 2 X the concentration of the sample. Run 2 consecutive checks; must agree within 1%.	A minimum 3-point linear calibration is performed. The acceptance criterion is %RSD </= 15%. All target analytes must be within the linear range of calibration (with the exception of O2, N2, and C6+ Hydrocarbons).
Sample Injection Volume	0.50 mL to achieve Methane linearity.	1.0 mL.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Six qualifiers may have been used on the data analysis sheets and indicate as follows:
J - Estimated value.

E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: HDOH-GASOLINE#1

Lab ID#: 1108544C-01A

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.024	44
Carbon Dioxide	0.024	0.080
Methane	0.00024	0.015

Client Sample ID: HDOH-DIESEL#2

Lab ID#: 1108544C-02A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.049	0.053

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HDOH-GASOLINE#1

Lab ID#: 1108544C-01A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9090217**	**Date of Collection: 8/25/11 10:30:00 AM**	
Dil. Factor:	**2.38**	**Date of Analysis: 9/2/11 06:13 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.024	44
Helium	0.12	Not Detected
Carbon Dioxide	0.024	0.080
Methane	0.00024	0.015

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HDOH-DIESEL#2

Lab ID#: 1108544C-02A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9090216**	**Date of Collection:**	**8/25/11 10:30:00 AM**
Dil. Factor:	**4.87**	**Date of Analysis:**	**9/2/11 05:45 PM**

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.049	Not Detected
Helium	0.24	Not Detected
Carbon Dioxide	0.049	0.053
Methane	0.00049	Not Detected

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1108544C-03A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9090206**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 9/2/11 09:04 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.010	Not Detected
Carbon Dioxide	0.010	Not Detected
Methane	0.00010	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1108544C-03B

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9090205b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 9/2/11 08:42 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.050	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1108544C-04A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9090202**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 9/2/11 06:54 AM**	

Compound	%Recovery
Helium	93
Carbon Dioxide	101
Methane	99

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1108544C-04AA

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9090225**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 9/2/11 10:36 PM**	

Compound	%Recovery
Helium	93
Carbon Dioxide	101
Methane	102

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

8/26/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1108300C

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 8/15/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1945 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1108300C

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	08/15/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	08/26/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HH-OUIC-MW10SG	Modified ASTM D-1945	4.0 "Hg	15 psi
02A	HH-OUIC-MW22R	Modified ASTM D-1945	5.0 "Hg	15 psi
03A	HH-OUIC-OTNS1	Modified ASTM D-1945	3.2 "Hg	15 psi
04A	Lab Blank	Modified ASTM D-1945	NA	NA
04B	Lab Blank	Modified ASTM D-1945	NA	NA
05A	LCS	Modified ASTM D-1945	NA	NA
05AA	LCSD	Modified ASTM D-1945	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 08/26/11

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763,
NY NELAP - 11291, UT NELAP - 9166389892, AZ Licensure AZ0719
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/09, Expiration date: 06/30/11
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-1945
Tetra Tech EM, Inc.
Workorder# 1108300C

Three 1 Liter Summa Canister (MA APH Certified) samples were received on August 15, 2011. The laboratory performed analysis via modified ASTM Method D-1945 for Methane and fixed gases in natural gas using GC/FID or GC/TCD. The method involves direct injection of 1.0 mL of sample.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	*ASTM D-1945*	*ATL Modifications*
Normalization	Sum of original values should not differ from 100.0% by more than 1.0%.	Sum of original values may range between 85-115%. Normalization of data not performed.
Sample analysis	Equilibrate samples to 20-50° F. above source temperature at field sampling	No heating of samples is performed.
Sample calculation	Response factor is calculated using peak height for C5 and lighter compounds.	Peak areas are used for all target analytes to quantitate concentrations.
Reference Standard	Concentration should not be < half of nor differ by more than 2 X the concentration of the sample. Run 2 consecutive checks; must agree within 1%.	A minimum 3-point linear calibration is performed. The acceptance criterion is %RSD </= 15%. All target analytes must be within the linear range of calibration (with the exception of O2, N2, and C6+ Hydrocarbons).
Sample Injection Volume	0.50 mL to achieve Methane linearity.	1.0 mL.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

Per client's request, the carbon range of C2-C4 was quantified based on the response factor of Methane.

Definition of Data Qualifying Flags

Six qualifiers may have been used on the data analysis sheets and indicate as follows:
J - Estimated value.
E - Exceeds instrument calibration range.

S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: HH-OUIC-MW10SG

Lab ID#: 1108300C-01A

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.023	0.027
Carbon Dioxide	0.023	10
Methane	0.00023	16

Client Sample ID: HH-OUIC-MW22R

Lab ID#: 1108300C-02A

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.024	0.028
Carbon Dioxide	0.024	16
Methane	0.00024	42

Client Sample ID: HH-OUIC-OTNS1

Lab ID#: 1108300C-03A

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.11	0.31
Carbon Dioxide	0.023	2.4
Methane	0.00023	0.0019

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OUIC-MW10SG

Lab ID#: 1108300C-01A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9081807**	**Date of Collection: 8/11/11 2:03:00 PM**	
Dil. Factor:	**2.33**	**Date of Analysis: 8/18/11 08:58 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.023	0.027
Helium	0.12	Not Detected
Carbon Dioxide	0.023	10
Methane	0.00023	16

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OUIC-MW22R

Lab ID#: 1108300C-02A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9081808**	**Date of Collection: 8/11/11 1:38:00 PM**	
Dil. Factor:	**2.42**	**Date of Analysis: 8/18/11 09:25 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.024	0.028
Helium	0.12	Not Detected
Carbon Dioxide	0.024	16
Methane	0.00024	42

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OUIC-OTNS1

Lab ID#: 1108300C-03A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9081810**	**Date of Collection: 8/11/11 2:38:00 PM**	
Dil. Factor:	**2.26**	**Date of Analysis: 8/18/11 10:24 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.023	Not Detected
Helium	0.11	0.31
Carbon Dioxide	0.023	2.4
Methane	0.00023	0.0019

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1108300C-04A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9081805**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/17/11 09:43 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.010	Not Detected
Carbon Dioxide	0.010	Not Detected
Methane	0.00010	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1108300C-04B

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9081804b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/17/11 09:20 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.050	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1108300C-05A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9081802**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/17/11 08:36 PM**	

Compound	%Recovery
Helium	94
Carbon Dioxide	100
Methane	101
Ethane	104
Ethene	102
Butane	104
Acetylene	98
Propane	98
Isobutane	104

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1108300C-05AA

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9081829**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 8/18/11 07:09 PM**	

Compound	%Recovery
Helium	95
Carbon Dioxide	102
Methane	101
Ethane	104
Ethene	102
Acetylene	98
Propane	98
Butane	104
Isobutane	104

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

10/21/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1110160C

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 10/8/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1945 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1110160C

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/08/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	10/21/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-SP43-VMP10	Modified ASTM D-1945	5.2 "Hg	15psi
02A	HAFB-SP43-VMP11	Modified ASTM D-1945	5.0 "Hg	15psi
03A	HAFB-SP43-VMP12	Modified ASTM D-1945	4.5 "Hg	15psi
04A	HAFB-SP43-VMP16	Modified ASTM D-1945	6.0 "Hg	15psi
05A	HAFB-SP43-VMP17	Modified ASTM D-1945	5.5 "Hg	15psi
06A	FV-GP01-HDOH#2	Modified ASTM D-1945	4.0 "Hg	15psi
07A	FV-GP08-HDOH#2	Modified ASTM D-1945	5.0 "Hg	15psi
08A	FV-GP16R-HDOH#2	Modified ASTM D-1945	5.5 "Hg	15psi
09A	JP8#1	Modified ASTM D-1945	4.0 "Hg	15psi
10A	Lab Blank	Modified ASTM D-1945	NA	NA
10B	Lab Blank	Modified ASTM D-1945	NA	NA
11A	LCS	Modified ASTM D-1945	NA	NA
11AA	LCSD	Modified ASTM D-1945	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 10/21/11

Laboratory Director

Certfication numbers: AZ Licensure AZ0719, CA NELAP - 02110CA, LA NELAP - 02089,
NY NELAP - 11291, TX NELAP - T104704434-11-3, UT NELAP -CA009332011-1, WA NELAP - C935
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/11 , Expiration date: 06/30/12.
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-1945
Tetra Tech EM, Inc.
Workorder# 1110160C

Nine 1 Liter Summa Canister (MA APH Certified) samples were received on October 08, 2011. The laboratory performed analysis via modified ASTM Method D-1945 for Methane and fixed gases in natural gas using GC/FID or GC/TCD. The method involves direct injection of 1.0 mL of sample.

On the analytical column employed for this analysis, Oxygen coelutes with Argon. The corresponding peak is quantitated as Oxygen.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***ASTM D-1945***	***ATL Modifications***
Normalization	Sum of original values should not differ from 100.0% by more than 1.0%.	Sum of original values may range between 85-115%. Normalization of data not performed.
Sample analysis	Equilibrate samples to 20-50° F. above source temperature at field sampling	No heating of samples is performed.
Sample calculation	Response factor is calculated using peak height for C5 and lighter compounds.	Peak areas are used for all target analytes to quantitate concentrations.
Reference Standard	Concentration should not be < half of nor differ by more than 2 X the concentration of the sample. Run 2 consecutive checks; must agree within 1%.	A minimum 3-point linear calibration is performed. The acceptance criterion is %RSD </= 15%. All target analytes must be within the linear range of calibration (with the exception of O2, N2, and C6+ Hydrocarbons).
Sample Injection Volume	0.50 mL to achieve Methane linearity.	1.0 mL.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Six qualifiers may have been used on the data analysis sheets and indicate as follows:
J - Estimated value.

E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: HAFB-SP43-VMP10

Lab ID#: 1110160C-01A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.024	14
Methane	0.00024	57

Client Sample ID: HAFB-SP43-VMP11

Lab ID#: 1110160C-02A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.024	15
Methane	0.00024	5.0

Client Sample ID: HAFB-SP43-VMP12

Lab ID#: 1110160C-03A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.024	12
Methane	0.00024	0.0072

Client Sample ID: HAFB-SP43-VMP16

Lab ID#: 1110160C-04A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.025	12
Methane	0.00025	34

Client Sample ID: HAFB-SP43-VMP17

Lab ID#: 1110160C-05A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.025	15
Methane	0.00025	1.0

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: FV-GP01-HDOH#2

Lab ID#: 1110160C-06A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.023	7.0
Methane	0.00023	0.17

Client Sample ID: FV-GP08-HDOH#2

Lab ID#: 1110160C-07A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.024	4.1
Methane	0.00024	1.0

Client Sample ID: FV-GP16R-HDOH#2

Lab ID#: 1110160C-08A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.025	2.4
Methane	0.00025	43

Client Sample ID: JP8#1

Lab ID#: 1110160C-09A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.023	0.039
Methane	0.00023	0.00056

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP10

Lab ID#: 1110160C-01A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9101108**	**Date of Collection: 10/5/11 2:05:00 PM**	
Dil. Factor:	**2.44**	**Date of Analysis: 10/11/11 10:29 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.024	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.024	14
Methane	0.00024	57

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP11

Lab ID#: 1110160C-02A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9101113**	**Date of Collection: 10/5/11 1:15:00 PM**	
Dil. Factor:	**2.42**	**Date of Analysis: 10/11/11 01:20 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.024	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.024	15
Methane	0.00024	5.0

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP12

Lab ID#: 1110160C-03A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9101106**	**Date of Collection: 10/5/11 12:44:00 PM**	
Dil. Factor:	**2.38**	**Date of Analysis: 10/11/11 09:28 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.024	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.024	12
Methane	0.00024	0.0072

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP16

Lab ID#: 1110160C-04A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9101109**	**Date of Collection: 10/5/11 1:42:00 PM**	
Dil. Factor:	**2.52**	**Date of Analysis: 10/11/11 10:58 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.025	Not Detected
Helium	0.13	Not Detected
Carbon Dioxide	0.025	12
Methane	0.00025	34

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-SP43-VMP17

Lab ID#: 1110160C-05A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9101114**	**Date of Collection: 10/5/11 11:52:00 AM**	
Dil. Factor:	**2.47**	**Date of Analysis: 10/11/11 01:46 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.025	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.025	15
Methane	0.00025	1.0

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP01-HDOH#2

Lab ID#: 1110160C-06A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9101107**	**Date of Collection: 10/6/11 1:45:00 PM**	
Dil. Factor:	**2.33**	**Date of Analysis: 10/11/11 10:02 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.023	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.023	7.0
Methane	0.00023	0.17

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP08-HDOH#2

Lab ID#: 1110160C-07A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9101115**	**Date of Collection: 10/6/11 1:06:00 PM**	
Dil. Factor:	**2.42**	**Date of Analysis: 10/11/11 02:13 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.024	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.024	4.1
Methane	0.00024	1.0

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: FV-GP16R-HDOH#2

Lab ID#: 1110160C-08A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9101110**	**Date of Collection: 10/6/11 12:19:00 PM**	
Dil. Factor:	**2.47**	**Date of Analysis: 10/11/11 11:33 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.025	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.025	2.4
Methane	0.00025	43

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: JP8#1

Lab ID#: 1110160C-09A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9101112**	**Date of Collection: 10/6/11 3:15:00 PM**	
Dil. Factor:	**2.33**	**Date of Analysis: 10/11/11 12:32 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.023	Not Detected
Helium	0.12	Not Detected
Carbon Dioxide	0.023	0.039
Methane	0.00023	0.00056

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110160C-10A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9101105**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/11/11 08:45 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.010	Not Detected
Carbon Dioxide	0.010	Not Detected
Methane	0.00010	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110160C-10B

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9101104b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/11/11 08:02 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.050	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110160C-11A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9101102**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/11/11 07:08 AM**	

Compound	%Recovery
Helium	94
Carbon Dioxide	101
Methane	99
Ethane	101
Ethene	100
Propane	96
Butane	102
Acetylene	96
Isobutane	102

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1110160C-11AA

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9101124**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/11/11 06:40 PM**	

Compound	%Recovery
Helium	95
Carbon Dioxide	101
Methane	100
Ethane	102
Ethene	101
Acetylene	97
Propane	96
Isobutane	102
Butane	102

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

11/2/2011
Mr. Roger Brewer
Tetra Tech EM, Inc.
919 Ala Moana Blvd.
Room 206
Honolulu HI 96814

Project Name:
Project #:
Workorder #: 1110413D

Dear Mr. Roger Brewer

The following report includes the data for the above referenced project for sample(s) received on 10/20/2011 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1945 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

WORK ORDER #: 1110413D

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/20/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/02/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	HAFB-VP26-B05(18)	Modified ASTM D-1945	4.0 "Hg	5 psi
02A	HAFB-VP26-B05(24)	Modified ASTM D-1945	3.5 "Hg	5 psi
03A	HAFB-VP26-B07(20)	Modified ASTM D-1945	2.5 "Hg	5 psi
04A	HAFB-VP26-B07(25)	Modified ASTM D-1945	4.5 "Hg	5 psi
05A	HAFB-ST03-B58(347)	Modified ASTM D-1945	4.4 "Hg	5 psi
06A	HAFB-ST03-B58(422)	Modified ASTM D-1945	5.0 "Hg	5 psi
07A	HAFB-ST03-B58(492)	Modified ASTM D-1945	4.6 "Hg	5 psi
08A	HAFB-ST03-B59(388)	Modified ASTM D-1945	5.0 "Hg	5 psi
09A	HH-OU1C-MW10SG	Modified ASTM D-1945	6.0 "Hg	5 psi
10A	HH-OU1C-MW22R	Modified ASTM D-1945	5.4 "Hg	5 psi
11A	HH-OU1C-OTNS1	Modified ASTM D-1945	4.2 "Hg	5 psi
12A	GASOLINE#2	Modified ASTM D-1945	2.6 "Hg	5 psi
13A	DIESEL#3	Modified ASTM D-1945	3.2 "Hg	5 psi
14A	GASOLINE-EXHAUST	Modified ASTM D-1945	3.2 "Hg	5 psi
15A	DIESEL-EXHAUST	Modified ASTM D-1945	3.0 "Hg	5 psi
16A	Lab Blank	Modified ASTM D-1945	NA	NA
16B	Lab Blank	Modified ASTM D-1945	NA	NA

Continued on next page

Air Toxics LTD.
Laboratory Services Since 1989

WORK ORDER #: 1110413D

Work Order Summary

CLIENT:	Mr. Roger Brewer Hawaii State Dept. of Health 919 Ala Moana Blvd. Room 206 Honolulu, HI 96814	**BILL TO:**	Mr. Eric Jensen Tetra Tech EM, Inc. 737 Bishop Street Suite 3010 Honolulu, HI 96813
PHONE:	808-586-4328	**P.O. #**	1077200
FAX:	808-586-7537	**PROJECT #**	
DATE RECEIVED:	10/20/2011	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	11/02/2011		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
17A	LCS	Modified ASTM D-1945	NA	NA
17AA	LCSD	Modified ASTM D-1945	NA	NA

CERTIFIED BY: Linda D. Fruman DATE: 11/02/11

Laboratory Director

Certfication numbers: AZ Licensure AZ0719, CA NELAP - 02110CA, LA NELAP - 02089,
NY NELAP - 11291, TX NELAP - T104704434-11-3, UT NELAP -CA009332011-1, WA NELAP - C935
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/11 , Expiration date: 06/30/12.
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 95630
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
Modified ASTM D-1945
Tetra Tech EM, Inc.
Workorder# 1110413D

Fifteen 1 Liter Summa Canister (MA APH Certified) samples were received on October 20, 2011. The laboratory performed analysis via modified ASTM Method D-1945 for Methane and fixed gases in natural gas using GC/FID or GC/TCD. The method involves direct injection of 1.0 mL of sample.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***ASTM D-1945***	***ATL Modifications***
Normalization	Sum of original values should not differ from 100.0% by more than 1.0%.	Sum of original values may range between 85-115%. Normalization of data not performed.
Sample analysis	Equilibrate samples to 20-50° F. above source temperature at field sampling	No heating of samples is performed.
Sample calculation	Response factor is calculated using peak height for C5 and lighter compounds.	Peak areas are used for all target analytes to quantitate concentrations.
Reference Standard	Concentration should not be < half of nor differ by more than 2 X the concentration of the sample. Run 2 consecutive checks; must agree within 1%.	A minimum 3-point linear calibration is performed. The acceptance criterion is %RSD </= 15%. All target analytes must be within the linear range of calibration (with the exception of O2, N2, and C6+ Hydrocarbons).
Sample Injection Volume	0.50 mL to achieve Methane linearity.	1.0 mL.

Receiving Notes

The Chain of Custody (COC) information for sample HH-OU1C-MW22R and HH-OU1C-OTNS1 did not match the information on the canister with regard to canister identification. The client was notified of the discrepancy and the information on the canister was used to process and report the samples.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Six qualifiers may have been used on the data analysis sheets and indicate as follows:
J - Estimated value.

E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: HAFB-VP26-B05(18)

Lab ID#: 1110413D-01A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.016	15
Methane	0.00016	5.2

Client Sample ID: HAFB-VP26-B05(24)

Lab ID#: 1110413D-02A

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.015	3.6
Carbon Dioxide	0.015	3.7
Methane	0.00015	16

Client Sample ID: HAFB-VP26-B07(20)

Lab ID#: 1110413D-03A

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.015	0.034
Helium	0.073	0.22
Carbon Dioxide	0.015	17
Methane	0.00015	8.7

Client Sample ID: HAFB-VP26-B07(25)

Lab ID#: 1110413D-04A

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.016	0.36
Carbon Dioxide	0.016	11
Methane	0.00016	27

Client Sample ID: HAFB-ST03-B58(347)

Lab ID#: 1110413D-05A

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: HAFB-ST03-B58(347)

Lab ID#: 1110413D-05A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.016	6.5
Methane	0.00016	0.00086

Client Sample ID: HAFB-ST03-B58(422)

Lab ID#: 1110413D-06A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.016	9.9
Methane	0.00016	0.0014

Client Sample ID: HAFB-ST03-B58(492)

Lab ID#: 1110413D-07A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.016	11
Methane	0.00016	0.0018

Client Sample ID: HAFB-ST03-B59(388)

Lab ID#: 1110413D-08A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.021	6.0
Methane	0.00021	0.00031

Client Sample ID: HH-OU1C-MW10SG

Lab ID#: 1110413D-09A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.017	10
Methane	0.00017	11

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: HH-OU1C-MW22R

Lab ID#: 1110413D-10A

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.016	0.025
Carbon Dioxide	0.016	16
Methane	0.00016	38

Client Sample ID: HH-OU1C-OTNS1

Lab ID#: 1110413D-11A

Compound	Rpt. Limit (%)	Amount (%)
Helium	0.10	1.1
Carbon Dioxide	0.021	3.2
Methane	0.00021	0.00093

Client Sample ID: GASOLINE#2

Lab ID#: 1110413D-12A

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.015	0.18
Carbon Dioxide	0.015	0.043
Methane	0.00015	0.00067

Client Sample ID: DIESEL#3

Lab ID#: 1110413D-13A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.015	0.042
Methane	0.00015	0.00021

Client Sample ID: GASOLINE-EXHAUST

Lab ID#: 1110413D-14A

Compound	Rpt. Limit (%)	Amount (%)

Air Toxics LTD.
Laboratory Services Since 1989

Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

Client Sample ID: GASOLINE-EXHAUST

Lab ID#: 1110413D-14A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.015	4.6
Methane	0.00015	0.0022

Client Sample ID: DIESEL-EXHAUST

Lab ID#: 1110413D-15A

Compound	Rpt. Limit (%)	Amount (%)
Carbon Dioxide	0.015	0.27
Methane	0.00015	0.00021

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(18)

Lab ID#: 1110413D-01A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102417**	**Date of Collection: 10/13/11 10:12:00 A**	
Dil. Factor:	**1.55**	**Date of Analysis: 10/24/11 01:40 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.016	Not Detected
Helium	0.078	Not Detected
Carbon Dioxide	0.016	15
Methane	0.00016	5.2

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B05(24)

Lab ID#: 1110413D-02A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102410**	**Date of Collection: 10/13/11 10:46:00 A**	
Dil. Factor:	**1.52**	**Date of Analysis: 10/24/11 10:57 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.015	3.6
Helium	0.076	Not Detected
Carbon Dioxide	0.015	3.7
Methane	0.00015	16

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(20)

Lab ID#: 1110413D-03A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102411**	**Date of Collection: 10/13/11 11:23:00 A**	
Dil. Factor:	**1.46**	**Date of Analysis: 10/24/11 11:18 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.015	0.034
Helium	0.073	0.22
Carbon Dioxide	0.015	17
Methane	0.00015	8.7

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-VP26-B07(25)

Lab ID#: 1110413D-04A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102412**	**Date of Collection: 10/13/11 11:49:00 A**	
Dil. Factor:	**1.58**	**Date of Analysis: 10/24/11 11:43 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.016	0.36
Helium	0.079	Not Detected
Carbon Dioxide	0.016	11
Methane	0.00016	27

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(347)

Lab ID#: 1110413D-05A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102419**	**Date of Collection: 10/14/11 9:35:00 AM**	
Dil. Factor:	**1.57**	**Date of Analysis: 10/24/11 02:30 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.016	Not Detected
Helium	0.078	Not Detected
Carbon Dioxide	0.016	6.5
Methane	0.00016	0.00086

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(422)

Lab ID#: 1110413D-06A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102418**	**Date of Collection:**	**10/14/11 10:19:00 A**
Dil. Factor:	**1.61**	**Date of Analysis:**	**10/24/11 02:05 PM**

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.016	Not Detected
Helium	0.080	Not Detected
Carbon Dioxide	0.016	9.9
Methane	0.00016	0.0014

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B58(492)

Lab ID#: 1110413D-07A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102420**	**Date of Collection: 10/14/11 10:36:00 A**	
Dil. Factor:	**1.58**	**Date of Analysis: 10/24/11 02:54 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.016	Not Detected
Helium	0.079	Not Detected
Carbon Dioxide	0.016	11
Methane	0.00016	0.0018

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HAFB-ST03-B59(388)

Lab ID#: 1110413D-08A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102409**	**Date of Collection: 10/14/11 11:03:00 A**	
Dil. Factor:	**2.08**	**Date of Analysis: 10/24/11 10:25 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.021	Not Detected
Helium	0.10	Not Detected
Carbon Dioxide	0.021	6.0
Methane	0.00021	0.00031

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-MW10SG

Lab ID#: 1110413D-09A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102413**	**Date of Collection: 10/18/11 11:43:00 A**	
Dil. Factor:	**1.68**	**Date of Analysis: 10/24/11 12:06 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.017	Not Detected
Helium	0.084	Not Detected
Carbon Dioxide	0.017	10
Methane	0.00017	11

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-MW22R

Lab ID#: 1110413D-10A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102414**	**Date of Collection: 10/18/11 11:09:00 A**	
Dil. Factor:	**1.63**	**Date of Analysis: 10/24/11 12:30 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.016	0.025
Helium	0.082	Not Detected
Carbon Dioxide	0.016	16
Methane	0.00016	38

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: HH-OU1C-OTNS1

Lab ID#: 1110413D-11A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102421**	**Date of Collection: 10/18/11 10:31:00 A**	
Dil. Factor:	**2.09**	**Date of Analysis: 10/24/11 03:19 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.021	Not Detected
Helium	0.10	1.1
Carbon Dioxide	0.021	3.2
Methane	0.00021	0.00093

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE#2

Lab ID#: 1110413D-12A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102416**	**Date of Collection: 10/18/11 8:35:00 AM**	
Dil. Factor:	**1.47**	**Date of Analysis: 10/24/11 01:15 PM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.015	0.18
Helium	0.074	Not Detected
Carbon Dioxide	0.015	0.043
Methane	0.00015	0.00067

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL#3

Lab ID#: 1110413D-13A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102405**	**Date of Collection: 10/18/11 8:35:00 AM**	
Dil. Factor:	**1.50**	**Date of Analysis: 10/24/11 08:31 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.015	Not Detected
Helium	0.075	Not Detected
Carbon Dioxide	0.015	0.042
Methane	0.00015	0.00021

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: GASOLINE-EXHAUST

Lab ID#: 1110413D-14A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102407**	**Date of Collection: 10/18/11 8:50:00 AM**	
Dil. Factor:	**1.50**	**Date of Analysis: 10/24/11 09:36 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.015	Not Detected
Helium	0.075	Not Detected
Carbon Dioxide	0.015	4.6
Methane	0.00015	0.0022

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: DIESEL-EXHAUST

Lab ID#: 1110413D-15A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102408**	**Date of Collection: 10/18/11 8:45:00 AM**	
Dil. Factor:	**1.49**	**Date of Analysis: 10/24/11 10:00 AM**	

Compound	Rpt. Limit (%)	Amount (%)
C2-C4 Hydrocarbons ref. to Methane	0.015	Not Detected
Helium	0.074	Not Detected
Carbon Dioxide	0.015	0.27
Methane	0.00015	0.00021

Container Type: 1 Liter Summa Canister (MA APH Certified)

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110413D-16A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102404**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/24/11 08:07 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
C2-C4 Hydrocarbons ref. to Methane	0.010	Not Detected
Carbon Dioxide	0.010	Not Detected
Methane	0.00010	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: Lab Blank

Lab ID#: 1110413D-16B

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102403b**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/24/11 07:35 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.050	Not Detected

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCS

Lab ID#: 1110413D-17A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102402**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/24/11 07:03 AM**	

Compound	%Recovery
Helium	94
Carbon Dioxide	101
Methane	98
Ethane	101
Ethene	99
Propane	96
Butane	102
Acetylene	96
Isobutane	102

Container Type: NA - Not Applicable

Air Toxics LTD.
Laboratory Services Since 1989

Client Sample ID: LCSD

Lab ID#: 1110413D-17AA

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1945

File Name:	**9102429**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 10/24/11 06:27 PM**	

Compound	%Recovery
Helium	94
Carbon Dioxide	103
Methane	99
Ethane	102
Ethene	100
Acetylene	97
Propane	96
Isobutane	103
Butane	103

Container Type: NA - Not Applicable