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Hanford Tank Vapors COPCs Update

September 2016

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U.S. DEPARTMENT OF ENERGY

Prepared for the U.S. Department of Energy
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Summary

The identification of Chemicals of Potential Concerns (COPCs) in tank headspace vapors and the development of specific Occupational Exposure Limits (OELs) recommendations for these COPCs were completed over 10 years ago. The results were documented in a number of Pacific Northwest National Laboratory (PNNL) and Tank Operations Contractor reports, and a set of COPCs with corresponding Hanford tank farm OELs ($_{HTF}$OEL) were accepted for use. The establishment of COPCs was previously based on measured headspace concentrations, relative to available OELs for target vapor constituents.

In 2016, two parallel efforts were undertaken to revisit the COPC list and examine the basis for assigned $_{HTF}$OELs so the most current tank vapor data and health effects information are considered in updating the COPC list. This report documents analyses and recommendations on tank vapor COPCs. A companion report (PNNL-25790) documents updated health effects information for current COPCs.

An updated set of headspace sample analysis results for tank vapors and airborne emissions, including a range of operating conditions (i.e., quiescent, sluicing, tank transfers, etc.), were compared with historical data and used to prioritize COPCs. From over 1400 compounds evaluated, 88 were identified for further examination based on a comparison of reported maximum tank vapor concentrations to the screening values. Compounds with maxima to screening value ratios >1 qualified as potential additions, as did organic compounds that had been detected but lacked screening values. Most of the screening values were based either on 10% of the OEL, 10% of the AOEL,[1] or screening criteria used in the prior screening evaluation for developing most of the original COPC candidates in 2006 (if no OEL or AOEL had been identified).

Out of the 83 compounds that qualified as potential additions to the COPC list, three were flagged as strong candidates for new COPCs. These were cases where 1) the maximum exceeded the screening value, 2) the screening value was based on the set developed at Hanford in 2006 or a value used in U.S. practice, and 3) there was no obvious basis for screening them out. Such bases included misidentification in analysis, non-tank source, or chemical implausibility.

It is recommended that these three compounds—1-butanamine, N-butyl-N-nitroso; 2-propenal; and mercury, dimethyl—be added to the COPC list. The three compounds are shown in Table S-1 with their screening values, current maximum concentrations, and historical maximum concentrations.

Table S-1. Proposed New COPCs

Chemical	Screening Value (ppm)	Maximum (ppm)	Prior Maximum (ppm)
1-Butanamine, N-butyl-N-nitroso 924-16-3	0.00001[a]	0.00123	n/a
2-Propenal 107-02-8	0.01	0.084	0.00799
Mercury, dimethyl 593-74-8	0.00012	0.000172	0.0000268

[a] An $_{HTF}$OEL needs to be formally determined for this chemical

[1] "Acceptable OEL (AOEL)" refers to exposure action levels developed in 2006 for a subset of the COPCs that lacked established OELs (e.g., NIOSH, ACGIH). $_{HTF}$OELs are a combination of established OELs and AOELs.

These three compounds exceeded their screening levels because of new concentration measurements since 2006. One of the three COPC candidates, a nitrosobutanamine (CAS # 924-16-3), needs to have an $_{HTF}$OEL developed. Because the $_{HTF}$OELs of nitrosamines are typically below 1 ppb, this compound was considered to be a strong COPC candidate even though no formal $_{HTF}$OEL has yet been defined.

Another 34 compounds require Hanford tank farm exposure action levels to be developed by considering available health-related literature dealing with acute, bolus, chronic, and long-term exposure effects as well as an assessment of latent health effects related to the chemicals identified. After this evaluation is made, a decision can be made either to add them as COPCs or approve them for non-COPC status. Many of these compounds are hydrocarbons that lacked OELs. Their screening values were based on the NIOSH Recommended Exposure Limit for kerosene (100 mg/m^3). For comparison, the assessment of hydrocarbons conducted in 2006 studies used an OEL of 200 mg/m^3, based on the ACGIH TLV. Tetrahydrofuran is also part of this 34-compound set; its biological limit has decreased since 2006.

Biological limits may possibly have changed for other compounds since 2006, and these changes might not have been caught in this task because of the focus on using limits from 2006 studies. A more general review of updates to biological limits for all the tank vapor compounds is recommended.

Another nine compounds exceeded their screening values in the present study, though not in the 2006 studies, because this study used the maximum of individual measurements rather than the maximum of the average of measurements for each sample. This additional conservatism in selection of the maximum caused maxima for these nine compounds to be higher by a factor of two or less compared to the 2006 maxima. The concentration data for these nine compounds should be assessed to determine whether the data sets containing the maximum concentrations have any issues that would make it undesirable to base COPC status on the maximum of individual measurements rather than the maximum of averages. In addition, the size of the data sets providing the maxima for these compounds should be assessed to decide whether they are a sufficient basis. If the data are considered sufficient, these compounds should be considered potential additions to the COPC list.

Three more compounds that qualified as potential additions to the COPC list did so because of data that were suspect in some way; one of these three compounds was considered in 2006 but was considered not to qualify as a COPC. The maxima for all three of these compounds came from small data sets and should be further assessed to decide whether the quality of the data is adequate to justify adding them as COPCs, and whether decisions made in 2006 should be re-evaluated.

Finally, five existing COPCs, all furan derivatives, were found to be based completely on misidentified concentration data. A decision should be made regarding retention of these COPCs, because of the typically low OELs associated with furans, or whether they can be deleted from the list.

In summary, a total of 54 compounds are recommended for further assessment of some kind; of these, five (the furans) are current COPCs. The remaining 34 of the 88 compounds that were initially identified are not recommended for further consideration. The decision was made largely because the authors concur with decisions made in 2006 to approve these same chemicals for non-COPC status. The reasons included misidentifications, contamination of samples, compounds with chemical behaviors that made their presence implausible in tank headspaces, and compounds that are found in common, innocuous commercial products.

This report also makes recommendations toward improvements in analytical methodologies that may reduce misidentifications and sampling strategies to improve accuracy and time resolved maxima.

Objective

The objective of the Health Process Plan project is to define the strategy and to plan for regularly and rigorously reviewing and updating the tank vapors COPCs and corresponding occupational exposure limits where established, and/or proposing exposure action levels for those COPCs or mixtures of COPCs where no acceptable OELs exist. The approach is to build from the strategy and processes that form the foundation of the current industrial hygiene technical basis (RPP-22491, Rev. 1), and extend the assessments to include evolving issues and understanding of chronic exposure limits, transient/acute exposure limits, and COPC mixtures. The 2016 priority for this effort included revisiting the COPC list using the most current tank vapor data. Specifically, this effort included:

- Reviewing historical and current data on headspace and source sampling and analysis available using the Tank Waste Information Network System (TWINS) databases and the Site-Wide Industrial Hygiene Database (SWIHD), limited to headspace data only
- Reviewing the historical basis for COPC selection decisions made more than a decade ago
- Updating the COPC list, and identifying any additional tank vapor chemicals that should undergo further review and consideration as potential COPCs based on evolving tank vapor characterization and understanding
- Recommendations on future sampling and analysis to improve COPC identification.

Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
AOEL	Acceptable Occupational Exposure Limit. OELs developed for Hanford tank farm chemicals without existing regulatory guidelines.
CAS	Chemical Abstracts Service
COPC	Chemicals of Potential Concern
CORE™	Common Operating and Response Environment
DST	double-shell tank
FOUO	For Official Use Only
GC/MS	gas chromatography–mass spectrometry
HPP	Health Process Plan
$_{HTF}$OEL	Hanford Tank Farm Occupational Exposure Limit. An OEL or AOEL accepted for Hanford tank farm use.
IH	industrial hygiene
NIOSH	National Institute for Occupational Safety and Health
OEL	Occupational Exposure Limit. OELs established by government agencies (e.g., OSHA, NIOSH) or recommended by professional occupational and environmental health organizations (e.g., ACGIH).
OSHA	Occupational Safety and Health Administration
PAH	poly-aromatic hydrocarbon
PEL	Permissible Exposure Limit
PNNL	Pacific Northwest National Laboratory
REL	Recommended Exposure Limit
SST	single-shell tank
SWIHD	Site-Wide Industrial Hygiene Database
TLV	threshold limit values
TWA	Time-Weighted Average
TWINS	Tank Waste Information Network System

Contents

Tables

1.0 Introduction and Background

1.1 Defining a Process for Updating the COPCs

The process of defining possible new Chemicals of Potential Concern (COPCs) was based on comparing the maximum measured concentration (inside or outside the headspace) to the screening value, which is the vapor concentration above which potential adverse effects of exposures to the workers should be evaluated. A very similar approach was used by Poet et al. (2006). As noted in that study, screening values are intended to be 10% or less of an 8-hr time-weighted average Occupational Exposure Limit (OEL). Such a guideline is expected to be conservative to the extent that the maxima is an extreme value, rather than a typical value, and that the chemical is found in a relatively small number of tanks (or ventilation systems).

This section provides general descriptions of the procedures used to develop the list of headspace chemicals, specify their maximum headspace concentrations, and apply screening values for an initial review of both historical data (headspace data before 2005) and later data. The objective was to identify chemicals that might need to be added to the list of COPCs. This section also identifies the points at which there are procedural differences from the comprehensive study carried out by Poet et al. (1996).

1.2 Concentration Data

Headspace-characterization data and industrial-hygiene (IH) data—hereafter referred to as "TWINS HS" and "TWINS IH"—were obtained from the Tank Characterization Database via the Tank Waste Information Network System (TWINS). All headspace vapor analysis results for all single-shell and double-shell tanks, as well as "stack," "ventilation," "vent system," and the small tanks 241-ER-311 and 241-Z-361 were obtained via a TWINS query on June 20, 2016. More recent headspace data were also obtained from the Site-Wide Industrial Hygiene Database (SWIHD) by a query on July 12, 2016; this data set is referred to as "SWIHD HS."

For comparison, Poet et al. (2006) used only historical data from the TWINS HS database, which contains only data taken on or before March 6, 2005; their TWINS query was made on July 14, 2005. Their TWINS HS data set probably contained all the same data as the data set used for the present study; the final sampling date in the present set is March 6, 2005, which is 4 months before the Poet et al. query.

For the purpose of locating maximum concentrations, TWINS HS and TWINS IH data were eliminated if they were

- Quality Assurance samples (blanks, laboratory control samples, or spikes)
- Marked as suspect (Data Qualifier flag S)
- Associated with a contaminant in a blank, trip blank, or field blank (Data Qualifier flags B, T, or F)
- A laboratory control sample that was out of range (Data Qualifier flag a)
- An excessive relative percent difference (Data Qualifier flag c)
- Less than the Vapor Program Required Quantitation Limits (Data Qualifier flag Q)
- A tentatively identified chemical not detected in the sample (Data Qualifier flag M)
- Below the analytical reporting limit (Data Qualifier flag U)

- Marked with a laboratory-defined flag whose meaning was not generically defined and might indicate a serious data-quality issue (Data Qualifier flags L or Y).

The TWINS data exclusions were consistent with those applied by Poet et al. (2006) to TWINS HS data, except that the Y flag was added to the list of exclusions for the current study, based on information given in ATS-GD-1028, Rev. D-2 (the 222-S Laboratory Guidance Document). Flags a, c, and L were found only in the TWINS IH database, not in TWINS HS.

In addition, data with concentrations that exceeded 1,000,000 ppm were eliminated as unphysical. This step affected one N_2O datum and one CO_2 datum in the TWINS HS data set, and thus did not affect organic vapor data.

The exclusions for the SWIHD HS data set were similar:

- Having a laboratory control sample that was out of range (flag a)
- Associated with a contaminant in a blank (flags b or B)
- Having an excessive relative percent difference or relative standard deviation (flags c or d)
- Having an excessive difference between the sample result and its serial dilution (flag e)
- Having a failed mass spectrometer reading on the sample but not on its serial dilution (flag f)
- Below the analytical reporting limit (flag U)
- Marked with a laboratory-defined flag whose meaning was not generically defined and might indicate a serious data-quality issue (flags L or Y).

As in the previous study, TWINS HS results associated with chemicals that were ambiguously identified (e.g., “alkane,” “unknown,” “C6 ketone”) were deleted unless the molecular weight of one of the chemicals could be unambiguously specified (e.g., “octanenitrile and others” was kept). In these mixture cases, where the Chemical ID consisted of a Chemical Abstracts Service (CAS) number followed by M, the molecular weight of the identified chemical was added to the data record, the CAS number was used for the Chemical ID, and the concentration expressed in parts per million (absent from the downloaded database) was calculated from the concentration in milligrams per cubic meter at 25°C and the molecular weight.

The deletion rule for unknowns and mixtures was applied more stringently in the present study than in Poet et al. (2006), in that many unknown chemicals (Chemical IDs beginning with a letter, usually “U” or “M”) were deleted in this study. Poet et al had in some cases retained these: “Mixtures of two or more chemicals (e.g., “acetaldehyde and methanol”) were entered separately for each analyte, and each analyte was assumed to be at the reported concentration of the mixture.”

A number of chemicals in the TWINS IH data set had “needs conversion” notes in the concentration (mg/m^3 and ppm) columns, rather than numbers, and required calculations to supply these concentrations. The calculations made use of values already in the database: the molecular weight, the Reported Value and its units, and the Sample Volume and its units. A temperature of 25°C and a pressure of 1 atm were assumed.

Finally, the present study determined the maximum concentration over all the individual measurements made for each chemical; that is, for every unique CAS number found in any of the three databases. This approach gave higher (and more conservative) maxima for TWINS HS data than Poet et al. (2006) used. Their method included an averaging step before finding the maxima: according to Poet et al., “The

resulting data were averaged by sample device and laboratory for each day of sampling from a given source (tank, vent system, etc.). This process resulted in averaged individual sample results. The maximum averaged concentrations were then determined for each tank and ventilation system."

1.3 Screening Values

The present study is preliminary (i.e., a step toward identifying chemicals that may need to have OELs or AOELs accepted for Hanford tank farm use [$_{HTF}$OEL] identified or developed). Therefore, when possible toxicological criterion information was drawn from Poet et al. (2006), Poet and Timchalk (2006), and Meacham et al. (2006).

Where earlier data were not available for hydrocarbons, this study set screening values based on the current NIOSH Recommended Exposure Limit (REL) for kerosene, 100 mg/m^3. This approach is similar to that used by Meacham et al. (2006), who used the 200 mg/m^3 ACGIH TLV as the OEL for all hydrocarbons for which no specific OELs were found. In a few cases, the present study takes toxicological criteria from U.S. data sources that were publicly available on the Internet. It should be noted that a few chemicals were found whose current OELs, as found in public data sources, had changed since 2006.

The following sources of toxicological criteria were used to supply screening values in this study, in decreasing order of preference:

1. 10% of the $_{HTF}$OEL given for the chemicals presently on the 59-chemical COPC list
2. 10% of the OEL given in the SWIHD database
3. 10% of the acceptable OEL (AOEL) developed by Poet and Timchalk (2006)
4. 10% of the OEL given in Table C-5 of Meacham et al. (2006) as being an established U.S. OEL as of 2006
5. The screening value provided in Table 4 or Table A-16 of Poet et al. (2006)
6. A screening value developed for this preliminary study by searching online databases for the TLV-TWA, OSHA Permissible Exposure Limit (PEL), or NIOSH REL, and multiplying it by 10%
7. For hydrocarbons with no defined screening value, 10% of 100 mg/m^3.

Screening values assigned under items 6 and 7 in the list above are preliminary values and should be confirmed by toxicological review in a later phase of this study.

No attempt has been made to sum all the contributions of individual contributing chemicals in a sample to obtain a maximum for any "family" of chemicals (e.g., furans, alkanes, chlorinated biphenyls, etc). Only the maxima of individual chemicals have been considered.

2.0 Data Review and Recommended Additional COPCs

The ratio of maximum concentration (over all available data, not just headspace data) was calculated for all chemicals with unique CAS numbers. Any chemical with a ratio that exceeded unity was reviewed for suitability, considering how many observations were near or above the maxima and consulting earlier COPC studies to find out whether chemicals might have been misidentified or contaminants from laboratory equipment or handling (Meacham et al. 2006; Evans and Huckaby 2006; Huckaby 2006; Sklarew and Mitroshkov 2006). In general, the re-examination in this study resulted in concurrence with 2006 decisions to remove chemicals from the list of potential COPCs. The existing set of 59 COPCs also was reviewed to see if there were reasons to remove any chemicals.

Of the existing COPCs, 54 were found to have a good basis for inclusion when judged by the ratio of maxima to screening values. Among these chemicals, seven had new maximum concentrations based on measurements not included in the data set used by Poet et al. (2006). These are shown in Table 1. In this table, as in others in this section, the chemicals are given in decreasing order of the ratio of maximum to screening value.

Table 1. Existing COPCs with Maxima from New Data

Chemical	Screening Value (ppm)	Maximum (ppm)	Prior Maximum (ppm)	Notes
Methanamine, N-methyl-N-nitroso- 62-75-9	0.00003	1.1	0.214	TWINS IH: 09/21/10, C FARM, Inside Farm, C-111 COPC follow-up, data-quality code D.
Ethanamine, N-methyl-N-nitroso 10595-95-6	0.00003	0.0613	n/a	TWINS IH: 09/21/10, C FARM, Inside Farm, C-111 COPC follow-up, data-quality code D. No prior maximum; TWINS HS data were nondetects.
Mercury (elemental) 7439-97-6	0.0003	0.0555	0.0148	TWINS IH: 08/11/12, AN FARM, Primary Exhauster, AN-106 to AP-104 Transfer Stack Samples. No data quality code.
1,3-Butadiene 106-99-0	0.1	3.38	0.345	TWINS IH: 04/08/08, BY FARM, BY108, BY-108 COPC Sampling. No data quality code.
Ethanamine, N-ethyl-N-nitroso 55-18-5	0.00001	0.000327	n/a	TWINS IH: 08/16/12, AP FARM, Primary Exhauster, “AW106 to AP101 AP-Stack Sample During”. No data quality code. No prior maximum; TWINS HS data were nondetects.
Formaldehyde 50-00-0	0.03	0.272	0.0657	TWINS IH: 12/11/12, C FARM, C101, C-101 Retrieval COPC Sampling C Farm, no data quality code. The screening value is 10% of 0.3 ppm, one of the two OEL values given in SWIHD (the other is 0.75 ppm). For comparison, the OSHA PEL is 0.75 ppm TWA and the ACGIH TLV is a 0.3 ppm ceiling.
Ethanamine 75-04-7	0.5	0.828	0.049	TWINS IH: 11/11/05, AP FARM, Primary Exhauster, AP-Stack, data-quality code J.

Table 2 lists the five chemicals that are currently listed as COPCs, but for which there is questionable evidence. All of these chemicals are in the furan family; all had concentration measurements which were based on some degree of misidentification.

Table 2. Existing COPCs that could be Removed for Misidentification

Chemical	Screening Value (ppm)	Maximum (ppm)	Notes
Furan, 2-propyl- 4229-91-8	0.0001	0.654	According to PNNL-15673, Table 3, all six data points identified for this chemical were possible but unlikely ("can't rule it out"); HASQARD criteria were not met.
Furan, 2-heptyl- 3777-71-7	0.0001	0.0612	According to PNNL-15673, Table 3, the two data points identified for this chemical were low concentration and lacked spectral info to identify; HASQARD criteria were not met.
Furan, 2-octyl- 4179-38-8	0.0001	0.00087	According to PNNL-15673, Table 3, all four data points identified for this chemical were possible but unlikely ("can't rule it out"); HASQARD criteria were not met.
2-Propen-1-one, 3-(2-furanyl)-1-phenyl- 717-21-5	0.0001	0.00058	There was only one sample, in which this chemical was misidentified per Table 3, PNNL-15673.
Furan, 3-(1,1-dimethylethyl)-2,3-dihydro- 34314-82-4	0.0001	0.000532	According to PNNL-15673, Table 3, all four data points in which this chemical was identified were poor fits.

The three proposed new COPCs are listed in Table 3. Two of these COPCs have screening values based on U.S. OELs or OELs that are derived from Hanford practice, including those in the SWIHD. The third compound, N-butyl-N-nitroso-1-butanamine, has a screening value based on that of another nitrosamine that is a COPC. Although this compound does not have an established OEL, the low screening values for other nitrosamines strongly suggest that this one would not have a screening value high enough to disqualify the compound as a COPC candidate. For all three compounds, the COPC candidate status is based on new maxima provided by post-2006 measurements.

Table 4 shows another 34 chemicals that need to have their OELs established by toxicological review before a firm conclusion can be made about their potential as COPCs. Of these, 29 were categorized as hydrocarbons in 2006.

Table 3. Proposed New COPCs

Chemical	Screening Value (ppm)	Maximum (ppm)	Prior Maximum (ppm)	Notes
1-Butanamine, N-butyl-N-nitroso 924-16-3	0.00001	0.00123	n/a	New maximum is from 2010 TWINS IH data (01/25/10, C FARM, C104, C-104 Initial Waste Disturbing Activities COPCs, no data quality code). Four concentrations in 2009-2014 were above the detection limit and above the screening value of 0.00001 ppm, which is based on the screening value of nitrosodiethylamine, the closest surrogate. No prior maximum; TWINS HS data were non-detects. *NOTE: SWIHD OEL for this is 0.004 ppm, giving a factor of 40 higher screening value than for nitrosodiethylamine. A single point, the maximum, is above the higher SWIHD screening value.*
2-Propenal 107-02-8	0.01	0.084	0.00799	New maximum is from 2014 SWIHD HS data (12/18/14, AX Farm, AX-104, no data quality code); more than one measurement in the databases was above screening value, which came from an established U.S. OEL (Table C-5 of RPP-22491 R.1). The TWINS HS data maximum in PNNL-15640 was 0.008 ppm. *NOTE: the minimum detection limit shown in IH data is greater than the screening value.*
Mercury, dimethyl 593-74-8	0.00012	0.000172	0.0000268	New maximum is from 2016 TWINS IH data (02/09/16, 702-AZ, Stack, DMM Sampling for AP102 to AZ102 Transfer, no data quality code). Many other measurements in TWINS IH database are above or near the screening value (10% of current TLV-TWA, 0.01 mg/m^3 as Hg).

Table 4. Chemicals Proposed for Toxicological Review

Chemical	Screening Value (ppm)	Maximum (ppm)	Notes
Tridecane 629-50-5	1.3	80.4	The screening value is 10% of the NIOSH REL for kerosene (100 mg/m^3), applied to historical TWINS HS data. For comparison, the SWIHD OEL is equal to 200 mg/m^3.
Dodecane 112-40-3	1.4	82.1	The screening value is 10% of the NIOSH REL for kerosene (100 mg/m^3), applied to historical TWINS HS data. For comparison, the SWIHD OEL is equal to 200 mg/m^3.

Chemical	Screening Value (ppm)	Maximum (ppm)	Notes
Carbon disulfide 75-15-0	0.1	2.37	The current NIOSH REL is 1 ppm; the screening value is 10% of that, or 0.1 ppm. This maximum and three other historical data exceed 0.1 ppm; three are from 241-ER-311, which is not a double-shell tank (DST) or single-shell tank (SST), one is from C-103 (0.79 ppm). The 1 ppm REL also existed in 2006; RPP-22491 R.1 removed the chemical for being less than 10% of the TLV (OSHA PEL of 10 ppmv).
9H-Fluorene 86-73-7	0.0029	0.0625	There is only one measurement (1994 C-102, TWINS HS) for this PAH. The TLV-TWA for fluorene is 0.2 mg/m^3 in Sittig's Handbook (Sixth Edition); used 10% of this as screening value.
1,1`-Biphenyl, 2-methyl- 643-58-3	0.02	0.381	Used the same screening value as for 1,1'-biphenyl, which is a COPC. There were five total historical measurements (TWINS HS); the second high was 0.087 ppm.
Hexadecanoic acid, 1-methylethyl ester 142-91-6	0.0035	0.0578	Screening value from Table A-16 of PNNL-15640. More than a dozen historical data points from several different tanks exceeded the screening value of 0.0035 ppm. The historical maximum was in BY-108, three TWINS HS samples collected within 15 min of each other in same tank: 0.058, 0.028, 0.012 ppm; max over average of these three matches the ratio to the PNNL-15640 maximum of averages. Another point from TY-101, 0.039 ppm, fell within this range. There are no new data in TWINS IH or SWIHD HS databases. This chemical was listed in RPP-22491 R.1 as needing in-depth analysis, but no further discussion was found in that document.
Undecane 1120-21-4	1.5	20.5	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). More than 20 TWINS HS data points above screening value of 1.5 ppm; mostly C-103 in 1994, a few in C-102 in 2004.
Dodecane, 4,6-dimethyl- 61141-72-8	1.2	9.05	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Numerous historical TWINS HS measurements in several tanks. Of these, eight were above the screening value of 1.2 ppm: seven from C-103 on 5/17/94, one from BY-108 on 10/27/94.
Undecane, 2,6-dimethyl- 17301-23-4	1.3	6.85	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Numerous historical TWINS HS measurements in several tanks. Of these, eight were above the screening value of 1.3 ppm; all of these were from C-103 on the same date (5/17/94); the entire set exceeded the screening value.

Chemical	Screening Value (ppm)	Maximum (ppm)	Notes
Undecane, 2,10-dimethyl- 17301-27-8	1.3	5.99	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Numerous historical TWINS HS measurements in several tanks. Of these, seven were above the screening value of 1.3 ppm; all seven were from C-103 on the same date (5/17/94). One other measurement from the same sample did not exceed the screening value.
Dodecane, 2,6,11- trimethyl- 31295-56-4	1.1	5.05	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Numerous measurements from several tanks. However, the maximum (C-103 in 5/17/94) is more than 10 times the second high (different date and time), and the second high is less than the screening value.
Undecane, 2,4-dimethyl- 17312-80-0	1.3	5.54	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Numerous historical TWINS HS measurements in several tanks. However, only one point exceeds the screening value; this maximum is more than 6 times the second high; both the high and the second high were from C-103 on the same date, 5/17/94.
Heptadecane 629-78-7	1	4.05	Numerous historical TWINS HS measurements in several tanks. Of these, only one (C-103, 1994) was above the screening level of 1 ppm. The historical maximum is more than 50 times the second high. The screening value is 10% of the OEL in SWIHD, which is the same as the NIOSH REL for kerosene (100 mg/m^3).
Tridecane, 6-methyl- 13287-21-3	1.2	4.7	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Numerous historical TWINS HS measurements in many tanks. Of these, six were above the screening value of 1.2 ppm; all six were from the same eight-point data set, C-103 on 5/17/94.
Undecane, 2-methyl- 7045-71-8	1.4	5.22	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Maximum is from set of TWINS HS data taken 5/17/94, C-103; eight out of eight measurements were above screening value of 1.4 ppm.
1-Butene 106-98-9	4.3	14.8	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Maximum is from set of TWINS HS data taken 5/17/94, C-103; five out of nine measurements in the set were above or equal to screening value of 4.3 ppm.
Undecane, 3,7-dimethyl- 17301-29-0	1.3	4.08	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Numerous historical TWINS HS measurements in several tanks. Of these, seven were above the screening value of 1.3 ppm; all seven were from C-103 on the same date (5/17/94). One point in the data set from this sample did not exceed the screening value.

Chemical	Screening Value (ppm)	Maximum (ppm)	Notes
Naphthalene, decahydro-2-methyl- 2958-76-1	1.6	4.51	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Numerous historical TWINS HS measurements in several tanks. Of these, nine were above or equal to the screening value of 1.6 ppm; eight were from C-103 on 5/17/94, one from BY-108 on 10/27/94.
Decane, 2,4,6-trimethyl- 62108-27-4	1.3	3.59	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Sparse data; only six TWINS HS measurements from three tanks. Of these, two were above the screening value of 2 ppm; this was the whole set from C-103 on 5/17/94.
1-Propene, 2-methyl- 115-11-7	4.3	11.5	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Maximum is from set of TWINS HS data taken 5/17/94, C-103; only one measurement in the set of two was above screening value of 4.3 ppm, the other was a factor of 10 less.
Tridecane, 2-methyl- 1560-96-9	1.2	2.82	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Numerous historical TWINS HS measurements in many tanks. Of these, eight were above the screening value of 1.2 ppm; all of these were C-103 on the same date (5/17/94); the entire set exceeded the screening value.
Undecane, 3-methyl- 1002-43-3	1.4	3	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Maximum is from set of TWINS HS data taken 5/17/94, C-103; nine out of nine measurements were above screening value of 1.4 ppm. In addition, one measurement from C-101 equaled 1.4 ppm.
Dodecane, 4-methyl- 6117-97-1	1.3	2.67	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Numerous historical TWINS HS measurements in many tanks. Of these, seven were above the screening value of 1.3 ppm; all seven were from C-103 on 5/17/94.
Undecane, 4-methyl- 2980-69-0	1.4	2.36	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Maximum is from TWINS HS set of data taken 5/17/94, C-103; four out of five measurements in this set were above screening value of 1.4 ppm.
1-Hexene 592-41-6	2.9	4.61	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Maximum is from set of TWINS HS data taken 5/17/94, C-103; three out of five measurements in this data set were above screening value of 2.9 ppm.
Cyclotetradecane 295-17-0	1.2	1.93	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Maximum is from set of TWINS HS data taken 5/17/94, C-103; three out of three measurements were above screening value of 1.2 ppm.

Chemical	Screening Value (ppm)	Maximum (ppm)	Notes
Pentene, 2-methyl- 107-83-5	2.8	4.19	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Maximum is from set of TWINS HS data taken 10/27/94, BY-108; three out of three measurements in the set were above or equal to screening value of 2.8 ppm.
Furan, tetrahydro- 109-99-9	5	7.05	Maximum is from historical data. The OEL seems to have decreased since 2006: RPP-22491 R.1 (Table C.5) gave a PEL of 200 ppm, but the SWIHD database uses an OEL of 50 ppm. Current TLV-TWA is 50 ppm, OSHA PEL is 200 ppm. There were eight TWINS HS data points in same tank (C-103, 5/17/94) over 2.5 hrs, ranging smoothly from 7.0 to 3.7 ppm, with three points above 5 ppm. The tank with the next highest historical maximum was BY-108 with 3.4 ppm.
Tridecane, 3-methyl- 6418-41-3	1.2	1.48	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Of the historical data, three were above the screening value of 1.2 ppm; all three were from C-103 on 5/17/94; the entire data set was above the screening value.
Tridecane, 5-methyl- 25117-31-1	1.2	1.37	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Maximum is from set of TWINS HS data taken 5/17/94, C-103; only one measurement in the set, and only one in TWINS HS is above the screening value.
Tridecane, 7-methyl- 26730-14-3	1.2	1.33	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Maximum is from set of TWINS HS data taken 10/27/94, BY-108; only one measurement in the set, and only one in TWINS HS is above the screening value.
1-Pentene 109-67-1	3.4	3.65	Screening value is 10% of NIOSH REL for kerosene (100 mg/m^3). Maximum is from set of TWINS HS data taken 5/17/94, C-103; two out of six measurements in the set were above or equal to screening value of 3.4 ppm.
Tetradecane 629-59-4	20	20.4	Screening value used is 10% of SWIHD OEL. Many historical data points but only one above 20 ppm (from C-103 in 1993-1994); more than 40 points, from more than one tank, were above 1.2 ppm. *Note: the SWIHD OEL is about 20 times the NIOSH REL for kerosene (100 mg/m^3), which equates to 1.2 ppm.*
2-Butanone 78-93-3	20	19.9	Screening value is 10% of SWIHD OEL (which is the same as the OSHA PEL), applied to historical TWINS HS data. The maximum is very slightly less than the screening value, so this chemical is borderline. Numerous data points from numerous tanks, but only one equals 20 ppm. The only near-screening-value highs are in C-103 in 1994, but data from C-103 in 2004 were factor of 6 less.

Carbon disulfide was removed from the COPC list because it was found to be less than 10% of the OSHA PEL of 10 ppm (Meacham et al. 2006). However, the NIOSH REL is 1 ppm; at this level there are three historical measurements from tank 241-ER-311 and one from 241-C-103 that are greater than the corresponding screening value of 0.1 ppm. Because ER-311 is not an SST or a DST, the datum from C-103 may be the only one of concern.

Another nine chemicals, listed in Table 5, have maxima that are above the screening values in this study, though not in the 2006 study (Poet et al. 2006), only because the maximum of individual concentrations was used rather than the maximum of averages (as discussed in the preceding section). These were the only chemicals for which the maxima taken from historical TWINS HS data exceed the screening value solely because of the additional conservatism of using maximum individual values. This additional conservatism was less than a factor of two. These chemicals should be considered as potential COPCs, with assessment based partly on judgment of whether the maxima were outliers compared to the rest of the data set. The chemicals 2-nonanone and 4-octanone are the most plausible in this regard, with more than one concentration measurement above or near the screening value.

Table 5. Possible COPCs not identified in 2006 because Maxima were estimated by Averaging

Chemical	Screening Value (ppm)	Maximum (ppm)	Notes
4-Octanone 589-63-9	0.5	0.877	Screening value from PNNL-15640. TWINS HS maximum data set was six points within ~1 hr in same tank (5/17/94, C-103): 0.88, 0.45, 0.43, 0.40, 0.35, 0.29 ppm.
Benzoic acid, 4-(1,1-dimethylethyl)-, methyl ester 26537-19-9	0.00055	0.000932	Screening value from PNNL-15640. TWINS HS maximum data set was two data points, both in same tank (C-108 8/5/94) half an hour apart: 0.00093, 0.00012 ppm. Possible plasticizer contaminant – Table 3.1, PNNL-15646.
Hexane, 3-methoxy- 54658-01-4	0.05	0.0756	Screening value from PNNL-15640. TWINS HS maximum data set was three data points in same tank (BY-107, 10/26/94) within 15 min: 0.076, 0.032, 0.028 ppm.
Butanoic acid 107-92-6	1	1.48	Screening value from PNNL-15640. TWINS HS maximum data set was two data points in same tank (C-103, 5/17/94) within 1 hr: 1.48, 0.21 ppm.
Pyridine, 2,5-dimethyl- 589-93-5	0.02	0.0292	Screening value from PNNL-15640. TWINS HS maximum data set was three data points in one tank (C-104, 3/3/94) within 3 hr: 0.029, 0.015, 0.012 ppm.
2,5-Furandione, dihydro- 108-30-5	0.0025	0.00326	Screening value from PNNL-15640. TWINS HS maximum data set was two data points, both in same tank half an hour apart (SX-103, 3/23/95): 0.0033, 0.00072 ppm.
2-Nonanone 821-55-6	1.7	2.19	Screening value 10% of AOEL from PNNL-15736. TWINS HS maximum data set was eight data points in same tank (C-103, 5/17/94) over 2.5 hr, ranging smoothly from 2.2 to 1.2 ppm. 3 points were above 1.7 ppm.

Chemical	Screening Value (ppm)	Maximum (ppm)	Notes
1H-Pyrazole, 4,5-dihydro-5-methyl- 1568-20-3	0.02	0.0245	Screening value from PNNL-15640. TWINS HS maximum data set was six data points in one tank (U-106, 3/7/95) taken in about 15 min: 0.024, 0.015, 0.014 ppm, then three lower ones that were mixtures.
Cyclobutanone 1191-95-3	0.067	0.0671	Screening value 10% of AOEL from PNNL-15640. TWINS HS maximum data set was four data points in one tank within ~15 min (BY-104, 6/24/94): 0.067, 0.048, 0.038, 0.038 ppm.

The COPC status of three chemicals shown in Table 6 is unclear because of questions about the reliability of the historical (TWINS HS) data set for this chemical. Diethylmethylborane was not discussed in 2006 reports. It is highly reactive in humid environments; it was found in only a single measurement, as part of a mixture, which raises the possibility that it was misidentified. The compound 1,3-propanediol dinitrate was removed from the potential COPC list in 2006 (Meacham et al. 2006) because its presence in the single available measurement was questioned. However, other diols and diol nitrates have been observed in tank vapors; perhaps this particular chemical should be reconsidered in that light. In the case of dichloromethane, most of the measurements are flagged with E data-quality codes, meaning that the reported measurement was above the instrument calibration range.

Table 6. Possible COPCs with Questioned Concentration Data

Chemical	Screening Value (ppm)	Maximum (ppm)	Notes
Borane, diethylmethyl- 1115-07-7	n/a	1.33	On an initial internet search, no accepted biological limits were found for the toxicity of alkylboranes at concentrations below their spontaneous ignition point. These chemicals are highly reactive or pyrophoric, and the reasons why any would exist in a tank headspace are unclear. The chemical was found in a single measurement in C-103 (5/17/94), as part of a mixture, so there is potential for misidentification.
1,3-Propanediol, dinitrate 3457-90-7	0.005	0.018	The screening value is based on an AOEL from PNNL-15736. There is only one measurement, in C-204 (7/2/96), with no replicate. This C-204 data package could not be found for re-examination in 2006 and was removed from the COPC list. However, other dinitrates have been seen in tank waste and were not found to be misidentified.
Methane, dichloro- 75-09-2	2.5	6.18	The OEL is taken from SWIHD. For comparison, the ACGIH TLV-TWA is 50 ppm and the OSHA PEL is 25 ppm TWA. There are four non-S-coded TWINS HS data points with concentrations above 2.5 ppm, from two tanks. Of these points, three have E codes, meaning in excess of calibrated rating. The only non-E measurement has an X code, and is 2.9 ppm. All SWIHD data are below the screening value of 2.5 ppm, and the highest TWINS IH measurement (from 2006) was 0.094 ppm.

Concentration maxima for the final group of chemicals were above the screening values, or were detected but had no screening values, and were not considered to qualify as COPCs. These non-qualifying chemicals are given in Table 7. Most of these 34 chemicals were also removed from consideration in 2006, for a variety of reasons. The present study concurs with those 2006 removals.

Table 7. Chemicals Determined Not To Meet Criteria for Potential COPCs

Chemical	Screening Value (ppm)	Maximum (ppm)	Notes
Butanoic acid, anhydride 106-31-0	n/a	0.000141	Anhydrides are considered improbable in tank conditions (p. C-3, RPP-22491 R. 1)
Phenol, 2,6-bis(1,1-dimethylethyl)-4-methyl- 128-37-0	n/a	0.784	Screening value from PNNL-15640. RPP-22491 R.1 removed this because it was a possible plasticizer contaminant from laboratory equipment; it is BHT, a common anti-oxidant (PNNL-15646).
Propane, 2-isocyanato- 1795-48-8	n/a	0.0115	Only one data point and it was misidentified, per Table 3 PNNL-15673.
Hexanoic acid, anhydride 2051-49-2	n/a	0.031	The presence of anhydrides are considered improbable in tank conditions (p. C-3, RPP-22491 R. 1).
1,2-Propanediol, (S)- 4254-15-3	n/a	0.123	Propylene glycol is a food additive and is considered innocuous.
Carbon monoxide 630-08-0	n/a	100	Removed as non-tank source; Table C-9, RPP-22491 R.1.
Ethene, chloro- 75-01-4	n/a	0.01	The ACGIH TLV is 1 ppm; screening value would be 0.1 ppm; the maximum is below the plausible screening level. RPP-22491 R.1 rejected this chemical as a laboratory contaminant in SST/DSTs.
2-Furanacetaldehyde, .alpha.-propyl- 31681-26-2	0.0001	0.0362	Screening value is based on the PNNL-15736 AOEL. RPP-22491 R.1 removed this chemical for misidentification; the only two samples containing it both had it misidentified (PNNL-15673).
3-Buten-1-ol 627-27-0	0.07	5.7	Screening value from PNNL-15640. RPP-22491 R.1 removed this chemical for misidentification. The maximum was misidentified by reporting analytical laboratory (Table 3 PNNL-15673) and the three remaining points are all below screening.
1-Hexadecanol 36653-82-4	0.015	1.1	Screening value from PNNL-15640. RPP-22491 R.1 removed this because it is a common constituent in cosmetics, creams, and lotions.
Tetradecanoic acid, 1-methylethyl ester 110-27-0	0.0035	0.24	Screening value from PNNL-15640. RPP-22491 R.1 removed it because decanoates are low-toxicity oils often used as additives in hand lotions and soaps. They possibly came from hand lotions used by technicians or chemists in the sampling and analytical process. If they were present as a tank waste constituent, other low-carbon-number analogues of the family would also be observed, and they have not been.

Chemical	Screening Value (ppm)	Maximum (ppm)	Notes
1-Octadecanol 112-92-5	0.015	0.96	Screening value from PNNL-15640. RPP-22491 R.1 removed this because it is a common constituent in cosmetics, creams, and lotions.
Tetradecanoic acid, butyl ester 110-36-1	0.0035	0.2	Screening value from PNNL-15640. RPP-22491 R.1 removed it because decanoates are low-toxicity oils often used as additives in hand lotions and soaps. They possibly came from hand lotions used by technicians or chemists in the sampling and analytical process. If they were present as a tank waste constituent, other low-carbon-number analogues of the family would also be observed, and they have not been.
Benzenemethanol, .alpha.,.alpha.-dimethyl- 617-94-7	0.1	3.4	Screening value from PNNL-15640. RPP-22491 R.1 removed this because it was a possible plasticizer contaminant from laboratory equipment, part of possible Viton O-ring off-gas (Table 3.1, PNNL-15646).
Benzenesulfonamide, N-butyl- 3622-84-2	0.015	0.224	Screening value from PNNL-15640. RPP-22491 R.1 removed this because it was a possible plasticizer contaminant from laboratory equipment; it could have come from nylon off-gassing (PNNL-15646).
Aziridine, 1-methyl- 1072-44-2	0.005	0.065	There is only one datum, in TWINS HS; this supplies the maximum and is marked with an S flag as being suspect. PNNL-15736 gave an AOEL. RPP-22491 R.1 discusses basis for the screening, but did not mention it as a COPC. However, note that 2-ethyl-aziridine was marked as misidentified, and the presence of aziridine was considered disproven (p. B-12 RPP-22491 R. 1).
Pyridine, 1,2,3,6-tetrahydro- 694-05-3	0.01	0.093	This sub-PAH was found in four tanks, several data points currently marked S for suspect, but one non-S data point above the screening level. Report PNNL-15640 used an S data point, 0.093 ppm, which is excluded from this study for being suspect. The two highest data points that were non-S were both found to be misidentified, per PNNL-15673 Table 2 and Table 3. All other non-S points were below screening.
Propanoic acid, 2-methyl-, 1-(1,1-dimethylethyl)-2-methyl-1,3- propanediyl ester 74381-40-1	0.1	0.54	Found in samples from several tanks; two tanks contained samples above the screening value (from PNNL-15640). Listed as plasticizer contaminant, Table 3-1 PNNL-15646.
1-Propanol, 2-nitro- 2902-96-7	0.08	0.43	Only one TWINS HS data point, currently labeled as suspect. Screening value based on AOEL from PNNL-15736.
Cyclopentanol 96-41-3	0.5	2.54	Screening factor based on PNNL-15736 AOEL. Maximum may have been misidentified by reporting analytical laboratory (PNNL-15673 Table 3); second and third highest definitely misidentified, fourth highest is 0.037 ppm, less than screening.

Chemical	Screening Value (ppm)	Maximum (ppm)	Notes
Methanamine, N-(1-methylbutylidene)- 22431-09-0	0.05	0.185	Screening value from PNNL-15640. Maximum and second-high were both misidentified by reporting analytical laboratory (PNNL-15673 Table 3); Third-high was 0.010 ppm, which is below screening.
3-Hexanone 589-38-8	6.7	24.8	Screening value came from PNNL-15736 AOEL. The maximum TWINS HS data set was five samples within ~1 hr of each other in same tank (C-103, 5/17/94): 24.8, 2.0, 1.9, 1.5, 1.2 ppm. RPP-22491 R. 1 removed this because the average of the data set was less than the screening value; concur, because there is a factor of 10 difference between the high and second high in the data taken from the same tank at about the same time; the high looks like an outlier.
Aziridine, 2-ethyl- 2549-67-9	0.02	0.0725	Screening value from PNNL-15640. The samples with the six highest concentrations were all misidentified by reporting analytical laboratory (Table 3, PNNL-15673); the seventh-highest is 0.0125 ppm, which is below screening.
Nitrogen oxide (NO_2) 10102-44-0	0.3	0.9	Screening value is based on SWIHD OEL. RPP-22491 R.1 removed this as having a non-tank source.
2-Pyrrolidinone 616-45-5	0.1	0.252	RPP-22491 R.1 removed this. The maximum sample was misidentified by reporting analytical laboratory (Table 3, PNNL-15673); all other samples have concentrations at least a factor of nine lower than the maximum, hence below screening.
Butane, 2-bromo- 78-76-2	0.01	0.023	RPP-22491 R.1 removed this. There were only two samples, both misidentified by reporting analytical laboratory (PNNL-15673 Table 3).
2-Butenoic acid, 2-propenyl ester 20474-93-5	0.15	0.292	RPP-22491 R.1 removed this. There was only one sample, which was misidentified by reporting analytical laboratory (PNNL-15673).
Butane, 1-nitro- 627-05-4	0.25	0.483	Screening value based on PNNL-15736 AOEL. RPP-22491 R.1 removed this chemical from consideration because it was measured in only one sample, and its measured concentration was much lower in the triple-sorption tube sample than in the SUMMA collected at the same time.
Oxirane, 2-ethyl-3-propyl-, cis- 56052-94-9	0.02	0.0327	RPP-22491 R.1 removed this from consideration. All three data points were misidentified by reporting analytical laboratory (PNNL-15673 Table 3).
2,4(3H,5H)-Furandione, 3-methyl- 1192-51-4	0.0025	0.004	RPP-22491 R.1 removed this from consideration because it was misidentified by reporting analytical laboratory in all samples (PNNL-15673, Table 3).
Cyclohexanone, 5-methyl-2-(1-methylethylidene)-, (R)- 89-82-7	0.25	0.37	Screening value was based on PNNL-15736 AOEL. RPP-22491 R.1 removed this from consideration because it was detected in only one of three SUMMA samples taken during the 1996 sampling event.

Chemical	Screening Value (ppm)	Maximum (ppm)	Notes
Methane, trichloro- 67-66-3	1	1.29	Screening value from SWIHD OEL. The maximum data set was 2 TWINS HS data points from vessel 241-Z-361, which is not a DST/SST. The highest SST/DST value is 0.016 ppm, less than the screening value. RPP-22491 R.1 removed this from consideration because of the low concentration in SST/DSTs.
Bicyclo[4.1.0]heptan-3-one, 4,7,7-trimethyl-, [1R-(1.alpha.,4.alpha.,6.alpha.)]- 4176-04-9	0.07	0.086	Screening value based on PNNL-15736 AOEL. RPP-22491 R.1 removed this from consideration because it is an unlikely degradation product and was observed only in one measurement.
Formic acid, 2-propenyl ester 1838-59-1	1	1.1	Screening value from PNNL-15640. RPP-22491 R.1 removed this from consideration. There is only one measurement, in which the chemical was misidentified by reporting analytical laboratory (PNNL-15673, Table 3).

3.0 Database and Information Management

3.1 Data Management Plan

In response to the large scope and amount of data involved in the HPP project, the need for a data repository to serve the project was identified, and efforts to create a database were initiated in 2016. The purpose of the database was to provide a central point for the integration of data relevant to the HPP project. The HPP database was created using the PNNL Common Operating and Response Environment (CORE™) data-collection system, which is described in greater detail below. The database was established as a single tool for staff on the project to use to track and disseminate information. Such information included the routine updating of COPCs and related data, the knowledge surrounding health effects and the supporting literature, and historical documents that recounted relevant research performed at the tank farms during years past. Details of the various capabilities of the database are given below.

3.2 Database Objective

The HPP database is home to data relevant to the Hanford tank farms, including information such as tank headspace and IH measurements, current exposure guidelines, chemical and physical properties, toxicology summaries, as well as the reports and publications that support the data. The database is not intended to duplicate or store data already available through TWINS or SWIHD, but provide additional capability and home for analysis data and documentation that supports regular updates of the industrial hygiene technical basis. The HPP database is a resource for all scientists, engineers, and managers involved in the Hanford tank farms, as it allows users to quickly access the current state of knowledge of potential exposures and associated guidance documents, standard operating procedures, and links to current regulatory or exposure standards by national and international agencies.

3.2.1 Common Operating and Response Environment Overview

The PNNL CORE™ data-collection system is a highly configurable system composed of broadly applicable modules that allow rapid setup and customization of data-collection systems that can be used in the office and the field. CORE™ design is crafted from years of extensive experience in information integration, data-access applications, field data collections, and operational analysis. The CORE™ data-collection system is delivered via a web-based platform that provides globally-accessible data forms, consolidates diverse data streams, visualizes datasets, and displays information in context to allow rapid understanding and oversight of generated datasets. The CORE™ data-collection system uses role-based access to allow information to be collected, displayed, and controlled in a secure environment.

3.2.2 Method of Data Management

A secure CORE™ site at https://lambda.pnnl.gov/hpp has been established for the HPP effort. Access to the site is authorized by the PNNL Project Manager and the Sponsor and provided to the PNNL Data Manager. The site includes the resources identified below:

- *Historical Database* – A database of historical data that brings together disparate, yet relevant, data from numerous documents and reports into a format that can be queried, including the following:
  - Data defining the suite of chemicals known as COPCs and their OELs at different points in time.
  - The sample, analytical, and temporal variability of target analytes and tentatively identified compounds in tank headspaces measured through triple-solvent traps and/or SUMMA canister sampling campaigns.
  - The relative standard deviations of ammonia, hydrogen, and nitrous oxide in tank headspaces.
  - Statistical values and figures associated with the TWINS entries identified with the vapor tank headspace samples.
  - Data are linked to an electronic copy of the source document that is stored in the database in an electronically searchable format.
- *Recommendations* – The COPC recommendations workflow provides scientists with a customizable, centralized, and traceable platform for evaluating, developing, and proposing $_{HTF}$OELs. Relevant metadata and information for each chemical are included to facilitate decision-making.
  - Chemical names and CAS numbers
  - OEL values and relevant details or figures needed to support OEL values
  - Relevant literature identified through literature search or a surrogate literature search depending on the data available for the chemical in question
  - Toxicity values and details (e.g., carcinogenicity, irritation indications, odor threshold, mixture interactions) and supporting files
  - References and previous documentation relevant to an OEL
  - Conclusions drawn by the scientist making the recommendation.
- *Library* – The library is a tag-based file repository that allows uploading, downloading, browsing, searching, and managing files that support the project. Tags allow superior integration of data over that of traditionally used folders, as a file can be associated with as many tags as are relevant to the document, as opposed to the file being confined to only one folder. The library tool allows scientists to store and tag documents that support activities and areas such as planning and meeting, reference materials, literature search documentation, and research data and materials. The library supports the upload and tagging of documents in bulk and facilitates information sharing between involved parties.
- *Document Exchange* – The Document Exchange form was created to allow secure exchange of Official Use Only (OUO) documents between employees of PNNL and Washington River Protection Solutions. The form provides a secure and tractable alternative to sending files via e-mail.
- *Global Search* – The global search feature allows users to query all of the data stored and generated on the HPP site. Two search types are available: 1) a “basic” search function that returns results that include any terms queried and 2) an “exact match” search function that returns results that include the precise string queried. Search operators (e.g., AND, OR) can be employed to perform more advanced searches. Results can be refined through the use of facets, a suite of terms and tags that are relevant to the results displayed at that time. Facets available include the library tags, data origin (i.e., whether data are historical or not), the compound family (phthalates), and the chemical name (2-octylfuran). Results that are associated with each facet are shown in real time, allowing users to assess which facet(s) may be the most pertinent to their search. Results are formatted as a table that includes the name of the item, a link to the item, the date of creation, the user who created it, and the type of data (e.g., document, raw data).

3.2.3 Data Storage and Reporting

Several options exist for data output from CORE™. Data can be outputted and converted to a variety of formats, such as PDF, CSV, DOC, XML, XLS, KML, or print. A custom report feature was created for the recommendations form to allow the export of all the recommendations data and associated files as a ZIP archive. Custom reports can be configured in advance and upon request.

3.2.4 Information Security

This section describes the classification and related measures to be taken to prevent the misuse, misdistribution, and mishandling of the data collected.

3.2.4.1 Data Access and Distribution of Data

Data access and distribution is controlled through a secured web-based portal. Data are not anticipated to be provided through any other method (e.g., hard drive, DVD, flash drive, e-mail, etc.). The portal implements a two-factor authentication process, requiring at least two pieces of information before access is granted. The portal also is role-based, such that authorized users are restricted by permissions to the appropriate level of access for their role. This results in control over which portions of the data are visible or modifiable by each user and allows the tracking of data workflow. Authorization to grant a user access and provide them with the appropriate role is determined by the PNNL Project Manager and Sponsor, and roles can be created and customized to serve security needs as they arise.

The data is collected and stored on the CORE™ server, which is managed following U.S. Department of Energy requirements for housing data that is potentially For Official Use Only (FOUO).

3.2.4.2 Data Classification

All data will be handled as FOUO.

4.0 Recommendations

Any changes toward sampling considerations and analytical methodologies must be deliberated through a coordinated effort. Operations in each of these activities impact one another. For example, a change in sampling method or duration will impact the success of detection or sensitivity of the analytical process and so on. In addition, the annual review of the COPC listing and the screening values will, of course, dictate the sampling and analytical methodologies employed and the desired sensitivity. So, in turn, this will mean there must, at least, be an annual review of the sampling and analytical protocols including an annual cycle for identifying development requirements. Certainly one of the first goals should be to improve sensitivity and identification of five furan compounds currently listed as COPCs that are based solely on compound misidentifications. These compounds are listed in Table 2. In addition, there are 34 compounds, most of which are hydrocarbons, that may be candidates for listing as COPCs. For these compounds, $_{HTF}$OELs need to be established and improved identification would be beneficial. These compounds are listed in Table 4.

The catagories listed below are not intended to be an all inclusive list of considerations. It is envisioned that a working group of subject matter experts would use a Data Quality Objective type of approach to address each topic area. The terms of sitting members and new members would need to overlap to ensure continuity in the various approaches toward developing a comprehensive analytical plan.

4.1 Sampling

Addressing sampling issues can be a complex undertaking. The working group of experts must consider data end-uses such as those described below:

- Will data represent the breathing zone?
- What adjustments should be made to account for environmental and meteorological conditions (e.g., temperatures of the source and surroundings, boundary layer conditions such as wind speed and direction, etc.)?
- Are the contaminants lighter or heavier than air?
- How are replicate samples obtained (desorption tubes require chemistry considerations and multiple sampling trains, summa canisters provide samples for many analytical attempts)?
- Are the compounds thermally labile (thermal desorption sampling can destroy compounds or produce artifacts)?

The working group will likely agree that the error associated with sampling usually far exceeds that of analytical method uncertainty. They must develop a comprehensive sampling strategy that takes into consideration all of these questions and address such issues as:

- Depth profile within the tank or the possibility for concentration stratification outside of the tank due to varying stability conditions
- Activities occurring within the tank such as static or perturbation conditions resulting from tank mixing, transfers and additions, etc.
- The recent and long-term history of the tank and its known constituents.

Certainly this working group must have access to the latest COPC candidate list and screening levels, but must also continually try to answer the question: “What are we not detecting?” The sampling techniques and duration will impact both monitoring the COPC list and the analytical methods necessary to do so.

4.2 Analytical Procedures and Development

A comprehensive analytical test plan should be developed by the sampling/analytical team. The analytical team should provide feedback regarding instrument sensitivity to the sampling team. Meeting the annually updated COPC list screening levels must be a critical goal.

Headspace samples have produced very complex chromatograms that often are dominated by hydrocarbon backgrounds. In addition, a significant number of compounds have provided poor mass spectral matches to established spectral libraries. The use of single quadrupole instruments can result in limited mass spectral information and renders the compounds difficult to identify. Once again, here the working group should consider using a Data Quality Objective type of approach and consider a wide variety of analytical tools to meet their needs. For example, analysis of complex samples requires employing higher resolution chromatographic methods (smaller bore columns or multi-dimensional gas chromatography [GC-GC]) and/or analysis using triple quadrupole mass spectrometry (MS-MS) systems. A few of the benefits of triple quadrupole analysis are described below:

- It can produce both chemical and electron impact ionization mass spectra in tandem (essentially simultaneously). Chemical ionization can elucidate molecular weight, which is increasingly important for low mass compounds. Electron impact ionization can produce the fragmentation needed to identify compound structure.
- GC/MS/MS produces richer daughter ion-mass spectra to better elucidate unknown compounds.
- It is helpful in minimizing interferences and expands the dynamic range over that of single quadrupole GC/MS instrumentation.
- A triple quadrupole instrument can still satisfy the requirements of regulatory methods that may specify single quadrupole instrumentation.
- Triple quadrupole MS analyzers reduce the method-development and start-up times associated with complex analyses.
- Selected ion monitoring and scanning analysis can be achieved simultaneously increasing sensitivity and selectivity.
- New GC/MS/MS systems are extremely sensitive, which is important when employing smaller diameter chromatographic columns and investigating compounds with low OEL screening criteria while requiring good spectral confirmation.

GC-GC can be used to separate very complex chromatograms. However, the working group must consider acceptance of the data by the scientific community. Unfortunately the only commercial system routinely employing the GC-GC method uses a time-of-flight mass spectrometer, which is less sensitive and produces mass spectra that, at best, are similar to that of single quadrupole instruments so spectral information may be lacking. It may be determined that GC-GC must be coupled to the MS-MS detector, so off-the-shelf hybrid instruments may not be available, thus decreasing the the day-to-day operational reliability. Other confirmatory analytical methods could also be considered. Gas chromatography-Fourier transform infrared analysis in the laboratory could be employed to confirm field measurements and

elucidate functional groups of unknown compounds when sensitivity is not paramount. Gas chromatography-inductively coupled mass spectrometry would elucidate volatile metallic or organometallic species. Other analytical instrumentation also should be considered

4.3 Difficult and Highly Reactive Compounds

Consideration should be given to the potential presence of highly reactive compounds. While these compounds may be short lived, they also may create the greatest irritation response. Special sampling techniques and direct real-time analysis may need to be considered. The presence of free radicals should be considered as part of this group. Direct sampling to electron spin resonance or other more advanced analytical techniques may be necessary to rule out the presence of these intermediates.

4.4 Changes to COPCs

In Section 2, this report has made recommendation related to five categories of compounds in the vapor space:

- Five furan compounds currently listed as COPCs had measured concentrations based solely on misidentifications. A decision should be made regarding whether these compounds, which are listed in Table 2, are to be retained, because of the typically low $_{HTF}$OELs associated with furans, or whether they can be deleted from the list.
- Three compounds are recommended as strong candidates to be added to the COPC list, based on high maximum concentrations in SSTs or DSTs and on well-defined screening values. These compounds are listed in Table 3.
- Thirty-four compounds, most of which are hydrocarbons, may be candidates for listing as COPCs. However, a review of available health-related literature should be completed and $_{HTF}$OELs established before a final determination can be made. These compounds are listed in Table 4.
- Nine compounds have established screening values but small concentration data sets. The extent of data availability should be assessed, and deemed adequate, before these compounds are considered as candidates for the COPC list. In particular, a decision should be made regarding whether these data sets should be represented by the maximum of individual measurements or by the maximum of sample averages. These compounds are listed in Table 5.
- Three compounds were identified as having issues with small data sets, plausibility of their presence in headspace vapors, and/or data qualifier codes that indicate some issue with the measurement. One of these, diethylmethylborane, also needs an $_{HTF}$OEL. The extent of data available for these compounds should be assessed, and deemed adequate, before they are considered as candidates for the COPC list. These compounds are listed in Table 6.

Thirty-four other compounds with maxima that exceeded the screening value,or that had measured concentrations without having an screening value were categorized as requiring no further attention at this time. Most of these compounds already were considered and dismissed during the 2006 studies. The reasons for removing these compounds from consideration are given in Table 7.

4.5 Recommendation Related to OELs

Although the scope of the task described in this report did not include any systematic examination of OELs, the COPC analysis revealed cases where regulatory limits appear to have been updated since the 2006 studies. For example, as mentioned in Table 4, tetrahydrofuran was found to have a current TLV-TWA of 50 ppm (which is consistent with the SWIHD OEL), but the OEL used in the 2006 studies was 200 ppm (consistent with the current OSHA PEL). This apparent change in the biological limit suggests that screening values devised in 2006 need a general review for updates.

5.0 References

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Appendix A

Compound Evaluation Table

Appendix A

Compound Evaluation Table

Table A.1 lists all the individual chemicals considered in this study, with their maximum concentrations, screening values, and the sources of concentrations and screening values. All the unique Chemical IDs in the TWINS headspace, TWINS Industrial Hygiene, and SWIHD headspace databases are included, except for those beginning with a letter, such as "U" for unknown or "M" for mixture. Mixtures that were represented by a CAS number followed by "M" were included as part of the data set for the CAS number.

In Table A.1, the chemicals are identified by CAS number and name. The maximum concentration observed and the screening value are then given for each chemical in units of ppm rounded to three significant figures. The last two columns of the table list the source of the maximum concentration and the source of the screening value.

The sources of screening values are listed as:

- "COPC": the screening value is 10% of the OEL given for one of the 59 COPCs
- "SWIHD": the screening value is 10% of the OEL given in the SWIHD
- "AOEL": the screening value is 10% of the AOEL given by PNNL-15736 (Poet and Timchalk 2006)
- "22491": the screening value is 10% of an OEL given in RPP-22491 Rev. 1 (Meacham et al. 2006)
- "15640": used the screening value from Table A-16 or Table 4 of PNNL-15640 (Poet et al. 2006)
- "kerosene": used 10% of the NIOSH REL, 100 mg/m^3
- CAS # given: the identified compound supplied the screening value for the chemical
- "10% of" a biological limit: as stated
- "n/a": screening value not available.

The sources of concentration data are listed as "hist.", for historical headspace data from TWINS, "IH" for the TWINS Industrial Hygiene database, "SWIHD" for the SWIHD headspace database, and "n/a" where no maximum concentration was available because all the concentration measurements for the CAS number were less than the detection limit or were filtered out based on the data-quality codes.

More detail can be found in the main body of this report.

Table A.1. The Maximum Concentration Observed and the Screening Value Given for Each Chemical in Units of ppm

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
100-00-5	Benzene, 1-chloro-4-nitro-	0.01	0.000853	22491	hist.
1002-16-0	Nitric acid, pentyl ester	0.25	0.16	15640	hist.
1002-17-1	Decane, 2,9-dimethyl-	1.4	0.00232	kerosene	hist.
1002-43-3	Undecane, 3-methyl-	1.4	3	kerosene	hist.
10024-97-2	Nitrogen oxide (N_2O)	5	53000	COPC	hist.
1002-68-2	3-Undecene, (E)-	1.5	0.00338	kerosene	hist.
1002-84-2	Pentadecanoic acid	1	0.235	15640	hist.
10035-10-6	hydrobromic acid	n/a	n/a	n/a	n/a
100-40-3	Cyclohexene, 4-ethenyl-	2.2	0.00236	kerosene	IH
100-41-4	Benzene, ethyl-	2	0.142	SWIHD	hist.
100-42-5	Benzene, ethenyl-	2	0.279	SWIHD	hist.
1004-29-1	Furan, 2-butyltetrahydro-	0.5	0.037	15640	hist.
100-44-7	Benzene, (chloromethyl)-	n/a	n/a	n/a	n/a
100-47-0	Benzonitrile	1	0.0163	15640	hist.
100-51-6	Benzenemethanol	1	0.0103	22491	hist.
100-52-7	Benzaldehyde	0.4	0.00675	22491	hist.
10061-01-5	1-Propene, 1,3-dichloro-, (Z)-	0.1	0.014	SWIHD	hist.
10061-02-6	1-Propene, 1,3-dichloro-, (E)-	0.1	0.011	SWIHD	hist.
100-61-8	Benzenamine, N-methyl-	0.05	0.00356	22491	hist.
100-71-0	Pyridine, 2-ethyl-	0.05	0.0024	15640	hist.
100-73-2	2H-Pyran-2-carboxaldehyde, 3,4-dihydro-	1.9	0.00163	15640	hist.
100-75-4	n-Nitrosopiperidine	0.0008	0.0000147	SWIHD	IH
1008-80-6	Naphthalene, decahydro-2,3-dimethyl-	1.4	0.413	kerosene	hist.
1009-61-6	Ethanone, 1,1`-(1,4-phenylene)bis-	0.1	0.000414	15640	hist.
100-97-0	1,3,5,7-Tetraazatricyclo[3.3.1.13,7]decane	0.052	0.012	15640	hist.
10102-43-9	Nitrogen oxide (NO)	2.5	1.9	SWIHD	hist.
10102-44-0	Nitrogen oxide (NO_2)	0.3	0.9	SWIHD	hist.
101300-62-3	Silane, (4,5-dimethyl-1,4-cyclohexadiene-1,2-diyl)bis[trimethyl-	n/a	n/a	n/a	n/a
101-81-5	Benzene, 1,1`-methylenebis-	1.4	0.0545	kerosene	hist.
101-84-8	Benzene, 1,1`-oxybis-	0.1	0.0264	22491	hist.
10203-30-2	3-Dodecanol	0.015	0.00102	15640	hist.
10264-17-2	Butanamide, N-hexyl-	0.1	0.0000523	15640	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
103-23-1	Hexanedioic acid, bis(2-ethylhexyl) ester	0.15	0.0039	15640	hist.
103-65-1	Benzene, propyl-	2	0.00522	kerosene	hist.
10374-14-8	Cyclobutanone, 2-ethyl-	0.067	0.00502	15640	hist.
10374-74-0	7-Tetradecene	1.2	0.00329	kerosene	hist.
104-50-7	2(3H)-Furanone, 5-butyldihydro-	5	0.000945	15640	hist.
104-61-0	2(3H)-Furanone, dihydro-5-pentyl-	0.5	0.00408	15640	hist.
104-67-6	2(3H)-Furanone, 5-heptyldihydro-	15	0.000862	15640	hist.
104-76-7	1-Hexanol, 2-ethyl-	2	0.49	AOEL	hist.
10486-19-8	Tridecanal	0.5	0.00023	15640	hist.
104-87-0	p-Tolualdehyde	n/a	n/a	n/a	n/a
104-90-5	Pyridine, 5-ethyl-2-methyl-	0.02	0.0026	15640	hist.
105-21-5	2(3H)-Furanone, dihydro-5-propyl-	5	0.00197	15640	hist.
105-42-0	2-Hexanone, 4-methyl-	0.05	1.1	COPC	hist.
105-66-8	Butanoic acid, propyl ester	15	0.0448	15640	hist.
10595-95-6	Ethanamine, N-methyl-N-nitroso	0.00003	0.0613	COPC	IH
10599-75-4	Methanamine, N-pentylidene-	0.05	0.025	15640	hist.
10599-77-6	1-Butanamine, N-pentylidene-	0.01	0.000793	15640	hist.
106-31-0	Butanoic acid, anhydride	n/a	0.000141	n/a	hist.
106-35-4	3-Heptanone	5	1.8	SWIHD	hist.
106-42-3	Benzene, 1,4-dimethyl-	2.3	0.221	kerosene	hist.
106-46-7	Benzene, 1,4-dichloro-	1	0.0033	SWIHD	hist.
1066-40-6	Silanol, trimethyl-	5	0.056	15640	hist.
106-68-3	3-Octanone	2.5	0.7	22491	hist.
106-72-9	5-Heptenal, 2,6-dimethyl-	25	0.0805	15640	hist.
1068-19-5	Heptane, 4,4-dimethyl-	1.9	0.0133	kerosene	hist.
106-88-7	Oxirane, ethyl-	0.2	0.0842	22491	hist.
106-93-4	Ethane, 1,2-dibromo-	n/a	n/a	n/a	n/a
1069-53-0	Hexane, 2,3,5-trimethyl-	1.9	0.0591	kerosene	hist.
106-97-8	Butane	80	9.2	22491	hist.
106-98-9	1-Butene	4.3	14.8	kerosene	hist.
106-99-0	1,3-Butadiene	0.1	3.38	COPC	IH
107-00-6	1-Butyne	4.5	0.00664	kerosene	hist.
107-01-7	2-Butene	4.3	0.415	kerosene	hist.
107-02-8	2-Propenal	0.01	0.084	22491	SWIHD
107-05-1	1-Propene, 3-chloro-	0.1	0.00644	SWIHD	hist.
107-06-2	Ethane, 1,2-dichloro-	1	0.0121	SWIHD	hist.
107-12-0	Propanenitrile	0.6	5.5	COPC	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
107-13-1	2-Propenenitrile	0.2	0.0109	SWIHD	hist.
107-15-3	1,2-Ethanediamine	1	0.23	22491	hist.
107-16-4	Acetonitrile, hydroxy-	n/a	n/a	n/a	n/a
1071-81-4	Hexane, 2,2,5,5-tetramethyl-	1.7	0.00409	kerosene	hist.
107-18-6	2-Propen-1-ol	0.05	0.00412	SWIHD	hist.
1072-05-5	Heptane, 2,6-dimethyl-	1.9	0.104	kerosene	hist.
1072-44-2	Aziridine, 1-methyl-	0.005	0.065	AOEL	hist.
1073-11-6	2(3H)-Furanone, 5-ethenyldihydro-5-methyl-	0.5	0.000444	15640	hist.
107-31-3	Formic acid, methyl ester	10	0.027	22491	hist.
107-39-1	1-Pentene, 2,4,4-trimethyl-	30	0.047	22491	hist.
1074-17-5	Benzene, 1-methyl-2-propyl-	1.8	0.144	kerosene	hist.
107-66-4	Phosphoric acid, dibutyl ester	n/a	n/a	n/a	n/a
107-75-5	Octanal, 7-hydroxy-3,7-dimethyl-	0.5	0.00013	15640	hist.
107-83-5	Pentane, 2-methyl-	2.8	4.19	kerosene	hist.
107-87-9	2-Pentanone	15	1.69	22491	hist.
107-89-1	Butanal, 3-hydroxy-	0.2	0.019	15640	hist.
107-92-6	Butanoic acid	1	1.48	15640	hist.
108-03-2	Propane, 1-nitro-	2.5	0.0356	22491	hist.
108-05-4	Acetic acid ethenyl ester	1	0.000781	22491	hist.
108-08-7	Pentane, 2,4-dimethyl-	2.4	0.134	kerosene	hist.
108-10-1	2-Pentanone, 4-methyl-	5	1.28	SWIHD	hist.
108-20-3	Propane, 2,2`-oxybis-	2.5	0.0965	22491	hist.
108-29-2	2(3H)-Furanone, dihydro-5-methyl-	75	0.0111	15640	hist.
108-30-5	2,5-Furandione, dihydro-	0.0025	0.00326	15640	hist.
1083-56-3	Benzene, 1,1`-(1,4-butanediyl)bis-	1	0.0026	15640	hist.
108-38-3	m,p-xylene	10	0.385	1330-20-7	hist.
108-39-4	Phenol, 3-methyl-	0.5	0.00207	SWIHD	hist.
108-47-4	Pyridine, 2,4-dimethyl-	0.05	0.104	COPC	hist.
108-48-5	Pyridine, 2,6-dimethyl-	0.02	0.00251	15640	hist.
108-67-8	Benzene, 1,3,5-trimethyl-	2.5	0.015	22491	hist.
108-87-2	Cyclohexane, methyl-	30	0.445	22491	hist.
108-88-3	Benzene, methyl-	2	1.23	SWIHD	hist.
108-89-4	Pyridine, 4-methyl-	0.2	0.057	22491	hist.
108-90-7	Benzene, chloro-	1	0.025	SWIHD	hist.
108-93-0	Cyclohexanol	5	0.000492	22491	hist.
108-94-1	Cyclohexanone	2.5	0.093	22491	IH
108-95-2	Phenol	0.5	0.28	22491	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
108-99-6	Pyridine, 3-methyl-	0.2	0.0409	22491	hist.
109-06-8	Pyridine, 2-methyl-	0.2	0.067	22491	hist.
109-08-0	Pyrazine, methyl-	1	0.00612	15640	hist.
109-21-7	Butanoic acid, butyl ester	1.5	0.526	15640	hist.
109-66-0	Pentane	12	5.7	22491	hist.
109-67-1	1-Pentene	3.4	3.65	kerosene	hist.
109-68-2	2-Pentene	3.4	0.303	kerosene	hist.
109-69-3	Butane, 1-chloro-	0.75	0.15	15640	hist.
109-74-0	Butanenitrile	0.8	3.33	COPC	hist.
109-75-1	3-Butenenitrile	0.1	0.021	AOEL	hist.
109-93-3	Ethene, 1,1`-oxybis-	2	0.031	15640	hist.
109-97-7	1H-Pyrrole	0.03	0.0113	15640	hist.
109-99-9	Furan, tetrahydro-	5	7.05	SWIHD	hist.
110-00-9	Furan	0.0001	3.2	COPC	hist.
110-12-3	2-Hexanone, 5-methyl-	5	0.0412	22491	hist.
110-13-4	2,5-Hexanedione	0.005	0.00151	15640	hist.
110-27-0	Tetradecanoic acid, 1-methylethyl ester	0.0035	0.24	15640	hist.
110-36-1	Tetradecanoic acid, butyl ester	0.0035	0.2	15640	hist.
110-43-0	2-Heptanone	5	0.712	SWIHD	hist.
110-54-3	Hexane	5	2.31	SWIHD	hist.
110-59-8	Pentanenitrile	0.6	1.26	COPC	hist.
110-60-1	1,4-Butanediamine	n/a	n/a	n/a	n/a
110-62-3	Pentanal	5	0.262	SWIHD	hist.
110-71-4	Ethane, 1,2-dimethoxy-	100	0.0025	15640	hist.
110-74-7	Formic acid, propyl ester	1	0.054	15640	hist.
110-82-7	Cyclohexane	10	1.13	SWIHD	hist.
110-83-8	Cyclohexene	30	0.00272	22491	hist.
110-86-1	Pyridine	0.1	0.147	COPC	hist.
110-89-4	Piperidine	0.1	0.00833	22491	hist.
110-93-0	5-Hepten-2-one, 6-methyl-	0.15	0.00124	15640	hist.
111-06-8	Hexadecanoic acid, butyl ester	0.0035	0.00019	15640	hist.
111-13-7	2-Octanone	0.5	0.36	15640	hist.
1112-39-6	Silane, dimethoxydimethyl-	5	0.011	15640	hist.
111-27-3	1-Hexanol	1	0.075	15640	hist.
1113-56-0	1,3-Pentadiene, 2,3-dimethyl-	2.5	0.00279	kerosene	hist.
1115-07-7	Borane, diethylmethyl-	n/a	1.33	n/a	hist.
1115-11-3	2-Butenal, 2-methyl-	0.003	0.0247	COPC	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
111-65-9	Octane	7.5	0.47	22491	hist.
111-66-0	1-Octene	2.1	0.237	kerosene	hist.
111-67-1	2-Octene	2.1	0.148	kerosene	hist.
1116-90-1	1,4-Hexadiene, 4-methyl-	2.5	0.00699	kerosene	hist.
111-70-6	1-Heptanol	0.5	0.474	15640	hist.
111-71-7	Heptanal	0.5	0.12	15640	hist.
1117-59-5	Pentanoic acid, hexyl ester	1.5	0.00218	15640	hist.
111-76-2	Ethanol, 2-butoxy-	2.5	0.0606	22491	hist.
111-84-2	Nonane	20	0.415	22491	hist.
1118-58-7	1,3-Pentadiene, 2-methyl-	2.9	0.401	kerosene	hist.
111-87-5	1-Octanol	5	0.061	22491	hist.
1120-06-5	2-Decanol	0.015	0.000835	15640	hist.
1120-07-6	Nonanamide	5	0.00114	15640	hist.
1120-21-4	Undecane	1.5	20.5	kerosene	hist.
1120-36-1	1-Tetradecene	1.2	0.705	kerosene	hist.
1120-64-5	Oxazole, 4,5-dihydro-2-methyl-	0.5	0.0226	15640	hist.
1121-05-7	2-Cyclopenten-1-one, 2,3-dimethyl-	0.05	0.00134	15640	hist.
1121-07-9	2,5-Pyrrolidinedione, 1-methyl-	10	0.00574	15640	hist.
112-12-9	2-Undecanone	0.5	0.373	15640	hist.
1121-33-1	Cyclopentanone, 2,4-dimethyl-	0.2	0.0052	15640	hist.
112-30-1	1-Decanol	0.15	0.0011	15640	hist.
112-31-2	Decanal	0.5	0.063	15640	hist.
1123-28-0	Cyclohexanecarboxylic acid, 1-hydroxy-	0.3	0.018	15640	hist.
112-40-3	Dodecane	1.4	82.1	kerosene	hist.
112-41-4	1-Dodecene	1.4	0.0696	kerosene	hist.
112-42-5	1-Undecanol	0.015	0.000691	15640	hist.
112-44-7	Undecanal	0.5	0.00053	15640	hist.
112-53-8	1-Dodecanol	0.015	0.000962	15640	hist.
112-54-9	Dodecanal	0.5	0.000729	15640	hist.
112-72-1	1-Tetradecanol	0.015	0.00104	15640	hist.
112-80-1	9-Octadecenoic acid (Z)-	1	0.00745	15640	hist.
112-88-9	1-Octadecene	1	0.00018	15640	hist.
112-92-5	1-Octadecanol	0.015	0.96	15640	hist.
112-95-8	Eicosane	2	0.026	15640	hist.
115-07-1	1-Propene	100	4.41	22491	hist.
115-10-6	Methane, oxybis-	100	2.01	22491	hist.
115-11-7	1-Propene, 2-methyl-	4.3	11.5	kerosene	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
117-81-7	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester	0.031	0.00348	10% ACGIH TLV	IH
1184-60-7	1-Propene, 2-fluoro-	0.01	0.53	COPC	hist.
1191-95-3	Cyclobutanone	0.067	0.0671	15640	hist.
1191-96-4	Cyclopropane, ethyl-	3.4	3.27	kerosene	hist.
1191-99-7	Furan, 2,3-dihydro-	0.0001	0.025	COPC	hist.
1192-18-3	cis-1,2-Dimethylcyclopentane	2.4	0.0226	kerosene	hist.
1192-33-2	Cyclobutanone, 3,3-dimethyl-	0.067	0.0011	15640	hist.
1192-51-4	2,4(3H,5H)-Furandione, 3-methyl-	0.0025	0.004	15640	hist.
1196-92-5	Phenol, 4-(aminomethyl)-2-methoxy-	0.05	0.0031	15640	hist.
120-82-1	Benzene, 1,2,4-trichloro-	0.5	0.0161	22491	hist.
121-00-6	Phenol, 2-(1,1-dimethylethyl)-4-methoxy-	0.05	0.0005	15640	hist.
122-39-4	Benzenamine, N-phenyl-	0.14	0.0349	22491	hist.
123-05-7	Hexanal, 2-ethyl-	0.5	0.0369	15640	hist.
123-15-9	Pentanal, 2-methyl-	0.5	0.0604	15640	hist.
123-19-3	4-Heptanone	5	0.569	22491	hist.
123-25-1	Butanedioic acid, diethyl ester	1.5	0.674	15640	hist.
123-32-0	Pyrazine, 2,5-dimethyl-	1	0.000393	15640	hist.
123-38-6	Propanal	2	0.26	SWIHD	hist.
123-51-3	1-Butanol, 3-methyl-	10	0.0277	22491	hist.
123-56-8	2,5-Pyrrolidinedione	10	0.00271	15640	hist.
123-72-8	Butanal	2.5	7.77	COPC	hist.
123-73-9	2-Butenal, (E)-	0.2	0.00354	SWIHD	hist.
123-75-1	Pyrrolidine	n/a	n/a	n/a	n/a
123-79-5	Hexanedioic acid, dioctyl ester	0.15	0.141	15640	hist.
123-86-4	Acetic acid, butyl ester	15	5.2	SWIHD	hist.
123-91-1	1,4-Dioxane	2	0.081	SWIHD	hist.
123-95-5	Octadecanoic acid, butyl ester	0.0035	0.00243	15640	hist.
123-96-6	2-Octanol	0.5	0.131	15640	hist.
124-11-8	1-Nonene	1.9	0.0928	kerosene	hist.
124-12-9	Octanenitrile	0.6	0.549	AOEL	hist.
124-13-0	Octanal	0.5	0.463	15640	hist.
124-18-5	Decane	20	4.17	SWIHD	hist.
124-19-6	Nonanal	5	1.34	15640	hist.
124-28-7	1-Octadecanamine, N,N-dimethyl-	0.1	0.000301	15640	hist.
124-38-9	Carbon dioxide	n/a	13000	n/a	hist.
124-40-3	Methanamine, N-methyl-	0.5	0.064	SWIHD	IH

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
124-48-1	Chlorodibromomethane	n/a	n/a	n/a	n/a
126-73-8	Phosphoric acid tributyl ester	0.02	0.625	COPC	hist.
126-98-7	2-Propenenitrile, 2-methyl-	0.1	0.0367	SWIHD	hist.
127-18-4	Ethene, tetrachloro-	2.5	2	SWIHD	hist.
127-19-5	Acetamide, N,N-dimethyl-	1	0.0164	22491	hist.
128-37-0	Phenol, 2,6-bis(1,1-dimethylethyl)-4-methyl-	n/a	0.784	n/a	hist.
13029-08-8	1,1`-Biphenyl, 2,2`-dichloro-	0.01	0.000622	COPC	hist.
13040-03-4	Bicyclo[3.1.1]hept-3-en-2-ol, 4,6,6-trimethyl-, [1R-(1.alpha.,2.beta.,5.alpha.)]-	0.5	0.000883	15640	hist.
13049-35-9	1,1`-Biphenyl, 2,2`-diethyl-	0.02	0.000319	92-52-4	hist.
1314-13-2	Zinc oxide	n/a	n/a	n/a	n/a
1314-62-1	Vanadium pentoxide	n/a	n/a	n/a	n/a
13151-04-7	1-Heptene, 5-methyl-	2.1	0.0211	kerosene	hist.
13151-06-9	1-Octene, 7-methyl-	1.9	0.00426	kerosene	hist.
13151-29-6	1-Decene, 4-methyl-	1.5	0.00116	kerosene	hist.
13151-34-3	Decane, 3-methyl-	1.5	0.193	kerosene	hist.
13151-35-4	Decane, 5-methyl-	1.5	0.138	kerosene	hist.
13151-74-1	Decane 3-cyclohexyl-, 3-cyclohexyl-	1	0.00499	kerosene	hist.
13151-75-2	Decane 4-cyclohexyl-, 4-cyclohexyl-	1	0.000199	kerosene	hist.
13151-99-0	Cyclooctane, 1,4-dimethyl-, cis-	1.7	0.00798	kerosene	hist.
13286-73-2	Tridecane, 3-ethyl-	1.1	0.11	kerosene	hist.
13287-21-3	Tridecane, 6-methyl-	1.2	4.7	kerosene	hist.
13287-23-5	Heptadecane, 8-methyl-	2	0.00018	15640	hist.
13287-24-6	Nonadecane, 9-methyl-	2	0.000951	15640	hist.
1330-20-7	Benzene, dimethyl-	10	0.478	22491	hist.
1331-43-7	Cyclohexane, diethyl-	1.7	0.00303	kerosene	hist.
1333-41-1	Pyridine, methyl, isomer	0.2	0.032	108-99-6	hist.
1333-74-0	Hydrogen	n/a	120000	n/a	hist.
13360-61-7	1-Pentadecene	1.1	0.0346	kerosene	hist.
134-32-7	1-Naphthylamine	0.00002	n/a	22491	n/a
13463-67-7	Titanium dioxide	n/a	n/a	n/a	n/a
13475-75-7	Pentadecane, 8-hexyl-	2	0.00544	15640	hist.
13475-78-0	Heptane, 5-ethyl-2-methyl-	1.7	0.0074	kerosene	hist.
13475-82-6	Heptane, 2,2,4,6,6-pentamethyl-	1.4	0.0311	kerosene	hist.
135-98-8	Benzene, (1-methylpropyl)-	1.8	0.00392	kerosene	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
136-77-6	1,3-Benzenediol, 4-hexyl-	0.2	0.000692	15640	hist.
137-32-6	1-Butanol, 2-methyl-	1	0.041	15640	hist.
13828-31-4	Cyclohexene, 1-methyl-3-(1-methylethyl)-	1.7	0.000875	kerosene	hist.
13861-97-7	2(3H)-Furanone, dihydro-4,4-dimethyl-	0.5	0.0012	15640	hist.
138-86-3	Cyclohexene, 1-methyl-4-(1-methylethenyl)-	3	0.0408	22491	hist.
13925-00-3	Pyrazine, ethyl-	0.1	0.00694	15640	hist.
14128-61-1	2-Hexanone, 5-methyl-5-phenyl-	0.5	0.00721	15640	hist.
14129-48-7	4-Octen-3-one	0.15	0.0036	15640	hist.
141-62-8	Tetrasiloxane, decamethyl-	3	0.00374	15640	hist.
141-78-6	Acetic acid ethyl ester	40	26	SWIHD	hist.
141-79-7	3-Penten-2-one, 4-methyl-	1	0.0222	22491	hist.
142-30-3	3-Hexyne-2,5-diol, 2,5-dimethyl-	0.1	0.000441	15640	hist.
14255-23-3	2-Hexene, 2,4-dimethyl-	2.1	0.00179	kerosene	hist.
142-60-9	Propanoic acid, octyl ester	1.5	0.0036	15640	hist.
142-62-1	Hexanoic acid	1	0.000964	15640	hist.
142-78-9	Dodecanamide, N-(2-hydroxyethyl)-	5	0.00072	15640	hist.
142-82-5	Heptane	40	0.981	SWIHD	hist.
142-91-6	Hexadecanoic acid, 1-methylethyl ester	0.0035	0.0578	15640	hist.
142-96-1	Butane, 1,1`-oxybis-	1	0.392	15640	hist.
143-07-7	Dodecanoic acid	1	0.0469	15640	hist.
143-08-8	1-Nonanol	0.07	0.00382	15640	hist.
143-28-2	9-Octadecen-1-ol, (Z)-	1	0.00042	15640	hist.
14398-71-1	Naphthalene, decahydro-2-methyl-	1.6	0.133	kerosene	hist.
14476-37-0	4-Undecanone	0.5	0.011	15640	hist.
1453-24-3	Cyclohexene, 1-ethyl-	2.2	0.138	kerosene	hist.
1453-58-3	1H-Pyrazole, 3-methyl-	n/a	n/a	n/a	n/a
1454-84-8	1-Nonadecanol	0.015	0.00071	15640	hist.
1454-85-9	1-Heptadecanol	0.015	0.00204	15640	hist.
1462-84-6	Pyridine, 2,3,6-trimethyl-	0.02	0.000129	15640	hist.
14676-29-0	Heptane, 3-ethyl-2-methyl-	1.7	1.34	kerosene	hist.
1467-79-4	Cyanamide, dimethyl-	8	0.0834	15640	hist.
14686-13-6	2-Heptene, (E)-	2.4	0.00828	kerosene	hist.
14686-14-7	3-Heptene, (E)-	2.4	0.00684	kerosene	hist.
14720-74-2	Heptane, 2,2,4-trimethyl-	1.7	0.153	kerosene	hist.
1472-09-9	Cyclopropane, octyl-	1.5	0.215	kerosene	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
14762-55-1	Helium, isotope of mass 3	n/a	n/a	n/a	n/a
14808-79-8	Sulfate	n/a	n/a	n/a	n/a
1482-15-1	1-Pentyn-3-ol, 3,4-dimethyl-	1	0.00054	15640	hist.
14850-23-8	4-Octene, (E)-	2.1	0.00199	kerosene	hist.
14898-79-4	2-Butanol, (R)-	10	0.0795	78-92-2	hist.
14905-56-7	Tetradecane, 2,6,10-trimethyl-	1	0.0192	kerosene	hist.
14919-01-8	3-Octene, (E)-	2.1	0.0818	kerosene	hist.
149-57-5	Hexanoic acid, 2-ethyl-	0.084	0.00031	22491	hist.
1506-02-1	Ethanone, 1-(5,6,7,8-tetrahydro-3,5,5,6,8,8-hexamethyl-2-naphthalenyl)-	0.1	0.00009	15640	hist.
151-18-8	Propanenitrile, 3-amino-	0.06	0.000959	15640	hist.
15232-85-6	Cyclohexene, 1-pentyl-	1.6	0.00956	kerosene	hist.
1534-26-5	3-Tridecanone	1.7	0.75	AOEL	hist.
1534-27-6	3-Dodecanone	1.7	1.26	AOEL	hist.
1560-88-9	Octadecane, 2-methyl-	2	0.076	15640	hist.
1560-92-5	Hexadecane, 2-methyl-	1	0.00671	kerosene	hist.
1560-93-6	Pentadecane, 2-methyl-	1	0.0329	kerosene	hist.
1560-96-9	Tridecane, 2-methyl-	1.2	2.82	kerosene	hist.
1560-97-0	Dodecane, 2-methyl-	1.3	0.382	kerosene	hist.
1565-80-6	1-Butanol, 2-methyl-, (S)-	1	0.00686	137-32-6	hist.
1565-81-7	3-Decanol	0.015	0.00396	15640	hist.
156-59-2	Ethene, 1,2-dichloro-, (Z)-	20	0.0403	22491	hist.
156-60-5	Ethene, 1,2-dichloro-, (E)-	20	n/a	156-59-2	n/a
1568-20-3	1H-Pyrazole, 4,5-dihydro-5-methyl-	0.02	0.0245	15640	hist.
1569-50-2	3-Penten-2-ol	0.02	0.0016	15640	hist.
15726-15-5	4-Heptanone, 3-methyl-	0.5	0.00372	15640	hist.
1574-41-0	1,3-Pentadiene, (Z)-	3.5	0.0333	kerosene	hist.
15869-80-4	Heptane, 3-ethyl-	1.9	0.00796	kerosene	hist.
15869-86-0	Octane, 4-ethyl-	1.7	0.0121	kerosene	hist.
15869-89-3	Octane, 2,5-dimethyl-	1.7	0.0519	kerosene	hist.
15869-92-8	Octane, 3,4-dimethyl-	1.7	0.00315	kerosene	hist.
15869-93-9	Octane, 3,5-dimethyl-	1.7	0.0252	kerosene	hist.
15869-94-0	Octane, 3,6-dimethyl-	1.7	0.254	kerosene	hist.
15877-57-3	Pentanal, 3-methyl-	0.17	0.0537	15640	hist.
15890-40-1	cis-1,2-trans-3-Trimethylcyclopentane	2.1	0.00697	kerosene	hist.
15892-23-6	2-Butanol, (.+-.)-	10	0.0581	78-92-2	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
15918-07-7	4-Nonene, 5-methyl-	1.7	0.000479	kerosene	hist.
15932-80-6	Cyclohexanone, 5-methyl-2-(1-methylethylidene)-	0.2	0.0485	15640	hist.
1604-34-8	2-Undecanone, 6,10-dimethyl-	0.5	0.0403	15640	hist.
16106-59-5	1-Hexene, 4,5-dimethyl-	2.1	0.0675	kerosene	hist.
1615-70-9	2,4-Pentadienenitrile	0.03	0.041	COPC	hist.
1618-22-0	Naphthalene, decahydro-2,6-dimethyl-	1.4	0.455	kerosene	hist.
1626-09-1	2,7-Octanedione	0.05	0.0072	15640	hist.
1630-94-0	Cyclopropane, 1,1-dimethyl-	3.4	0.162	kerosene	hist.
1632-16-2	Heptane, 3-methylene-	2.1	0.0763	kerosene	hist.
1632-70-8	Undecane, 5-methyl-	1.4	1.29	kerosene	hist.
1634-04-4	Tert-butyl methyl ether	n/a	n/a	n/a	n/a
1638-26-2	Cyclopentane, 1,1-dimethyl-	2.4	0.0348	kerosene	hist.
1640-89-7	Cyclopentane, ethyl-	2.4	0.16	kerosene	hist.
1647-11-6	Butanenitrile, 2-methylene-	0.03	0.043	COPC	hist.
16519-68-9	Cyclohexanone, 2,6-diethyl-	0.2	0.000581	15640	hist.
1653-30-1	2-Undecanol	0.015	0.00046	15640	hist.
1653-31-2	2-Tridecanol	0.015	0.00056	15640	hist.
16538-89-9	Cyclooctane, (1-methylpropyl)	1.4	0.0591	kerosene	hist.
16538-93-5	Cyclooctane, butyl-	1.4	0.044	kerosene	hist.
16580-24-8	Cyclohexane, 1-methyl-3-(1-methylethyl)-	1.7	0.0623	kerosene	hist.
16580-26-0	Cyclohexane, 1-isopropyl-1-methyl-	1.7	0.0282	kerosene	hist.
16605-91-7	1,1`-Biphenyl, 2,3-dichloro-	0.01	0.00015	COPC	hist.
16606-02-3	1,1`-Biphenyl, 2,4`,5-trichloro-	0.0094	0.000417	COPC	hist.
16624-06-9	Cyclooctanemethanol, .alpha.,.alpha.-dimethyl-	0.015	0.00259	15640	hist.
1669-44-9	3-Octen-2-one	0.15	0.047	15640	hist.
16745-94-1	1-Hexene, 3,4-dimethyl-	2.1	0.129	kerosene	hist.
16746-85-3	1-Hexene, 4-ethyl-	2.1	0.0409	kerosene	hist.
16747-25-4	Hexane, 2,2,3-trimethyl-	1.9	0.00332	kerosene	hist.
16747-26-5	Hexane, 2,2,4-trimethyl-	1.9	0.061	kerosene	hist.
16747-28-7	Hexane, 2,3,3-trimethyl-	1.9	0.000524	kerosene	hist.
16778-26-0	2(3H)-Benzofuranone, 3a,4,5,6-tetrahydro-3a,6,6-trimethyl-	0.5	0.105	15640	hist.
16778-70-4	1H-1,2,4-Triazole, 1-ethyl-	n/a	n/a	n/a	n/a
1678-81-5	cis,trans,cis-1,2,3-Trimethylcyclohexane	1.9	0.137	kerosene	hist.

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1678-91-7	Cyclohexane, ethyl-	2.1	0.116	kerosene	hist.
1678-92-8	Cyclohexane, propyl-	1.9	0.036	kerosene	hist.
1678-93-9	Cyclohexane, butyl-	1.7	0.303	kerosene	hist.
1678-97-3	Cyclohexane, 1,2,3-trimethyl-	1.9	0.000887	kerosene	hist.
1678-98-4	Cyclohexane, (2-methylpropyl)-	1.7	0.188	kerosene	hist.
1679-08-9	1-Propanethiol, 2,2-dimethyl-	7.3	0.0808	15640	hist.
1703-52-2	Furan, 2-ethyl-5-methyl-	0.0001	0.0101	COPC	hist.
1708-29-8	Furan, 2,5-dihydro-	0.0001	1.81	COPC	hist.
1712-64-7	Nitric acid, 1-methylethyl ester	1	0.095	15640	hist.
1713-33-3	7-Oxabicyclo[4.1.0]heptane, 1-methyl-	0.05	0.00213	15640	hist.
1717-00-6	Ethane, 1,1-dichloro-1-fluoro-	50	0.525	22491	hist.
17301-22-3	Undecane, 2,5-dimethyl-	1.3	0.019	kerosene	hist.
17301-23-4	Undecane, 2,6-dimethyl-	1.3	6.85	kerosene	hist.
17301-24-5	Undecane, 2,7-dimethyl-	1.3	0.0874	kerosene	hist.
17301-25-6	Undecane, 2,8-dimethyl-	1.3	0.117	kerosene	hist.
17301-26-7	Undecane, 2,9-dimethyl-	1.3	0.0442	kerosene	hist.
17301-27-8	Undecane, 2,10-dimethyl-	1.3	5.99	kerosene	hist.
17301-28-9	Undecane, 3,6-dimethyl-	1.3	0.0122	kerosene	hist.
17301-29-0	Undecane, 3,7-dimethyl-	1.3	4.08	kerosene	hist.
17301-30-3	Undecane, 3,8-dimethyl-	1.3	0.674	kerosene	hist.
17301-31-4	Undecane, 3,9-dimethyl-	1.3	0.023	kerosene	hist.
17301-32-5	Undecane, 4,7-dimethyl-	1.3	0.282	kerosene	hist.
17301-33-6	Undecane, 4,8-dimethyl-	1.3	0.0604	kerosene	hist.
17301-94-9	Nonane, 4-methyl-	1.7	0.232	kerosene	hist.
17302-23-7	Nonane, 4,5-dimethyl-	1.5	0.00143	kerosene	hist.
17302-28-2	Nonane, 2,6-dimethyl-	1.5	0.936	kerosene	hist.
17302-32-8	Nonane, 3,7-dimethyl-	1.5	0.345	kerosene	hist.
17302-33-9	Undecane, 6-methyl-	1.4	0.705	kerosene	hist.
17302-37-3	Decane, 2,2-dimethyl-	1.4	0.00804	kerosene	hist.
17312-50-4	Decane, 2,5-dimethyl-	1.4	0.475	kerosene	hist.
17312-53-7	Decane, 3,6-dimethyl-	1.4	n/a	kerosene	n/a
17312-54-8	Decane, 3,7-dimethyl-	1.4	0.151	kerosene	hist.
17312-55-9	Decane, 3,8-dimethyl-	1.4	0.114	kerosene	hist.
17312-57-1	Dodecane, 3-methyl-	1.3	0.213	kerosene	hist.
17312-58-2	Undecane, 3-ethyl-	1.3	0.000303	kerosene	hist.
17312-60-6	Undecane, 6-ethyl-	1.3	0.000364	kerosene	hist.
17312-62-8	Decane, 5-propyl-	1.3	0.00401	kerosene	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
17312-63-9	Nonane, 5-butyl-	1.3	0.0409	kerosene	hist.
17312-64-0	Undecane, 2,2-dimethyl-	1.3	0.00194	kerosene	hist.
17312-68-4	Undecane, 4,4-dimethyl-	1.3	0.0689	kerosene	hist.
17312-73-1	Undecane, 5,5-dimethyl-	1.3	0.189	kerosene	hist.
17312-74-2	Decane, 5-ethyl-5-methyl-	1.3	0.00127	kerosene	hist.
17312-76-4	Undecane, 6,6-dimethyl-	1.3	0.107	kerosene	hist.
17312-77-5	Undecane, 2,3-dimethyl-	1.3	0.156	kerosene	hist.
17312-78-6	Undecane, 3,4-dimethyl-	1.3	0.0861	kerosene	hist.
17312-80-0	Undecane, 2,4-dimethyl-	1.3	5.54	kerosene	hist.
17312-81-1	Undecane, 3,5-dimethyl-	1.3	0.000121	kerosene	hist.
17312-82-2	Undecane, 4,6-dimethyl-	1.3	0.7	kerosene	hist.
17312-83-3	Undecane, 5,7-dimethyl-	1.3	0.0987	kerosene	hist.
17351-34-7	14-Pentadecenoic acid	1	0.00391	15640	hist.
17429-02-6	Cyclohexanone, 4-hydroxy-4-methyl-	0.2	0.00035	15640	hist.
17453-93-9	Dodecane, 5-methyl-	1.3	0.0785	kerosene	hist.
17453-94-0	Undecane, 5-ethyl-	1.3	0.271	kerosene	hist.
1750-51-2	Naphthalene, decahydro-1,6-dimethyl-	1.4	0.0548	kerosene	hist.
1757-42-2	Cyclopentanone, 3-methyl-	0.2	0.0228	15640	hist.
1759-53-1	Cyclopropanecarboxylic acid	0.1	0.054	15640	hist.
1759-58-6	trans-1,3-Dimethylcyclopentane	2.4	0.00398	kerosene	hist.
17622-46-7	2-Cyclohexen-1-one, 4-ethyl-3,4-dimethyl-	0.02	0.000588	15640	hist.
1779-19-7	1,3,6-Trioxocane	0.2	0.0017	15640	hist.
17851-53-5	1,2-Benzenedicarboxylic acid, butyl 2-methylpropyl ester	0.0055	0.00112	15640	hist.
1795-15-9	Cyclohexane, octyl-	1.2	0.0174	kerosene	hist.
1795-16-0	Cyclohexane, decyl-	1	0.0728	kerosene	hist.
1795-21-7	Cyclopentane, decyl-	1.1	0.567	kerosene	hist.
1795-27-3	Cyclohexane, 1,3,5-trimethyl-, (1.alpha.,3.alpha.,5.alpha.)-	1.9	0.00355	kerosene	hist.
1795-48-8	Propane, 2-isocyanato-	n/a	0.0115	n/a	hist.
18294-04-7	Ethanedioic acid, bis(trimethylsilyl) ester	n/a	n/a	n/a	n/a
18344-37-1	Heptadecane, 2,6,10,14-tetramethyl-	2	0.0035	15640	hist.
1838-59-1	Formic acid, 2-propenyl ester	1	1.1	15640	hist.
1839-63-0	Cyclohexane, 1,3,5-trimethyl-	1.9	0.0147	kerosene	hist.
1840-42-2	Methane, fluorotrinitro-	10	0.0151	15640	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
18433-98-2	Pyrazine, 2,5-dimethyl-3-(3-methylbutyl)-	0.02	0.0013	15640	hist.
18435-22-8	Tetradecane, 3-methyl-	1.1	0.0404	kerosene	hist.
18435-45-5	1-Nonadecene	1	0.000084	15640	hist.
18476-57-8	2,6-Octadiene, 4,5-dimethyl-	1.7	0.00453	kerosene	hist.
18521-07-8	3-Octen-2-ol, 2-methyl-, (Z)-	1	0.0583	15640	hist.
18540-29-9	Hexavalent Chromium	n/a	n/a	n/a	n/a
18669-52-8	1,4-Hexadiene, 2,3-dimethyl-	2.2	0.00101	kerosene	hist.
18829-55-5	2-Heptenal, (E)-	0.003	0.00171	15640	hist.
18829-56-6	2-Nonenal, (E)-	0.003	0.00294	15640	hist.
1886-75-5	Propane, 2-[(1,1-dimethylethyl)sulfonyl]-2-methyl-	n/a	n/a	n/a	n/a
1888-57-9	3-Hexanone, 2,5-dimethyl-	0.5	0.0084	15640	hist.
18936-17-9	Butanenitrile, 2-methyl-	0.08	0.04	15640	hist.
1921-70-6	Pentadecane, 2,6,10,14-tetramethyl-	0.91	0.00475	kerosene	hist.
19269-28-4	Hexanal, 3-methyl-	1	0.142	15640	hist.
1927-69-1	2H-Pyran, 2-(1,1-dimethylethoxy)tetrahydro-	0.19	0.023	15640	hist.
1932-92-9	2-Propyn-1-ol, propanoate	1.5	0.0012	15640	hist.
19341-98-1	Cyclobutane, 1,2-diethyl-, trans-	2.1	0.0639	kerosene	hist.
1937-62-8	9-Octadecenoic acid, methyl ester, (E)-	0.0035	0.000755	15640	hist.
19398-37-9	3-Decene	1.7	0.0239	kerosene	hist.
19549-80-5	2-Heptanone, 4,6-dimethyl-	0.5	0.000961	15640	hist.
19549-87-2	1-Heptene, 2,4-dimethyl-	1.9	0.0218	kerosene	hist.
19550-03-9	2-Hexanol, 2,3-dimethyl-	0.5	0.00012	15640	hist.
19550-46-0	Cyclopentanol, 1,3-dimethyl-	0.5	0.025	15640	hist.
19550-73-3	Cyclopentanone, 3,4-dimethyl-, trans-	0.2	0.00012	15640	hist.
19689-19-1	5-Decene	1.7	0.118	kerosene	hist.
1975-78-6	Decanenitrile	0.6	0.163	AOEL	hist.
19780-10-0	5-Dodecanone	0.5	0.0491	15640	hist.
19780-59-7	2-Heptanol, 3-ethyl-2-methyl-	0.5	0.00107	15640	hist.
19780-63-3	2-Pentanol, 3-ethyl-2-methyl-	0.25	0.000172	15640	hist.
19781-07-8	2,7-Octanediol, 2,7-dimethyl-	0.5	0.00317	15640	hist.
19781-27-2	3-Octanol, 6-ethyl-	0.5	0.00135	15640	hist.
20063-97-2	2-Decene, (E)-	1.7	0.0758	kerosene	hist.
20184-89-8	3-Nonyne	1.9	0.0128	kerosene	hist.
20184-91-2	4-Nonyne	1.9	0.0719	kerosene	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
20192-66-9	1,3-Benzodioxol-2-one, hexahydro-, trans-	0.02	0.000473	15640	hist.
20278-85-7	Heptane, 2,3,5-trimethyl-	1.7	0.305	kerosene	hist.
2030-84-4	4-Dodecene	1.4	0.00499	kerosene	hist.
2040-07-5	Ethanone, 1-(2,4,5-trimethylphenyl)-	0.1	0.00251	15640	hist.
20474-93-5	2-Butenoic acid, 2-propenyl ester	0.15	0.292	15640	hist.
2049-95-8	Benzene, (1,1-dimethylpropyl)-	1.6	0.00314	kerosene	hist.
2050-67-1	1,1`-Biphenyl, 3,3`-dichloro-	0.01	0.000789	COPC	hist.
2050-68-2	1,1`-Biphenyl, 4,4`-dichloro-	0.01	0.000492	COPC	hist.
2050-78-4	Nitric acid, decyl ester	0.25	0.00106	15640	hist.
2051-30-1	Octane, 2,6-dimethyl-	1.7	0.14	kerosene	hist.
2051-49-2	Hexanoic acid, anhydride	n/a	0.031	n/a	hist.
2051-60-7	1,1`-Biphenyl, 2-chloro-	0.012	0.00506	COPC	hist.
2051-61-8	1,1`-Biphenyl, 3-chloro-	0.012	0.00501	COPC	hist.
2051-62-9	1,1`-Biphenyl, 4-chloro-	0.012	0.000392	COPC	hist.
20633-11-8	Nitric acid, hexyl ester	0.25	0.14	15640	hist.
20633-12-9	Nitric acid, heptyl ester	0.25	0.13	15640	hist.
20633-13-0	Nitric acid, nonyl ester	0.25	0.000189	15640	hist.
20691-89-8	4-Piperidinemethanol, 1-methyl-	0.01	0.0075	15640	hist.
20698-91-3	Benzeneacetic acid, .alpha.-hydroxy-, methyl ester, (R)-	0.0035	0.0011	15640	hist.
20743-95-7	Benzene, 1-butoxy-4-methoxy-	0.01	0.0005	15640	hist.
20754-04-5	4-Octanone, 3-methyl-	0.5	0.00313	15640	hist.
2090-38-2	Cyclohexane, 1,2,4,5-tetramethyl-	1.7	0.00159	kerosene	hist.
2091-29-4	9-Hexadecenoic acid	1	0.339	15640	hist.
20959-33-5	Heptadecane, 7-methyl-	2	0.0442	15640	hist.
21078-65-9	1-Decanol, 2-ethyl-	0.015	0.00012	15640	hist.
21164-95-4	Hexadecane, 7,9-dimethyl-	2	0.00128	15640	hist.
2132-84-5	Benzene, (1-methylhexyl)-	1.3	0.133	kerosene	hist.
21328-57-4	Cyclooctane, 1,5-dimethyl-	1.7	0.00159	kerosene	hist.
2136-70-1	Ethanol, 2-(tetradecyloxy)-	0.2	0.182	15640	hist.
21400-25-9	1-Propene, 1,1,2-trichloro-	0.1	0.00757	542-75-6	hist.
21964-48-7	1,12-Tridecadiene	1.3	0.000621	kerosene	hist.
219783-06-9	Cyclohexane, 1,3,4-trimethyl-1-(1-methylethyl)-	1.4	0.0459	kerosene	hist.
22026-12-6	6-Tridecanone	0.5	0.136	15640	hist.
22058-71-5	Methylamine, N-(1-methylhexylidene)-	n/a	n/a	n/a	n/a
2213-23-2	Heptane, 2,4-dimethyl-	1.9	0.14	kerosene	hist.

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2216-30-0	Heptane, 2,5-dimethyl-	1.9	0.0362	kerosene	hist.
2216-33-3	Octane, 3-methyl-	1.9	0.108	kerosene	hist.
2216-34-4	Octane, 4-methyl-	1.9	0.228	kerosene	hist.
2216-87-7	3-Undecanone	0.5	0.11	15640	hist.
2223-52-1	Cyclohexane, 1,1,4,4-tetramethyl-	1.7	0.0878	kerosene	hist.
22319-25-1	3-Hepten-2-one, 4-methyl-	0.15	0.00924	15640	hist.
22319-29-5	4-Hepten-3-one, 5-ethyl-2,4-dimethyl-	0.15	0.039	15640	hist.
2234-75-5	Cyclohexane, 1,2,4-trimethyl-	1.9	0.0736	kerosene	hist.
22431-09-0	Methanamine, N-(1-methylbutylidene)-	0.05	0.185	15640	hist.
2243-27-8	Nonanenitrile	0.6	0.178	AOEL	hist.
2244-07-7	Undecanenitrile	0.08	0.000308	15640	hist.
22808-06-6	3-Hexene, 2,2,5,5-tetramethyl-	1.7	0.00159	kerosene	hist.
2345-27-9	2-Tetradecanone	0.5	0.0141	15640	hist.
23462-75-1	2H-Pyran-3(4H)-one, dihydro-	1	0.00111	15640	hist.
23609-46-3	Cyclooctene, 1,2-diethyl-	1.4	0.0503	kerosene	hist.
2371-19-9	2-Heptanone, 3-methyl-	0.5	0.00879	15640	hist.
2384-85-2	3-Decyne	1.7	0.111	kerosene	hist.
2402-06-4	Cyclopropane, 1,2-dimethyl-, trans-	3.4	0.0159	kerosene	hist.
2407-94-5	Cyclohexanol, 1,1`-dioxybis-	0.5	0.000194	15640	hist.
2408-37-9	Cyclohexanone, 2,2,6-trimethyl-	0.2	0.0335	15640	hist.
2415-72-7	Cyclopropane, propyl-	2.9	0.224	kerosene	hist.
24251-86-3	Dodecane, 5,8-diethyl-	1	0.00752	kerosene	hist.
2425-77-6	1-Decanol, 2-hexyl-	0.2	0.025	15640	hist.
2432-55-5	Butanethioic acid, S-decyl ester	n/a	n/a	n/a	n/a
2437-56-1	1-Tridecene	1.3	0.0122	kerosene	hist.
24405-16-1	2H-Pyran-2-one, tetrahydro-5,6-dimethyl-, trans-	1	0.237	15640	hist.
2452-99-5	Cyclopentane, 1,2-dimethyl-	2.4	0.0771	kerosene	hist.
2453-00-1	Cyclopentane, 1,3-dimethyl-	2.4	0.0333	kerosene	hist.
2456-28-2	Decane, 1,1`-oxybis-	1	0.0941	15640	hist.
2490-48-4	1-Hexadecanol, 2-methyl-	0.0015	0.000436	15640	hist.
24949-38-0	6-Tridecene	1.3	0.0161	kerosene	hist.
24949-42-6	6-Tridecene, 7-methyl-	1.2	0.305	kerosene	hist.
25013-16-5	Phenol, (1,1-dimethylethyl)-4-methoxy-	0.05	0.000373	15640	hist.
2508-29-4	1-Pentanol, 5-amino-	0.05	0.000673	15640	hist.
25117-24-2	Tetradecane, 4-methyl-	1.1	0.363	kerosene	hist.

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25117-31-1	Tridecane, 5-methyl-	1.2	1.37	kerosene	hist.
25117-32-2	Tetradecane, 5-methyl-	1.1	0.000211	kerosene	hist.
2511-91-3	Cyclopropane, pentyl-	2.1	0.0119	kerosene	hist.
25168-05-2	Benzene, chloromethyl-	n/a	n/a	n/a	n/a
25323-68-6	1,1`-Biphenyl, trichloro-	0.0094	0.000348	COPC	hist.
2532-58-3	Cyclopentane, 1,3-dimethyl-, cis-	2.4	0.00136	kerosene	hist.
2548-87-0	2-Octenal, (E)-	0.003	0.00177	15640	hist.
2549-67-9	Aziridine, 2-ethyl-	0.02	0.0725	15640	hist.
25564-22-1	2-Cyclopenten-1-one, 2-pentyl-	0.05	0.04	15640	hist.
2610-95-9	2H-Pyran-2-one, tetrahydro-6,6-dimethyl-	1	0.000524	15640	hist.
2613-66-3	Cyclopentane, 1-ethyl-3-methyl-, cis-	2.1	0.000119	kerosene	hist.
26215-90-7	4-Tridecanone	0.5	0.025	15640	hist.
26248-42-0	Tridecanol	0.0015	0.0011	15640	hist.
2639-63-6	Butanoic acid, hexyl ester	1.5	0.00013	15640	hist.
26465-81-6	1H-Inden-1-one, 2,3-dihydro-3,3-dimethyl-	0.01	0.00042	15640	hist.
26496-20-8	4-Tetradecanone	0.5	0.0014	15640	hist.
26537-19-9	Benzoic acid, 4-(1,1-dimethylethyl)-, methyl ester	0.00055	0.000932	15640	hist.
26730-12-1	Tridecane, 4-methyl-	1.2	0.203	kerosene	hist.
26730-14-3	Tridecane, 7-methyl-	1.2	1.33	kerosene	hist.
2719-61-1	Benzene, (1-methylundecyl)-	0.99	0.000454	kerosene	hist.
2719-62-2	Benzene, (1-pentylheptyl)-	0.99	0.000636	kerosene	hist.
2719-63-3	Benzene, (1-butyloctyl)-	0.99	0.000636	kerosene	hist.
2719-64-4	Benzene, (1-propylnonyl)-	0.99	0.000454	kerosene	hist.
27392-16-1	Cyclohexanecarboxylic acid, 2-(1,1-dimethylethyl)-, trans-	0.00066	0.000243	15640	hist.
27675-36-1	1-Propene, 1-nitro-, (Z)-	0.25	0.00216	15640	hist.
27750-45-4	Benzenepropanoic acid, .alpha.-[(trimethylsilyl)oxy]-, trimethylsilyl ester	n/a	n/a	n/a	n/a
279-23-2	Bicyclo[2.2.1]heptane	2.5	0.0505	kerosene	hist.
2801-84-5	Decane, 2,4-dimethyl-	1.4	0.000526	kerosene	hist.
28019-94-5	1H-Pyrazole, 4,5-dihydro-4,5-dimethyl-	0.02	0.00593	15640	hist.
280-65-9	Bicyclo[3.3.1]nonane	1.9	0.00947	kerosene	hist.
2815-57-8	Cyclopentane, 1,2,3-trimethyl-	2.1	0.0283	kerosene	hist.
2815-58-9	Cyclopentane, 1,2,4-trimethyl-	2.1	0.0387	kerosene	hist.

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28290-01-9	Cyclobutanone, 2,3,3-trimethyl-	0.067	0.00239	15640	hist.
28473-21-4	Nonanol	0.07	0.00323	15640	hist.
2847-72-5	Decane, 4-methyl-	1.5	1.42	kerosene	hist.
286-08-8	Bicyclo[4.1.0]heptane	2.5	0.00536	kerosene	hist.
2865-82-9	2(3H)-Furanone, 5-ethyldihydro-5-methyl-	0.5	0.00157	15640	hist.
287-23-0	Cyclobutane	4.3	0.18	kerosene	hist.
287-92-3	Cyclopentane	60	0.227	22491	hist.
288-16-4	Isothiazole	0.01	0.00079	15640	hist.
2882-96-4	Pentadecane, 3-methyl-	1	0.00633	kerosene	hist.
2883-05-8	Octane, 2-cyclohexyl-	1.2	0.355	kerosene	hist.
288-47-1	Thiazole	0.1	0.00247	15640	hist.
288-88-0	1H-1,2,4-Triazole	1	0.0087	15640	hist.
28981-49-9	Cyclododecane, ethyl-	1.2	0.00302	kerosene	hist.
289-95-2	Pyrimidine	3	0.0293	15640	hist.
29006-00-6	2-Hexanone, 6-methoxy-	2	0.00012	15640	hist.
2902-96-7	1-Propanol, 2-nitro-	0.08	0.43	AOEL	hist.
290-37-9	Pyrazine	2	0.12	15640	hist.
29052-10-6	Butyric acid, ester with p-hydroxybenzonitrile	n/a	n/a	n/a	n/a
29053-04-1	Cyclopentane, 1-methyl-3-(2-methylpropyl)-	1.7	0.114	kerosene	hist.
2919-23-5	Cyclobutanol	0.5	0.0055	15640	hist.
29212-09-7	2,3-Hexadiene, 2-methyl-	2.5	0.07	kerosene	hist.
2922-51-2	2-Heptadecanone	0.5	0.00009	15640	hist.
292-64-8	Cyclooctane	2.1	0.00139	kerosene	hist.
29354-98-1	Hexadecanol	0.0015	0.0000924	15640	hist.
29366-35-6	4-Dodecanone, 11-methyl-	0.5	0.0029	15640	hist.
294-62-2	Cyclododecane	1.4	0.397	kerosene	hist.
295-17-0	Cyclotetradecane	1.2	1.93	kerosene	hist.
295-65-8	Cyclohexadecane	1	0.00994	kerosene	hist.
2958-75-0	1-Methyldecahydronaphthalene	1.6	0.13	kerosene	hist.
2958-76-1	Naphthalene, decahydro-2-methyl-	1.6	4.51	kerosene	hist.
29799-19-7	Cyclohexane, 1-(1,5-dimethylhexyl)-4-methyl-	1.1	0.000287	kerosene	hist.
2980-69-0	Undecane, 4-methyl-	1.4	2.36	kerosene	hist.
29887-79-4	Cycloheptane, 1,3-dimethoxy-, trans-	0.2	0.000283	15640	hist.
300-57-2	Benzene, 2-propenyl-	2	0.0701	kerosene	hist.
3054-63-5	Dodecane, 4,9-dipropyl-	0.96	0.00352	kerosene	hist.

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3054-92-0	3-Pentanol, 2,3,4-trimethyl-	0.25	0.00199	15640	hist.
30692-16-1	5-Tridecanone	0.5	0.00376	15640	hist.
3073-66-3	Cyclohexane, 1,1,3-trimethyl-	1.9	0.212	kerosene	hist.
3074-71-3	Heptane, 2,3-dimethyl-	1.9	0.0724	kerosene	hist.
30951-17-8	1-Naphthalenol, decahydro-4a-methyl-8-methylene-2-(1-methylethyl)-, [1R-(1.alpha.,2.beta.,4a.beta.,8a.alpha.)]-	0.5	0.000806	15640	hist.
31053-55-1	Thiophene, 2-methoxy-5-methyl-	n/a	n/a	n/a	n/a
31081-17-1	Nonane, 2-methyl-5-propyl-	1.3	0.000243	kerosene	hist.
31081-18-2	Nonane, 3-methyl-5-propyl-	1.3	0.0802	kerosene	hist.
311-89-7	1-Butanamine, 1,1,2,2,3,3,4,4,4-nonafluoro-N,N-bis(nonafluorobutyl)-	n/a	n/a	n/a	n/a
31295-56-4	Dodecane, 2,6,11-trimethyl-	1.1	5.05	kerosene	hist.
31681-26-2	2-Furanacetaldehyde, .alpha.-propyl-	0.0001	0.0362	AOEL	hist.
3178-29-8	Heptane, 4-propyl-	1.7	0.00155	kerosene	hist.
31807-55-3	Isododecane	1.4	0.00646	kerosene	hist.
32064-72-5	2-Nonen-4-one	0.15	0.011	15640	hist.
3221-61-2	Octane, 2-methyl-	1.9	0.00384	kerosene	hist.
32281-85-9	Cyclopentane, 1,3-dimethyl-2-(1-methylethyl)-	1.7	0.121	kerosene	hist.
32669-86-6	Cyclohexane, cyclopropyl-	1.9	0.0611	kerosene	hist.
3290-53-7	Benzene, (2-methyl-2-propenyl)-	1.8	0.1	kerosene	hist.
33083-83-9	5-Undecanone	0.5	0.0164	15640	hist.
33146-45-1	1,1`-Biphenyl, 2,6-dichloro-	0.01	0.000401	COPC	hist.
33342-89-1	1-Propanone, 1-[4-[(trimethylsilyl)oxy]phenyl]-	n/a	n/a	n/a	n/a
334-48-5	Decanoic acid	1	0.00039	15640	hist.
33933-82-3	2-Decanone, 5,9-dimethyl-	0.5	0.00291	15640	hist.
3404-75-9	2-Heptene, 3-methyl-	2.1	0.152	kerosene	hist.
34303-81-6	3-Hexadecene, (Z)-	1	0.00399	kerosene	hist.
34314-82-4	Furan, 3-(1,1-dimethylethyl)-2,3-dihydro-	0.0001	0.000532	COPC	hist.
34379-54-9	Furan, 2,3-dihydro-4-(1-methylpropyl)-, (S)-	0.0001	0.00098	COPC	hist.
3438-46-8	Pyrimidine, 4-methyl-	0.3	0.0114	15640	hist.
34386-42-0	Benzenemethanol, 4-(1,1-dimethylethyl)-.alpha.-methyl-	0.01	0.0031	15640	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
3452-09-3	1-Nonyne	1.9	0.0018	kerosene	hist.
3457-90-7	1,3-Propanediol, dinitrate	0.005	0.018	AOEL	hist.
3457-91-8	1,4-Butanediol, dinitrate	0.005	0.262	COPC	hist.
3457-92-9	1,5-Pentanediol, dinitrate	0.005	0.0033	AOEL	hist.
34883-39-1	1,1`-Biphenyl, 2,5-dichloro-	0.01	0.00011	COPC	hist.
3518-07-8	Benz[a]acridine, 8,10-diethyl-	n/a	n/a	n/a	n/a
35194-30-0	9-Decen-2-one	0.15	0.00048	15640	hist.
3522-94-9	Hexane, 2,2,5-trimethyl-	1.9	0.324	kerosene	hist.
3524-73-0	1-Hexene, 5-methyl-	2.4	0.36	kerosene	hist.
35468-97-4	1-Hepten-1-ol, acetate	1.5	0.00355	15640	hist.
35507-09-6	7-Hexadecene, (Z)-	1	0.0255	kerosene	hist.
35996-97-5	Pentadecanoic acid, butyl ester	0.0035	0.00062	15640	hist.
3604-14-6	Naphthalene, decahydro-1,2-dimethyl-	1.4	0.223	kerosene	hist.
3622-84-2	Benzenesulfonamide, N-butyl-	0.015	0.224	15640	hist.
3638-35-5	Cyclopropane, (1-methylethyl)-	2.9	0.0985	kerosene	hist.
3664-60-6	7-Octen-2-one	0.15	0.00142	15640	hist.
36653-82-4	1-Hexadecanol	0.015	1.1	15640	hist.
3682-42-6	Pentanoic acid, 3-methyl-2-oxo-, methyl ester	1.5	0.0036	15640	hist.
37050-03-6	3,4-Nonadiene	1.9	0.115	kerosene	hist.
37148-64-4	Benzeneacetic acid, .alpha.,4-bis[(trimethylsilyl)oxy]-, trimethylsilyl ester	n/a	n/a	n/a	n/a
3728-56-1	Cyclohexane, 1-ethyl-4-methyl-	1.9	0.0736	kerosene	hist.
3760-54-1	1-Pyrrolidinecarboxaldehyde	0.1	0.00014	15640	hist.
3760-63-2	1-Butanone, 4-(dimethylamino)-1-phenyl-	0.01	0.0019	15640	hist.
3761-94-2	Cycloheptanol, 1-methyl-	0.5	0.000332	15640	hist.
3769-23-1	1-Hexene, 4-methyl-	2.4	0.1	kerosene	hist.
3777-69-3	Furan, 2-pentyl-	0.0001	0.00274	COPC	hist.
3777-71-7	Furan, 2-heptyl-	0.0001	0.0612	COPC	hist.
3788-32-7	Cyclopentane, (2-methylpropyl)-	1.9	0.00682	kerosene	hist.
3789-85-3	Benzoic acid, 2-[(trimethylsilyl)oxy]-, trimethylsilyl ester	0.25	0.0243	15640	hist.
3796-70-1	5,9-Undecadien-2-one, 6,10-dimethyl-, (E)-	0.15	0.0000807	15640	hist.
38165-93-4	Propanedioic acid, [(trimethylsilyl)oxy]-, bis(trimethylsilyl) ester	n/a	n/a	n/a	n/a

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
38447-22-2	Hexanedioic acid, bis(1-methylpropyl) ester	0.15	0.000173	15640	hist.
3879-26-3	5,9-Undecadien-2-one, 6,10-dimethyl-, (Z)-	0.15	0.00115	15640	hist.
38851-69-3	cis-1-Butyl-2-methylcyclopropane	2.1	0.0699	kerosene	hist.
38851-70-6	Cyclopropane, 1-butyl-2-methyl-, trans-	2.1	0.05	kerosene	hist.
3891-98-3	Dodecane, 2,6,10-trimethyl-	20	9.92	SWIHD	hist.
3892-00-0	Pentadecane, 2,6,10-trimethyl-	2	0.0088	15640	hist.
3913-02-8	1-Octanol, 2-butyl-	0.5	0.0484	15640	hist.
3913-81-3	2-Decenal, (E)-	0.003	0.000653	15640	hist.
39161-19-8	3-Penten-1-ol	0.02	0.00781	15640	hist.
39168-02-0	Furan, tetrahydro-2,4-dimethyl-, trans-	0.5	0.00355	15640	hist.
39251-86-0	2-Furancarboxylic acid, hexyl ester	n/a	n/a	n/a	n/a
3944-36-3	2-Propanol, 1-(1-methylethoxy)-	0.2	0.0063	15640	hist.
39515-51-0	Benzaldehyde, 3-phenoxy-	0.0023	0.00023	15640	hist.
39899-08-6	3-Hepten-2-one, 3-methyl-	0.15	0.026	15640	hist.
4032-86-4	Heptane, 3,3-dimethyl-	1.9	0.00332	kerosene	hist.
4032-93-3	Heptane, 2,3,6-trimethyl-	1.7	0.305	kerosene	hist.
4050-45-7	2-Hexene, (E)-	2.9	0.0239	kerosene	hist.
40649-36-3	4-Propylcyclohexanone	0.2	0.034	15640	hist.
40702-26-9	3-Cyclohexene-1-carboxaldehyde, 1,3,4-trimethyl-	0.003	0.00078	15640	hist.
4088-60-2	2-Buten-1-ol, (Z)-	0.07	0.0373	15640	hist.
41239-48-9	Furan, 2,5-diethyltetrahydro-	0.5	0.0218	15640	hist.
41446-60-0	7-Tetradecene, (Z)-	1.2	0.000308	kerosene	hist.
41446-61-1	6-Tetradecene, (Z)-	1.2	0.00456	kerosene	hist.
41446-66-6	5-Tetradecene, (E)-	1.2	0.0832	kerosene	hist.
41446-67-7	3-Tetradecene, (Z)-	1.2	0.0284	kerosene	hist.
41446-68-8	3-Tetradecene, (E)-	1.2	0.0808	kerosene	hist.
41464-49-7	1,1`-Biphenyl, 2,3,3`,5`-tetrachloro-	0.0083	0.000437	COPC	hist.
4170-30-3	2-Butenal	0.03	0.023	22491	hist.
41744-75-6	1-Heptadecanol, 16-methyl-	0.0015	0.000331	15640	hist.
4176-04-9	Bicyclo[4.1.0]heptan-3-one, 4,7,7-trimethyl-, [1R-(1.alpha.,4.alpha.,6.alpha.)]-	0.07	0.086	AOEL	hist.
4179-38-8	Furan, 2-octyl-	0.0001	0.00087	COPC	hist.
41977-32-6	Cyclopropane, 1,2-dibutyl-	1.5	0.00618	kerosene	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
41977-33-7	Cyclopropane, 1-pentyl-2-propyl-	1.5	0.262	kerosene	hist.
41977-34-8	Cyclopropane, 1-butyl-1-methyl-2-propyl-	1.5	0.00145	kerosene	hist.
41977-43-9	Cyclopropane, 1,1,2-trimethyl-3-(2-methylpropyl)-	1.7	0.00159	kerosene	hist.
41977-48-4	Bicyclo[4.1.0]heptane, 3-methyl-7-pentyl-	1.3	0.0638	kerosene	hist.
420-56-4	Silane, fluorotrimethyl-	0.05	0.00049	15640	hist.
421-50-1	2-Propanone, 1,1,1-trifluoro-	n/a	n/a	n/a	n/a
4229-91-8	Furan, 2-propyl-	0.0001	0.654	COPC	hist.
4254-15-3	1,2-Propanediol, (S)-	n/a	0.123	n/a	hist.
42565-49-1	10-Undecen-4-one, 2,2,6,6-tetramethyl-	0.15	0.0014	15640	hist.
4259-00-1	Cyclopentane, 1,1,2-trimethyl-	2.1	0.0215	kerosene	hist.
42604-04-6	Cycloheptane, methoxy-	0.2	0.0192	15640	hist.
4272-06-4	4-Undecanol	0.015	0.00039	15640	hist.
42786-06-1	4H-1,2,4-Triazol-3-amine, 4-ethyl-	1	0.00259	15640	hist.
4291-79-6	Cyclohexane, 1-methyl-2-propyl-	1.7	0.014	kerosene	hist.
4291-80-9	Cyclohexane, 1-methyl-3-propyl-	1.7	0.104	kerosene	hist.
4292-75-5	Cyclohexane, hexyl-	1.4	0.0944	kerosene	hist.
4292-92-6	Cyclohexane, pentyl-	1.5	0.414	kerosene	hist.
430-51-3	2-Propanone, 1-fluoro-	n/a	n/a	n/a	n/a
4312-99-6	1-Octen-3-one	0.15	0.00657	15640	hist.
4316-65-8	1-Hexene, 3,5,5-trimethyl-	1.9	0.00177	kerosene	hist.
4337-65-9	Hexanedioic acid, mono(2-ethylhexyl) ester	0.15	0.0026	15640	hist.
4342-25-0	3,6-Dioxa-2,4,5,7-tetrasilaoctane, 2,2,4,4,5,5,7,7-octamethyl-	n/a	n/a	n/a	n/a
4390-04-9	Nonane, 2,2,4,4,6,8,8-heptamethyl-	1	0.00135	kerosene	hist.
4413-16-5	Benzene, (1-cyclohexylethyl)-	1.2	0.00284	kerosene	hist.
4457-62-9	Furan, tetrahydro-2,5-dipropyl-	0.5	0.00113	15640	hist.
4461-48-7	2-Pentene, 4-methyl-	2.9	0.00465	kerosene	hist.
4485-09-0	4-Nonanone	0.5	0.124	15640	hist.
4485-13-6	3-Heptene, 4-propyl-	1.7	0.00201	kerosene	hist.
4516-69-2	Cyclopentane, 1,1,3-trimethyl-	2.1	0.08	kerosene	hist.
4536-87-2	Benzene, (1-ethylnonyl)-	1	0.000771	kerosene	hist.
4536-88-3	Benzene, (1-methyldecyl)-	1	0.000675	kerosene	hist.
4537-15-9	Benzene, (1-butylheptyl)-	1	0.000675	kerosene	hist.
4551-51-3	1H-Indene, octahydro-, cis-	1.9	0.00882	kerosene	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
4562-27-0	4(1H)-Pyrimidinone	0.1	0.0016	15640	hist.
4573-09-5	Cyclopentanone, 2,2,5-trimethyl-	0.2	0.00285	15640	hist.
460-13-9	Propane, 1-fluoro-	0.75	0.0574	15640	hist.
4631-98-5	Cyclohexanol, 4-(1,1,3,3-tetramethylbutyl)-	0.5	0.000527	15640	hist.
463-49-0	Propadiene	6.1	0.137	kerosene	hist.
463-58-1	Carbon oxide sulfide (COS)	1	0.0261	15640	hist.
463-82-1	Propane, 2,2-dimethyl-	60	0.101	22491	hist.
464-06-2	Butane, 2,2,3-trimethyl-	2.4	0.0223	kerosene	hist.
4683-94-7	trans-2-Methyldecahydronaphthalene	1.6	0.377	kerosene	hist.
470-65-5	Cyclohexanol, 4-methyl-1-(1-methylethyl)-	0.5	0.000272	15640	hist.
4737-43-3	Cyclopentane, (1-methylbutyl)-	1.7	0.0378	kerosene	hist.
4786-20-3	2-Butenenitrile	0.02	0.0057	15640	hist.
4795-86-2	Bicyclo[3.1.1]heptane, 2,2,6-trimethyl-	1.7	0.0176	kerosene	hist.
4799-62-6	1-Pentanol, 5-methoxy-	1	0.0021	15640	hist.
4806-61-5	Cyclobutane, ethyl-	2.9	0.151	kerosene	hist.
4810-09-7	1-Heptene, 3-methyl-	2.1	0.17	kerosene	hist.
4826-62-4	2-Dodecenal	0.003	0.000491	15640	hist.
4850-28-6	Cyclopentane, 1,2,4-trimethyl-, (1.alpha.,2.alpha.,4.beta.)-	2.1	0.00798	kerosene	hist.
486-25-9	9H-Fluoren-9-one	0.01	0.00211	15640	hist.
4866-55-1	Cyclopropane, 1,2-dimethyl-3-methylene-, cis-	2.9	0.00545	kerosene	hist.
489-20-3	Cyclopentane, 1,2-dimethyl-3-(1-methylethyl)-	1.7	0.0811	kerosene	hist.
4911-70-0	2-Pentanol, 2,3-dimethyl-	0.25	0.00135	15640	hist.
4923-77-7	Cyclohexane, 1-ethyl-2-methyl-, cis-	1.9	0.00656	kerosene	hist.
4926-78-7	Cyclohexane, 1-ethyl-4-methyl-, cis-	1.9	0.11	kerosene	hist.
493-02-7	Naphthalene, decahydro-, trans-	1.7	1.48	kerosene	hist.
4941-53-1	5-Undecene	1.5	0.28	kerosene	hist.
49622-16-4	2-Undecene, 2,5-dimethyl-	1.3	0.0111	kerosene	hist.
50-00-0	Formaldehyde	0.03	0.272	COPC	IH
502-56-7	5-Nonanone	0.005	0.00315	15640	hist.
5026-76-6	1-Heptene, 6-methyl-	2.1	0.147	kerosene	hist.
502-69-2	2-Pentadecanone, 6,10,14-trimethyl-	0.5	0.000834	15640	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
503-30-0	Trimethylene oxide	2.5	0.56	15640	hist.
504-60-9	1,3-Pentadiene	3.5	0.0102	kerosene	hist.
505-57-7	2-Hexenal	n/a	n/a	n/a	n/a
5057-99-8	1,2-Cyclopentanediol, trans-	0.1	0.0019	15640	hist.
50639-02-6	5-Undecanone, 2-methyl-	0.5	0.206	15640	hist.
50746-53-7	Cyclopentane, 1-methyl-2-(2-propenyl)-, trans-	1.9	0.00541	kerosene	hist.
507-55-1	Propane, 1,3-dichloro-1,1,2,2,3-pentafluoro-	1.6	1.02	15640	hist.
50871-03-9	1-Decene, 3,4-dimethyl-	1.4	0.00173	kerosene	hist.
50876-31-8	Cyclohexane, 1,1,3,5-tetramethyl-, trans-	1.7	0.00335	kerosene	hist.
50876-32-9	Cyclohexane, 1,1,3,5-tetramethyl-, cis-	1.7	0.0733	kerosene	hist.
50915-91-8	Cyclopropene, 1-butyl-2-ethyl-	1.9	0.00324	kerosene	hist.
50991-08-7	1,1`-Bicyclohexyl, 2-methyl-, cis-	1.3	0.0168	kerosene	hist.
50991-09-8	1,1`-Bicyclohexyl, 2-methyl-, trans-	1.3	0.00273	kerosene	hist.
5115-98-0	3-Piperidinecarboxamide, N-methyl-	1	0.00157	15640	hist.
51284-29-8	Cyclohexane, (1,2-dimethylpropyl)-	1.5	0.0239	kerosene	hist.
512-85-6	2,3-Dioxabicyclo[2.2.2]oct-5-ene, 1-methyl-4-(1-methylethyl)-	n/a	n/a	n/a	n/a
513-35-9	2-Butene, 2-methyl-	3.4	0.0511	kerosene	hist.
513-81-5	1,3-Butadiene, 2,3-dimethyl-	2.9	0.0177	kerosene	hist.
51411-24-6	6,10-Dodecadien-1-ol, 3,7,11-trimethyl-	1	0.26	15640	hist.
5145-01-7	2(3H)-Furanone, dihydro-3,5-dimethyl-	0.5	0.166	15640	hist.
51595-87-0	2-Heptanone, 6-(2-furanyl)-6-methyl-	0.0001	0.000576	COPC	hist.
5166-53-0	3-Hexen-2-one, 5-methyl-	0.15	0.00441	15640	hist.
5171-86-8	Hexane, 3,3,4,4-tetraethyl-	1.2	0.00926	kerosene	hist.
51756-19-5	1-Nonen-3-one, 2-methyl-	0.15	0.000871	15640	hist.
51953-17-4	4(3H)-Pyrimidinone	0.1	0.0055	15640	hist.
5204-80-8	4-Pentenal, 2-ethyl-	5	0.014	15640	hist.
5205-34-5	5-Decanol	0.015	0.00446	15640	hist.
52588-78-0	3,4-Undecadiene-2,10-dione, 6,6-dimethyl-	0.015	0.00022	15640	hist.
52663-58-8	1,1`-Biphenyl, 2,3,4`,6-tetrachloro-	0.0083	0.000207	COPC	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
526-73-8	1,2,3-Trimethylbenzene	2	0.00488	kerosene	hist.
527-84-4	1-Isopropyl-2-methylbenzene	1.8	0.00364	kerosene	hist.
52896-87-4	Heptane, 4-(1-methylethyl)-	1.7	0.0697	kerosene	hist.
52896-90-9	Heptane, 3-ethyl-5-methyl-	1.7	0.177	kerosene	hist.
529-20-4	o-Tolualdehyde	n/a	n/a	n/a	n/a
53229-39-3	Oxirane, (1-methylbutyl)-	0.02	0.00051	15640	hist.
53366-38-4	Cyclopentane, (2-methylbutyl)-	1.7	0.0739	kerosene	hist.
53398-83-7	Butanoic acid, 2-hexenyl ester, (E)-	1.5	0.0053	15640	hist.
534-22-5	Furan, 2-methyl-	0.0001	1	COPC	hist.
53535-33-4	Heptanol	0.5	0.0617	15640	hist.
535-77-3	Benzene, 1-methyl-3-(1-methylethyl)-	1.8	0.00272	kerosene	hist.
5364-83-0	Cyclohexane, 1-propenyl-	1.9	0.371	kerosene	hist.
53833-32-2	Oxazole, 4,5-dimethyl-2-propyl-	0.5	0.00977	15640	hist.
538-68-1	Benzene, pentyl-	1.6	0.29	kerosene	hist.
53907-60-1	Cyclopentane, 1,1,3,4-tetramethyl-, cis-	1.9	0.00355	kerosene	hist.
53907-75-8	Oxirane, 2-methyl-2-pentyl-	0.02	0.0028	15640	hist.
54004-41-0	1-Pentanol, 4-methyl-2-propyl-	0.25	0.0055	15640	hist.
540-59-0	Ethene, 1,2-dichloro-	0.5	0.0529	75-35-4	hist.
540-84-1	Pentane, 2,2,4-trimethyl-	2.1	0.0122	kerosene	hist.
541-01-5	Heptasiloxane, hexadecamethyl-	n/a	n/a	n/a	n/a
54105-66-7	Cyclohexane, undecyl-	1	0.00169	kerosene	hist.
541-05-9	Cyclotrisiloxane, hexamethyl	4.4	0.86	15640	hist.
541-35-5	Butanamide	0.1	0.0257	15640	hist.
541-73-1	Benzene, 1,3-dichloro-	0.25	0.01	15640	hist.
541-85-5	3-Heptanone, 5-methyl-	2.5	0.0432	22491	hist.
54244-79-0	1-Decene, 5-methyl-	1.5	0.00029	kerosene	hist.
542-44-9	Hexadecanoic acid, 2,3-dihydroxypropyl ester	0.0035	0.000271	15640	hist.
542-54-1	Pentanenitrile, 4-methyl-	0.08	0.024	15640	hist.
542-55-2	Formic acid, 2-methylpropyl ester	1	0.103	15640	hist.
542-56-3	Isobutyl nitrite	0.1	0.0254	22491	hist.
542-75-6	1,3-Dichloropropene	0.1	0.005	SWIHD	SWIHD
54299-96-6	Cyclooctene, 1,2-dimethyl-	1.7	0.0163	kerosene	hist.
543-29-3	Nitric acid, 2-methylpropyl ester	0.25	0.07	15640	hist.
543-49-7	2-Heptanol	0.5	0.0846	15640	hist.
543-87-3	1-Butanol, 3-methyl-, nitrate	0.25	0.15	15640	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
54411-00-6	Cyclohexane, 1-methyl-4-(1-methylbutyl)-	1.4	0.0202	kerosene	hist.
54411-01-7	Cyclohexane, 1-methyl-2-pentyl-	1.4	0.0786	kerosene	hist.
54411-02-8	Cyclohexane, 1-methyl-3-pentyl-	1.4	0.0102	kerosene	hist.
544-16-1	Nitrous acid, butyl ester	0.01	0.49	COPC	hist.
544-63-8	Tetradecanoic acid	1	0.779	15640	hist.
544-76-3	Hexadecane	20	5.02	SWIHD	hist.
5454-28-4	Heptanoic acid, butyl ester	0.15	0.0012	15640	hist.
54549-80-3	Cyclopentane, 2-ethyl-1,1-dimethyl-	1.9	0.00039	kerosene	hist.
5458-16-2	Pentane, 2-cyclopropyl-	2.1	0.00581	kerosene	hist.
54658-01-4	Hexane, 3-methoxy-	0.05	0.0756	15640	hist.
54676-39-0	Cyclohexane, 2-butyl-1,1,3-trimethyl-	1.3	0.451	kerosene	hist.
54774-28-6	2-Furanmethanol, tetrahydro-5-methyl-, trans-	0.02	0.00065	15640	hist.
54823-94-8	Cyclohexane, 1-(cyclohexylmethyl)-2-methyl-, trans-	1.2	0.034	kerosene	hist.
54823-98-2	Cyclohexane, 1-(cyclohexylmethyl)-4-methyl-, trans-	1.2	0.00115	kerosene	hist.
54824-04-3	Cyclohexane, 1-(cyclohexylmethyl)-2-methyl-, cis-	1.2	0.0128	kerosene	hist.
54832-83-6	1H-Indene, octahydro-2,2,4,4,7,7-hexamethyl-, trans-	1.1	0.0216	kerosene	hist.
54833-48-6	Heptadecane, 2,6,10,15-tetramethyl-	2	0.000604	15640	hist.
54845-26-0	3-Heptene, 2,2,3,5,5,6,6-heptamethyl-	1.2	0.0251	kerosene	hist.
54845-28-2	2-Hexenoic acid, 2-hexenyl ester, (E,E)-	0.15	0.0353	15640	hist.
54934-90-6	Cyclohexane, 1,1`-(1-methylethylidene)bis-	1.1	0.00251	kerosene	hist.
54934-93-9	Cyclohexane, 1-(cyclohexylmethyl)-2-ethyl-, cis-	1.1	0.13	kerosene	hist.
54934-95-1	Cyclohexane, 1-(cyclohexylmethyl)-4-ethyl-, cis-	1.1	0.000645	kerosene	hist.
54965-05-8	Cyclohexane, 1,1,3-trimethyl-2-(3-methylpentyl)-	1.1	0.0886	kerosene	hist.
5500-21-0	Cyclopropanecarbonitrile	0.06	0.00734	15640	hist.
55030-62-1	Tridecane, 4,8-dimethyl-	1.1	0.299	kerosene	hist.
55045-07-3	Dodecane, 2-methyl-8-propyl-	1	0.337	kerosene	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
55045-08-4	Dodecane, 2-methyl-6-propyl-	1	0.00395	kerosene	hist.
55045-11-9	Tridecane, 5-propyl-	1	0.267	kerosene	hist.
55045-12-0	Tetradecane, 4,11-dimethyl-	1	0.0012	kerosene	hist.
55045-13-1	Tetradecane, 6,9-dimethyl-	1	0.0000989	kerosene	hist.
55045-14-2	Tetradecane, 4-ethyl-	1	0.00395	kerosene	hist.
55170-92-8	2-Undecene, 4,5-dimethyl-, [R*,R*-(E)]-	1.3	0.00135	kerosene	hist.
55-18-5	Ethanamine, N-ethyl-N-nitroso	0.00001	0.000327	COPC	IH
55282-34-3	Cyclohexane, 1,3,5-trimethyl-2-octadecyl-	1	0.0086	15640	hist.
55334-40-2	Benzeneacetic acid, .alpha.,4-bis[(trimethylsilyl)oxy]-, methyl ester	n/a	n/a	n/a	n/a
55373-86-9	Docosane, 7-hexyl-	2	0.0035	15640	hist.
55429-85-1	Benzeneethanamine, N-[(pentafluorophenyl)methylene]-.beta.,4- bis[(trimethylsilyl)oxy]-	1	0.0039	15640	hist.
55471-01-7	Butanamide, 2,2,3,3,4,4,4-heptafluoro-N-[2-[(trimethylsilyl)oxy]-2- [4-[(trimethylsilyl)oxy]phenyl]ethyl]-	n/a	n/a	n/a	n/a
55494-10-5	2-Hexenedioic acid, bis(trimethylsilyl) ester, (E)-	n/a	n/a	n/a	n/a
556-67-2	Cyclotetrasiloxane, octamethyl	3	0.847	15640	hist.
55702-46-0	1,1`-Biphenyl, 2,3,4-trichloro-	0.0094	0.0002	COPC	hist.
55702-61-9	2-Hexene, 4,4,5-trimethyl-	1.9	0.00674	kerosene	hist.
558-37-2	1-Butene, 3,3-dimethyl-	2.9	0.0235	kerosene	hist.
55937-92-3	Bicyclo[4.1.0]heptane, 2-methyl-7-pentyl-	1.3	0.158	kerosene	hist.
55956-20-2	2-Oxazolidinone, 5-methyl-3-(2-propenyl)-	0.5	0.0117	15640	hist.
560-21-4	2,3,3-Trimethylpentane	2.1	1.04	kerosene	hist.
56052-85-8	2-Pentene, 5-(pentyloxy)-, (E)-	1	0.00344	15640	hist.
56052-94-9	Oxirane, 2-ethyl-3-propyl-, cis-	0.02	0.0327	15640	hist.
56-23-5	Methane, tetrachloro-	0.5	0.325	SWIHD	hist.
562-49-2	Pentane, 3,3-dimethyl-	2.4	0.378	kerosene	hist.
56292-65-0	Dodecane, 2,5-dimethyl-	1.2	0.339	kerosene	hist.
56292-66-1	Tridecane, 2,5-dimethyl-	1.1	0.000949	kerosene	hist.
56292-69-4	Tetradecane, 2,5-dimethyl-	1	0.00108	kerosene	hist.
563-16-6	Hexane, 3,3-dimethyl-	2.1	0.00685	kerosene	hist.
563-45-1	1-Butene, 3-methyl-	3.4	0.487	kerosene	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
563-46-2	1-Butene, 2-methyl-	3.4	0.41	kerosene	hist.
563-78-0	1-Butene, 2,3-dimethyl-	2.9	0.00798	kerosene	hist.
563-79-1	2-Butene, 2,3-dimethyl-	2.9	0.0426	kerosene	hist.
563-80-4	2-Butanone, 3-methyl-	20	3.4	22491	hist.
564-02-3	Pentane, 2,2,3-trimethyl-	2.1	0.0514	kerosene	hist.
56554-96-2	2-Octadecenal	0.003	0.00201	15640	hist.
565-59-3	Pentane, 2,3-dimethyl-	2.4	0.84	kerosene	hist.
565-61-7	2-Pentanone, 3-methyl-	0.5	0.036	15640	hist.
565-67-3	3-Pentanol, 2-methyl-	0.25	0.073	15640	hist.
565-68-4	1-pentyn-3-ol, 4-methyl-	1	0.00982	15640	hist.
565-69-5	3-Pentanone, 2-methyl-	0.5	0.0179	15640	hist.
565-75-3	Pentane, 2,3,4-trimethyl-	2.1	0.578	kerosene	hist.
565-80-0	3-Pentanone, 2,4-dimethyl-	0.5	0.0611	15640	hist.
56728-10-0	1-Hexene, 3,4,5-trimethyl-	1.9	0.0094	kerosene	hist.
5675-51-4	1,12-Dodecanediol	0.0015	0.00011	15640	hist.
56851-45-7	2-Dodecene, 4-methyl-	1.3	0.00319	kerosene	hist.
57-10-3	Hexadecanoic acid	1	0.923	15640	hist.
57-11-4	Octadecanoic acid	1	0.00032	15640	hist.
57-14-7	Hydrazine, 1,1-dimethyl-	0.001	n/a	22491	n/a
5715-25-3	2-Cyclohexen-1-one, 4,5-dimethyl-	0.02	0.00471	15640	hist.
571-61-9	Naphthalene, 1,5-dimethyl-	1.5	0.00116	kerosene	hist.
5746-58-7	Tetradecanoic acid, 12-methyl-, (S)-	1	0.000924	15640	hist.
575-37-1	Naphthalene, 1,7-dimethyl-	1.5	0.0021	kerosene	hist.
57-55-6	1,2-Propanediol	5	0.148	22491	hist.
5756-43-4	Hexane, 1-ethoxy-	0.05	0.0194	15640	hist.
57706-88-4	3-Octanol, 3,7-dimethyl-, (.+-.)-	0.5	0.0015	15640	hist.
5775-96-2	1H-Pyrazole, 4,5-dihydro-1,5-dimethyl-	0.2	0.0071	15640	hist.
5779-94-2	2,5-Dimethylbenzaldehyde	n/a	n/a	n/a	n/a
578-54-1	Benzenamine, 2-ethyl-	0.005	0.00157	15640	hist.
57905-86-9	Cyclobutane, 1,1,2,3,3-pentamethyl-	1.9	0.00142	kerosene	hist.
581-40-8	Naphthalene, 2,3-dimethyl-	1.5	0.00166	kerosene	hist.
583-48-2	Hexane, 3,4-dimethyl-	2.1	0.0642	kerosene	hist.
583-57-3	Cyclohexane, 1,2-dimethyl-	2.1	0.0519	kerosene	hist.
583-58-4	Pyridine, 3,4-dimethyl-	0.02	0.0015	15640	hist.
58462-32-1	trans,trans-3-Ethyldecahydronaphthalene	1.4	0.0674	kerosene	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
58467-28-0	2,5-Pyrrolidinedione, 3-ethyl-3-hydroxy-	10	0.00125	15640	hist.
584-94-1	Hexane, 2,3-dimethyl-	2.1	0.259	kerosene	hist.
5857-36-3	3-Pentanone, 2,2,4-trimethyl-	0.5	0.012	15640	hist.
585-74-0	Ethanone, 1-(3-methylphenyl)-	0.1	0.000334	15640	hist.
5876-87-9	1,11-Dodecadiene	1.4	0.000539	kerosene	hist.
589-34-4	Hexane, 3-methyl-	2.4	1.43	kerosene	hist.
589-38-8	3-Hexanone	6.7	24.8	AOEL	hist.
589-43-5	Hexane, 2,4-dimethyl-	2.1	0.331	kerosene	hist.
589-53-7	Heptane, 4-methyl-	2.1	0.394	kerosene	hist.
589-63-9	4-Octanone	0.5	0.877	15640	hist.
589-81-1	Heptane, 3-methyl-	2.1	0.11	kerosene	hist.
589-82-2	3-Heptanol	0.5	0.106	15640	hist.
589-90-2	Cyclohexane, 1,4-dimethyl-	2.1	0.0557	kerosene	hist.
589-93-5	Pyridine, 2,5-dimethyl-	0.02	0.0292	15640	hist.
590-01-2	Propanoic acid, butyl ester	1.5	0.351	15640	hist.
590-18-1	2-Butene, (Z)-	4.3	0.623	kerosene	hist.
590-35-2	Pentane, 2,2-dimethyl-	2.4	0.0129	kerosene	hist.
590-36-3	2-Pentanol, 2-methyl-	0.25	0.0511	15640	hist.
590-50-1	2-Pentanone, 4,4-dimethyl-	0.5	0.11	15640	hist.
590-66-9	Cyclohexane, 1,1-dimethyl-	2.1	0.000996	kerosene	hist.
590-73-8	Hexane,2,2-dimethyl-	2.1	0.0342	kerosene	hist.
590-86-3	Butanal, 3-methyl-	0.5	0.085	15640	hist.
5910-87-2	2,4-Nonadienal, (E,E)-	0.003	0.001	15640	hist.
5910-89-4	Pyrazine, 2,3-dimethyl-	0.5	0.00954	15640	hist.
5911-04-6	Nonane, 3-methyl-	1.7	0.245	kerosene	hist.
591-22-0	Pyridine, 3,5-dimethyl-	0.02	0.0021	15640	hist.
591-23-1	Cyclohexanol, 3-methyl-	0.5	0.00059	15640	hist.
591-24-2	Cyclohexanone, 3-methyl-	0.2	0.03	15640	hist.
591-76-4	Hexane, 2-methyl-	2.4	0.986	kerosene	hist.
591-78-6	2-Hexanone	0.5	0.68	COPC	hist.
591-87-7	Acetic acid, 2-propenyl ester	5	1.02	15640	hist.
591-95-7	1,2-Pentadiene	3.5	0.0131	kerosene	hist.
592-13-2	Hexane, 2,5-dimethyl-	2.1	0.0476	kerosene	hist.
592-27-8	Heptane, 2-methyl-	2.1	0.398	kerosene	hist.
592-41-6	1-Hexene	2.9	4.61	kerosene	hist.
592-42-7	1,5-Hexadiene	2.9	0.0491	kerosene	hist.
592-43-8	2-Hexene	2.9	0.0133	kerosene	hist.

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592-45-0	1,4-Hexadiene	1	0.0545	22491	hist.
592-48-3	1,3-Hexadiene	2.9	0.12	kerosene	hist.
592-76-7	1-Heptene	2.4	0.378	kerosene	hist.
592-77-8	2-Heptene	2.4	0.15	kerosene	hist.
592-78-9	3-Heptene	2.4	0.017	kerosene	hist.
592-84-7	Formic acid, butyl ester	1	0.72	15640	hist.
592-98-3	3-Octene	2.1	0.0778	kerosene	hist.
593-08-8	2-Tridecanone	1.7	0.283	AOEL	hist.
593-45-3	Octadecane	2	0.00651	15640	hist.
593-74-8	Mercury, dimethyl	0.00012	0.000172	10% of ACGIH TLV	IH
594-11-6	Cyclopropane, methyl-	4.3	0.0731	kerosene	hist.
594-70-7	Propane, 2-methyl-2-nitro-	0.03	0.23	COPC	hist.
594-82-1	Butane, 2,2,3,3-tetramethyl-	2.1	0.051	kerosene	hist.
59681-06-0	2,6,10,14,18,22-Tetracosahexaene, 2,6,10,19,23-pentamethyl-, (all-E)-	5	0.0604	15640	hist.
598-32-3	3-Buten-2-ol	5	0.026	15640	hist.
598-58-3	Nitric acid, methyl ester	0.8	0.33	AOEL	hist.
598-61-8	Cyclobutane, methyl-	3.4	0.474	kerosene	hist.
59-89-2	Morpholine, 4-nitroso-	0.00006	0.0115	COPC	hist.
5989-27-5	Cyclohexene, 1-methyl-4-(1-methylethenyl)-, (R)-	1.7	0.0309	kerosene	hist.
599-70-2	Benzene, (ethylsulfonyl)-	n/a	n/a	n/a	n/a
59983-39-0	1-Pyrrolidinamine, 2-(methoxymethyl)-, (S)-	0.1	0.00031	15640	hist.
600-14-6	2,3-Pentanedione	0.2	0.016	15640	hist.
600-24-8	Butane, 2-nitro-	0.1	0.0013	15640	hist.
6031-02-3	Benzene, (1-methylpentyl)-	10	0.123	22491	hist.
6032-29-7	2-Pentanol	5	0.219	15640	hist.
60-34-4	Hydrazine, methyl-	0.001	n/a	22491	n/a
60-35-5	Acetamide	0.01	0.00485	15640	hist.
6044-71-9	Dodecane, 6-methyl-	1.3	0.158	kerosene	hist.
6064-27-3	6-Dodecanone	0.5	0.103	15640	hist.
60643-93-8	3-Hexene, 2,3,4,5-tetramethyl-, (Z)-	1.7	0.0126	kerosene	hist.
6069-98-3	Cyclohexane, 1-methyl-4-(1-methylethyl)-, cis-	1.7	0.069	kerosene	hist.
608-25-3	1,3-Benzenediol, 2-methyl-	10	0.00108	15640	hist.
609-26-7	Pentane, 3-ethyl-2-methyl-	2.1	0.0051	kerosene	hist.

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6094-02-6	1-Hexene, 2-methyl-	2.4	0.000913	kerosene	hist.
611-14-3	Benzene, 1-ethyl-2-methyl-	2	0.017	kerosene	hist.
61141-57-9	Cyclohexene, 1-ethyl-6-ethylidene-	1.7	0.00241	kerosene	hist.
61141-72-8	Dodecane, 4,6-dimethyl-	1.2	9.05	kerosene	hist.
61141-79-5	Cyclohexane, 1,2-diethyl-1-methyl-	1.5	0.0733	kerosene	hist.
61141-80-8	Cyclohexane, 1,2-diethyl-3-methyl-	1.5	0.0893	kerosene	hist.
61142-20-9	Cyclohexane, (4-methylpentyl)-	1.4	0.419	kerosene	hist.
61142-23-2	Cyclohexane, (2,2-dimethylcyclopentyl)-	1.3	0.0417	kerosene	hist.
61142-24-3	Cyclohexane, 1,2,4,5-tetraethyl-, (1.alpha.,2.alpha.,4.alpha.,5.alpha.)-	1.2	0.00593	kerosene	hist.
61142-37-8	Cyclohexane, (1,2-dimethylbutyl)-	1.4	0.00114	kerosene	hist.
61142-38-9	Cyclohexane, (3-methylpentyl)-	1.4	0.086	kerosene	hist.
61142-40-3	4-Undecene, 4-methyl-	1.4	0.402	kerosene	hist.
61142-41-4	Cyclooctane, ethenyl-	1.7	0.0183	kerosene	hist.
61142-47-0	2-Pentene, 2-methoxy-	0.5	0.000671	15640	hist.
61142-65-2	Cyclopentane, 3-hexyl-1,1-dimethyl-	1.3	0.000491	kerosene	hist.
61142-66-3	Cyclopentene, 5-hexyl-3,3-dimethyl-	1.3	0.00354	kerosene	hist.
61142-68-5	Cyclopentane, 1-hexyl-3-methyl-	1.4	0.0387	kerosene	hist.
61142-70-9	Cyclohexane, 2,4-diethyl-1-methyl-	1.5	0.0419	kerosene	hist.
6117-97-1	Dodecane, 4-methyl-	1.3	2.67	kerosene	hist.
6137-06-0	2-Heptanone, 4-methyl-	0.5	0.0174	15640	hist.
6137-12-8	3-Hexanone, 4-ethyl-	0.5	0.000594	15640	hist.
6137-26-4	4-Dodecanone	0.5	0.035	15640	hist.
613-93-4	Benzamide, N-methyl-	0.005	0.000331	15640	hist.
616-45-5	2-Pyrrolidinone	0.1	0.252	15640	hist.
617-29-8	3-Hexanol, 2-methyl-	0.06	0.0197	15640	hist.
6175-49-1	2-Dodecanone	0.5	0.018	15640	hist.
617-78-7	3-Ethylpentane	2.4	0.239	kerosene	hist.
617-94-7	Benzenemethanol, .alpha.,.alpha.-dimethyl-	0.1	3.4	15640	hist.
61886-62-2	3-Hexadecyne	1	0.0532	kerosene	hist.
620-00-8	2-Hexene, 3-ethyl-	2.1	0.0784	kerosene	hist.
620-14-4	3-Methylethylbenzene	2	0.00732	kerosene	hist.

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62016-14-2	Octane, 2,5,6-trimethyl-	1.5	0.00458	kerosene	hist.
62016-18-6	Octane, 5-ethyl-2-methyl-	1.5	0.0344	kerosene	hist.
62016-19-7	Octane, 6-ethyl-2-methyl-	1.5	0.0582	kerosene	hist.
62016-30-2	Octane, 2,3,3-trimethyl-	1.5	0.118	kerosene	hist.
62016-34-6	Octane, 2,3,7-trimethyl-	1.5	0.482	kerosene	hist.
62016-37-9	Octane, 2,4,6-trimethyl-	1.5	n/a	kerosene	n/a
620-23-5	m-Tolualdehyde	n/a	n/a	n/a	n/a
62108-21-8	Decane, 6-ethyl-2-methyl-	1.3	0.267	kerosene	hist.
62108-22-9	Decane, 2,5,9-trimethyl-	1.3	0.00352	kerosene	hist.
62108-25-2	Decane, 2,6,7-trimethyl-	1.3	0.428	kerosene	hist.
62108-26-3	Decane, 2,6,8-trimethyl-	1.3	0.0017	kerosene	hist.
62108-27-4	Decane, 2,4,6-trimethyl-	1.3	3.59	kerosene	hist.
62108-31-0	Heptane, 4-ethyl-2,2,6,6-tetramethyl-	1.3	0.0449	kerosene	hist.
62108-32-1	Heptane, 2,2,3,4,6,6-hexamethyl-	1.3	0.00182	kerosene	hist.
621-64-7	1-Propanamine, N-nitroso-N-propyl	0.0001	0.000084	SWIHD	SWIHD
62183-55-5	Octane, 3-ethyl-2,7-dimethyl-	1.4	0.00184	kerosene	hist.
62185-21-1	Octane, 3,4,5,6-Tetramethyl-	1.4	0.032	kerosene	hist.
62185-53-9	Nonane, 5-(2-methylpropyl)-	1.3	0.00718	kerosene	hist.
62199-50-2	Cyclopentane, 1-butyl-2-propyl-	1.4	0.0209	kerosene	hist.
62199-51-3	Cyclopentane, 1-pentyl-2-propyl-	1.3	0.0576	kerosene	hist.
62237-96-1	Decane, 2,2,5-trimethyl-	1.3	n/a	kerosene	n/a
62237-97-2	Decane, 2,2,6-trimethyl-	1.3	0.0023	kerosene	hist.
62238-01-1	Decane, 2,2,8-trimethyl-	1.3	0.0336	kerosene	hist.
62238-08-8	Cyclopropane, 1-ethyl-2-pentyl-	1.7	0.000319	kerosene	hist.
62238-11-3	Decane, 2,3,5-trimethyl-	1.3	0.0326	kerosene	hist.
62238-12-4	Decane, 2,3,6-trimethyl-	1.3	0.107	kerosene	hist.
62238-13-5	Decane, 2,3,7-trimethyl-	1.3	0.13	kerosene	hist.
62238-14-6	Decane, 2,3,8-trimethyl-	1.3	0.0408	kerosene	hist.
62238-33-9	Cyclohexane, 1-ethyl-2-propyl-	1.5	0.0717	kerosene	hist.
622-96-8	Benzene, 1-ethyl-4-methyl-	2	0.0001	kerosene	hist.
623-37-0	3-Hexanol	0.06	0.00965	15640	hist.
62338-08-3	3-Hexene, 3-ethyl-2,5-dimethyl-	1.7	0.0444	kerosene	hist.
62338-09-4	Decane, 2,2,3-trimethyl-	1.3	0.00176	kerosene	hist.
62338-40-3	Cyclohexane, decylidene-	1	0.000503	kerosene	hist.
62338-45-8	Bicyclo[2.2.2]octane, 1,2,3,6-tetramethyl-	1.4	0.0536	kerosene	hist.
62338-47-0	4-Decene, 3-methyl-, (E)-	1.5	0.0338	kerosene	hist.

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62338-52-7	Cyclobutane, 3-hexyl-1,1,2-trimethyl-	1.3	0.000859	kerosene	hist.
623-56-3	3-Hexanone, 5-methyl-	0.5	0.00194	15640	hist.
6236-88-0	Cyclohexane, 1-ethyl-4-methyl-, trans-	1.9	0.0305	kerosene	hist.
62376-15-2	Cycloundecane, 1,1,2-trimethyl-	1.2	0.00525	kerosene	hist.
623-87-0	1,3-dinitrate-1,2,3-Propanetriol	0.005	0.0103	COPC	hist.
624-16-8	4-Decanone	0.5	0.00286	15640	hist.
624-42-0	3-Heptanone, 6-methyl-	0.25	0.00524	15640	hist.
624-43-1	1,2,3-Propanetriol, 1-nitrate	0.8	0.0264	AOEL	hist.
624-64-6	2-Butene, (E)-	4.3	0.0503	kerosene	hist.
624-83-9	Methane, isocyanato-	0.002	0.018	COPC	hist.
624-91-9	Nitrous acid, methyl ester	0.01	0.429	COPC	hist.
624-95-3	1-Butanol, 3,3-dimethyl-	1	0.0188	15640	hist.
625-25-2	2-Heptanol, 2-methyl-	0.5	0.00069	15640	hist.
625-58-1	Nitric acid, ethyl ester	0.8	0.447	AOEL	hist.
625-65-0	2-Pentene, 2,4-dimethyl-	2.4	0.00892	kerosene	hist.
625-74-1	Propane, 2-methyl-1-nitro-	0.1	0.002	15640	hist.
625-84-3	1H-Pyrrole, 2,5-dimethyl-	0.01	0.0027	15640	hist.
625-86-5	Furan, 2,5-dimethyl-	0.0001	0.00932	COPC	hist.
627-05-4	Butane, 1-nitro-	0.25	0.483	AOEL	hist.
627-13-4	Nitric acid, propyl ester	2.5	1.2	22491	hist.
627-20-3	2-Pentene, (Z)-	3.4	0.438	kerosene	hist.
627-27-0	3-Buten-1-ol	0.07	5.7	15640	hist.
62-75-9	Methanamine, N-methyl-N-nitroso-	0.00003	1.1	COPC	IH
627-59-8	2-Hexanol, 5-methyl-	0.5	0.000578	15640	hist.
6281-96-5	Formamide, N-(2-methylpropyl)-	0.1	0.0058	15640	hist.
628-28-4	Butane, 1-methoxy-	1.7	0.43	AOEL	hist.
628-44-4	2-Octanol, 2-methyl-	0.5	0.00568	15640	hist.
628-61-5	Octane, 2-chloro-	0.01	0.000714	15640	hist.
628-73-9	Hexanenitrile	0.6	0.948	COPC	hist.
628-80-8	Pentane, 1-methoxy-	0.2	0.00877	15640	hist.
629-08-3	Heptanenitrile	0.6	0.677	COPC	hist.
629-23-2	3-Tetradecanone	0.5	0.149	15640	hist.
629-50-5	Tridecane	1.3	80.4	kerosene	hist.
6295-06-3	Acetic acid, oxo-, butyl ester	1.5	0.000344	15640	hist.
629-54-9	Hexadecanamide	5	0.000263	15640	hist.
629-59-4	Tetradecane	20	20.4	SWIHD	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
629-60-7	Tridecanenitrile	0.08	0.0521	15640	hist.
629-62-9	Pentadecane	20	6.11	SWIHD	hist.
629-70-9	1-Hexadecanol, acetate	1.5	0.0043	15640	hist.
629-73-2	1-Hexadecene	1	0.257	kerosene	hist.
629-76-5	1-Pentadecanol	0.015	0.0021	15640	hist.
629-78-7	Heptadecane	1	4.05	SWIHD	hist.
629-80-1	Hexadecanal	0.5	0.00044	15640	hist.
629-89-0	1-Octadecyne	10	0.00018	15640	hist.
629-92-5	Nonadecane	2	0.00025	15640	hist.
629-94-7	Heneicosane	2	0.000982	15640	hist.
630-01-3	Hexacosane	2	0.0182	15640	hist.
630-02-4	n-Octacosane	2	0.0542	15640	hist.
630-08-0	Carbon monoxide	n/a	100	n/a	hist.
630-18-2	Propanenitrile, 2,2-dimethyl-	0.08	0.0314	15640	hist.
630-19-3	Propanal, 2,2-dimethyl-	0.25	0.02	15640	hist.
6304-50-3	Dodecane, 2,2,4,9,11,11-hexamethyl-	0.96	0.00138	kerosene	hist.
6305-52-8	Naphthalene, 2-butyldecahydro-	1.2	0.0435	kerosene	hist.
637-50-3	Benzene, 1-propenyl-	2	0.124	kerosene	hist.
637-64-9	2-Furanmethanol, tetrahydro-, acetate	n/a	n/a	n/a	n/a
637-88-7	1,4-Cyclohexanedione	0.067	0.00359	15640	hist.
637-92-3	Propane, 2-ethoxy-2-methyl-	0.5	0.000241	22491	hist.
638-04-0	Cyclohexane, 1,3-dimethyl-, cis-	2.1	0.0683	kerosene	hist.
63830-68-2	4-Nonene, 2,3,3-trimethyl-, (Z)-	1.4	0.0922	kerosene	hist.
638-36-8	Hexadecane, 2,6,10,14-tetramethyl-	2	0.025	15640	hist.
64-17-5	Ethanol	100	21.3	SWIHD	hist.
6418-41-3	Tridecane, 3-methyl-	1.2	1.48	kerosene	hist.
6418-43-5	Hexadecane, 3-methyl-	1	0.0405	kerosene	hist.
6418-44-6	Heptadecane, 3-methyl-	2	0.00475	15640	hist.
64-18-6	Formic Acid	0.5	n/a	22491	n/a
64-19-7	Acetic acid	1	0.347	22491	hist.
6434-78-2	2-Nonene, (E)-	1.9	0.000142	kerosene	hist.
643-58-3	1,1`-Biphenyl, 2-methyl-	0.02	0.381	92-52-4	hist.
645-10-3	1,7-Dimethyl-4-(1-methylethyl)cyclodecane	1.1	0.0495	kerosene	hist.
645-56-7	Phenol, 4-propyl-	0.05	0.00051	15640	hist.
645-62-5	2-Hexenal, 2-ethyl-	0.01	0.028	COPC	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
646-04-8	2-Pentene, (E)-	3.4	0.228	kerosene	hist.
66-25-1	Hexanal	5	1.3	15640	hist.
66552-62-3	Naphthalene, decahydro-1,5-dimethyl-	1.4	0.00444	kerosene	hist.
66553-50-2	Cyclopentane, 1-methyl-2-(4-methylpentyl)-, trans-	1.4	0.0000798	kerosene	hist.
66660-41-1	cis,trans-3-Ethyldecahydronaphthalene	1.4	0.0691	kerosene	hist.
66660-42-2	cis, cis-3-Ethylbicyclo[4.4.0]decane	1.4	0.056	kerosene	hist.
66660-43-3	trans, cis-3-Ethylbicyclo[4.4.0]decane	1.4	0.11	kerosene	hist.
66826-95-7	Cyclohexane, 1-(cyclohexylmethyl)-4-methyl-	1.2	0.117	kerosene	hist.
6711-26-8	Cyclohexanone, 2,5-dimethyl-2-(1-methylethenyl)-	0.02	0.000404	15640	hist.
6728-26-3	2-Hexenal, (E)-	0.003	0.000388	15640	hist.
6728-31-0	4-Heptenal, (Z)-	5	0.002	15640	hist.
674-76-0	2-Pentene, 4-methyl-, (E)-	2.9	0.00985	kerosene	hist.
67-56-1	Methanol	20	39	COPC	hist.
67-63-0	2-Propanol	40	2.65	22491	hist.
67-64-1	2-Propanone	50	20	SWIHD	hist.
6765-39-5	1-Heptadecene	1	0.000733	kerosene	hist.
67-66-3	Methane, trichloro-	1	1.29	SWIHD	hist.
67-72-1	Ethane, hexachloro-(8CI,9CI)	n/a	n/a	n/a	n/a
67730-63-6	4,6-Decadiene, 3,8-dimethyl-, [S-[R*,R*-(E,E)]]-	1.4	0.0777	kerosene	hist.
6783-92-2	Cyclohexane, 1,1,2,3-tetramethyl-	1.7	0.0637	kerosene	hist.
6789-80-6	3-Hexenal, (Z)-	5	0.00545	15640	hist.
67975-92-2	Hex-1-enylcyclohexane	1.4	0.0256	kerosene	hist.
6836-38-0	6-Dodecanol	0.015	0.00208	15640	hist.
68443-63-0	Hexanoic acid, 2-ethyl-, butyl ester	0.15	0.00137	15640	hist.
6876-23-9	Cyclohexane, 1,2-dimethyl-, trans-	2.1	n/a	kerosene	n/a
68820-35-9	4-Undecenal, (E)-	5	0.00276	15640	hist.
6898-69-7	Methanamine, N-butylidene-	0.05	0.03	15640	hist.
6898-74-4	1-Butanamine, N-ethylidene-	0.01	0.0079	15640	hist.
690-08-4	2-Pentene, 4,4-dimethyl-, (E)-	2.4	0.00326	kerosene	hist.
691-37-2	1-Pentene, 4-methyl-	2.9	0.758	kerosene	hist.
692-47-7	3-Hexene, 2,2,5,5-tetramethyl-, (Z)-	1.7	0.000959	kerosene	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
693-54-9	2-Decanone	0.5	0.086	15640	hist.
693-61-8	2-Undecene, (E)-	1.5	0.0285	kerosene	hist.
693-62-9	4-Undecene, (E)-	1.5	0.000581	kerosene	hist.
693-98-1	1H-Imidazole, 2-methyl-	0.1	0.000491	15640	hist.
694-05-3	Pyridine, 1,2,3,6-tetrahydro-	0.01	0.093	AOEL	hist.
694-87-1	Bicyclo[4.2.0]octa-1,3,5-triene	2.3	n/a	kerosene	n/a
695-06-7	2(3H)-Furanone, 5-ethyldihydro-	5	0.0192	15640	hist.
696-29-7	Cyclohexane, (1-methylethyl)-	1.9	0.00124	kerosene	hist.
69687-91-8	2-Hexenoic acid, 4-methylphenyl ester	0.15	0.00154	15640	hist.
6975-98-0	Decane, 2-methyl-	1.5	0.345	kerosene	hist.
69770-96-3	Cyclopentanone, 2-methyl-4-(2-methylpropyl)-	0.2	0.0682	15640	hist.
699-22-9	1H-Pyrrole, 1-pentyl-	0.1	0.016	15640	hist.
7012-37-5	1,1`-Biphenyl, 2,4,4`-trichloro-	0.0094	0.000287	COPC	hist.
7045-71-8	Undecane, 2-methyl-	1.4	5.22	kerosene	hist.
7058-01-7	Cyclohexane, (1-methylpropyl)-	1.7	0.377	kerosene	hist.
706-14-9	2(3H)-Furanone, 5-hexyldihydro-	5	0.00079	15640	hist.
7094-26-0	Cyclohexane, 1,1,2-trimethyl-	1.9	0.266	kerosene	hist.
710-04-3	2H-Pyran-2-one, 6-hexyltetrahydro-	n/a	n/a	n/a	n/a
7112-02-9	Octanamide, N-(2-hydroxyethyl)-	0.5	0.0034	15640	hist.
7116-86-1	1-Hexene, 5,5-dimethyl-	2.1	0.00359	kerosene	hist.
71186-27-1	Cyclohexane, 2-ethyl-1,1,3-trimethyl-, trans-	1.5	0.078	kerosene	hist.
71-23-8	1-Propanol	10	5	SWIHD	hist.
71-36-3	1-Butanol	2	63.5	COPC	hist.
71-41-0	1-Pentanol	0.2	0.12	15640	hist.
71-43-2	Benzene	0.05	1.26	COPC	hist.
7154-80-5	Heptane, 3,3,5-trimethyl-	1.7	0.098	kerosene	hist.
71-55-6	Ethane, 1,1,1-trichloro-	35	0.0188	22491	hist.
717-21-5	2-Propen-1-one, 3-(2-furanyl)-1-phenyl-	0.0001	0.00058	COPC	hist.
719-22-2	2,5-Cyclohexadiene-1,4-dione, 2,6-bis(1,1-dimethylethyl)-	0.01	0.0029	15640	hist.
72014-90-5	1,4-Pentadiene, 2,3,4-trimethyl-	2.2	0.0481	kerosene	hist.
7206-14-6	3-Dodecene, (E)-	1.4	0.0248	kerosene	hist.
7206-15-7	4-Dodecene, (E)-	1.4	0.116	kerosene	hist.
7206-17-9	6-Dodecene, (E)-	1.4	0.00133	kerosene	hist.
7206-28-2	5-Dodecene, (Z)-	1.4	0.00106	kerosene	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
7225-64-1	Heptadecane, 9-octyl-	2	0.0174	15640	hist.
7239-23-8	3-Dodecene, (Z)-	1.4	0.0507	kerosene	hist.
7250-80-8	Benzenesulfonamide, N-hexyl-	0.0015	0.000557	15640	hist.
72-55-9	Dichlorodiphenyldichloroethylene	0.00037	n/a	22491	n/a
72993-32-9	Cyclopentane, 1-butyl-2-ethyl-	1.5	0.0199	kerosene	hist.
7300-03-0	3-Heptene, 3-methyl-	2.1	0.0545	kerosene	hist.
7367-38-6	4-Nonene, 5-butyl-	1.3	0.0298	kerosene	hist.
7379-12-6	3-Hexanone, 2-methyl-	0.5	0.0644	15640	hist.
7385-78-6	1-Pentene, 3,4-dimethyl-	2.4	0.402	kerosene	hist.
74054-92-5	1,1,6,6-Tetramethylspiro[4.4]nonane	1.3	0.133	kerosene	hist.
7429-90-5	Aluminum	n/a	n/a	n/a	n/a
7433-56-9	5-Decene, (E)-	1.7	0.00413	kerosene	hist.
74367-34-3	Propanoic acid, 2-methyl-, 3-hydroxy-2,4,4-trimethylpentyl ester	0.15	0.00052	15640	hist.
74381-40-1	Propanoic acid, 2-methyl-, 1-(1,1-dimethylethyl)-2-methyl-1,3-propanediyl ester	0.1	0.54	15640	hist.
7439-89-6	Iron	n/a	n/a	n/a	n/a
7439-92-1	Lead	n/a	n/a	n/a	n/a
7439-96-5	Manganese	n/a	n/a	n/a	n/a
7439-97-6	Mercury (elemental)	0.0003	0.0555	COPC	IH
7439-97-6T	Mercury (total)	0.00012	0.0145	dimethylHg	hist.
7439-98-7	Molybdenum	n/a	n/a	n/a	n/a
7440-02-0	Nickel	n/a	n/a	n/a	n/a
7440-22-4	Silver	n/a	0.00134	n/a	hist.
7440-31-5	Tin	n/a	0.0939	n/a	hist.
7440-36-0	Antimony	n/a	n/a	n/a	n/a
7440-37-1	Argon	n/a	9800	n/a	hist.
7440-38-2	Arsenic	n/a	n/a	n/a	n/a
7440-39-3	Barium	n/a	0.0124	n/a	hist.
7440-41-7	Beryllium	n/a	n/a	n/a	n/a
7440-43-9	Cadmium	n/a	0.000948	n/a	hist.
7440-47-3	Chromium	n/a	0.29	n/a	hist.
7440-48-4	Cobalt	n/a	n/a	n/a	n/a
7440-50-8	Copper	n/a	n/a	n/a	n/a
7440-59-7	Helium	n/a	210	n/a	hist.
74421-09-3	Cyclopentane, 1,1,3-trimethyl-3-(2-methyl-2-propenyl)-	1.4	0.00134	kerosene	hist.

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7446-09-5	Sulfur Dioxide	0.2	0.00169	SWIHD	IH
74630-08-3	1-Octene, 3-ethyl-	1.7	0.0305	kerosene	hist.
74630-30-1	2-Decene, 4-methyl-, (Z)-	1.5	0.0961	kerosene	hist.
74630-39-0	1-Undecene, 4-methyl-	1.4	0.204	kerosene	hist.
74630-40-3	1-Undecene, 8-methyl-	1.4	0.00679	kerosene	hist.
74630-42-5	1-Undecene, 7-methyl-	1.4	0.0127	kerosene	hist.
74630-44-7	2-Undecene, 8-methyl-, (Z)-	1.4	0.0685	kerosene	hist.
74630-48-1	3-Undecene, 2-methyl-, (Z)-	1.4	0.8	kerosene	hist.
74630-61-8	2-Undecene, 6-methyl-, (E)-	1.4	0.0241	kerosene	hist.
74630-62-9	5-Undecene, 7-methyl-, (Z)-	1.4	0.0147	kerosene	hist.
74630-66-3	5-Undecene, 7-methyl-, (E)-	1.4	0.0989	kerosene	hist.
74630-69-6	4-Undecene, 5-methyl-, (Z)-	1.4	0.0355	kerosene	hist.
74645-98-0	Dodecane, 2,7,10-trimethyl-	1.1	0.606	kerosene	hist.
74646-36-9	1-Dodecyn-4-ol	1	0.00762	15640	hist.
74646-37-0	1-Tridecyn-4-ol	1	0.000913	15640	hist.
74663-66-4	Cyclohexane, 1,5-diethyl-2,3-dimethyl-	1.4	0.103	kerosene	hist.
74663-86-8	Cyclopropane, 1-ethyl-2-heptyl-	1.4	0.00932	kerosene	hist.
74663-91-5	Cyclopropane, 1-heptyl-2-methyl-	1.5	0.00246	kerosene	hist.
74685-30-6	5-Eicosene, (E)-	1	0.0542	15640	hist.
74752-97-9	1,3-Hexadiene, 3-ethyl-2-methyl-, (Z)-	1.9	0.000938	kerosene	hist.
74764-46-8	3-Heptene, 3-ethyl	1.9	0.00118	kerosene	hist.
74793-02-5	2,2`-Bioxepane	0.05	0.046	15640	hist.
74810-41-6	Cyclohexane, (2-ethyl-1-methylbutylidene)-	1.3	0.0021	kerosene	hist.
74810-42-7	Cyclohexane, (2-ethyl-1-methyl-1-butenyl)-	1.3	0.000248	kerosene	hist.
74-82-8	Methane	100	299000	22491	hist.
74-83-9	Methane, bromo-	0.1	0.02	22491	hist.
74-84-0	Ethane	100	0.0904	22491	hist.
74-87-3	Methane, chloro-	5	0.1	22491	hist.
74-89-5	Methanamine	0.5	0.437	SWIHD	IH
74-90-8	Hydrocyanic acid	0.47	n/a	22491	n/a
74-98-6	Propane	100	24.9	22491	hist.
74-99-7	1-Propyne	100	0.352	22491	hist.
75-00-3	Ethane, chloro-	10	0.05	SWIHD	hist.
75011-90-4	1H-Pyrazole, 4,5-dihydro-5-propyl-	0.02	0.00453	15640	hist.
75-01-4	Ethene, chloro-	n/a	0.01	n/a	hist.

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75-02-5	Ethene, fluoro-	n/a	n/a	n/a	n/a
75-04-7	Ethanamine	0.5	0.828	COPC	IH
75-05-8	Acetonitrile	2	14	COPC	hist.
75-07-0	Acetaldehyde	2.5	12	COPC	hist.
75-09-2	Methane, dichloro-	2.5	6.18	SWIHD	hist.
75-12-7	Formamide	1	0.0499	22491	hist.
75-15-0	Carbon disulfide	0.1	2.37	10% of NIOSH REL	hist.
75163-97-2	Octadecane, 2,6-dimethyl-	2	0.00016	15640	hist.
75-19-4	Cyclopropane	5.8	0.697	kerosene	hist.
75-21-8	Oxirane	n/a	n/a	n/a	n/a
75-25-2	Bromoform	n/a	n/a	n/a	n/a
75268-01-8	1H-Azepin-1-amine, N-ethylidenehexahydro-	n/a	n/a	n/a	n/a
75-27-4	Dichlorobromomethane	n/a	n/a	n/a	n/a
75-28-5	Propane, 2-methyl-	80	0.713	22491	hist.
75-34-3	Ethane, 1,1-dichloro-	10	0.011	SWIHD	hist.
75-35-4	Ethene, 1,1-dichloro-	0.5	0.021	SWIHD	hist.
753-89-9	Propane, 1-chloro-2,2-dimethyl-	0.75	0.00374	15640	hist.
75-43-4	Methane, dichlorofluoro-	1	0.0631	22491	hist.
75-45-6	Methane, chlorodifluoro-	100	1.73	22491	hist.
75-50-3	Methanamine, N,N-dimethyl-	n/a	n/a	n/a	n/a
75-52-5	Methane, nitro-	2	0.0528	22491	hist.
75-55-8	Aziridine, 2-methyl-	n/a	n/a	n/a	n/a
75-65-0	2-Propanol, 2-methyl-	10	0.13	22491	hist.
75-68-3	Ethane, 1-chloro-1,1-difluoro-	100	1.29	22491	hist.
75-69-4	Methane, trichlorofluoro-	100	4.21	SWIHD	hist.
75-71-8	Methane, dichlorodifluoro-	100	0.0202	22491	hist.
75-77-4	Silane, chlorotrimethyl-	n/a	n/a	n/a	n/a
75-83-2	Butane, 2,2-dimethyl-	2.8	0.16	kerosene	hist.
75-84-3	1-Propanol, 2,2-dimethyl-	0.5	0.0427	15640	hist.
75-85-4	2-Butanol, 2-methyl-	10	0.0228	15640	hist.
758-86-1	1,4-Pentadiene, 2,3-dimethyl-	2.5	0.00174	kerosene	hist.
75-97-8	2-Butanone, 3,3-dimethyl-	2	0.034	15640	hist.
75-98-9	Propanoic acid, 2,2-dimethyl-	n/a	n/a	n/a	n/a
76-09-5	2,3-Butanediol, 2,3-dimethyl-	0.1	0.0017	15640	hist.
76-13-1	Ethane, 1,1,2-trichloro-1,2,2-trifluoro-	100	0.287	22491	hist.
76-14-2	Ethane, 1,2-dichloro-1,1,2,2-	100	0.022	22491	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
	tetrafluoro-				
762-62-9	1-Pentene, 4,4-dimethyl-	2.4	0.0159	kerosene	hist.
763-29-1	1-Pentene, 2-methyl-	2.9	1.18	kerosene	hist.
763-93-9	3-Hexen-2-one	0.15	0.0111	15640	hist.
7642-09-3	3-Hexene, (Z)-	2.9	0.00798	kerosene	hist.
7642-15-1	4-Octene, (4Z)-	2.1	0.034	kerosene	hist.
7647-01-0	Hydrochloric acid	n/a	n/a	n/a	n/a
764-96-5	5-Undecene, (Z)-	1.5	0.00162	kerosene	hist.
764-97-6	5-Undecene, (E)-	1.5	0.159	kerosene	hist.
766-15-4	1,3-Dioxane, 4,4-dimethyl-	0.02	0.00173	15640	hist.
7664-38-2	Phosphoric Acid	n/a	n/a	n/a	n/a
7664-39-3	hydrofluoric acid	n/a	n/a	n/a	n/a
7664-41-7	Ammonia	2.5	2502	COPC	hist.
7664-93-9	sulfuric acid	n/a	n/a	n/a	n/a
7667-60-9	Cyclohexane, 1,2,4-trimethyl-, (1.alpha.,2.beta.,4.beta.)-	1.9	0.00273	kerosene	hist.
7683-64-9	2,6,10,14,18,22-Tetracosahexaene, 2,6,10,15,19,23-hexamethyl-	5	0.066	15640	hist.
7688-21-3	2-Hexene, (Z)-	2.9	0.0133	kerosene	hist.
7697-37-2	Nitric Acid	n/a	n/a	n/a	n/a
7726-08-1	Decanamide, N-(2-hydroxyethyl)-	5	0.000593	15640	hist.
7727-37-9	Nitrogen	n/a	883000	n/a	hist.
7732-18-5	Water	n/a	105752	n/a	hist.
774-40-3	Benzeneacetic acid, .alpha.-hydroxy-, ethyl ester	0.0035	0.0017	15640	hist.
777-22-0	Benzene, (1-methylheptyl)-	1.2	0.0216	kerosene	hist.
7782-44-7	Oxygen	n/a	213000	n/a	hist.
7782-49-2	Selenium	n/a	n/a	n/a	n/a
78-46-6	Phosphonic acid, butyl-, dibutyl ester	0.0007	0.0802	COPC	hist.
78-76-2	Butane, 2-bromo-	0.01	0.023	15640	hist.
78-78-4	Butane, 2-methyl-	60	2.68	22491	hist.
78-79-5	1,3-Butadiene, 2-methyl-	5	0.0658	22491	hist.
78-82-0	Propanenitrile, 2-methyl-	0.8	0.0194	22491	hist.
78-83-1	1-Propanol, 2-methyl-	5	0.0181	22491	hist.
78-84-2	Propanal, 2-methyl-	2.5	0.00382	22491	hist.
78-85-3	2-Propenal, 2-methyl-	0.2	0.026	15640	hist.
78-87-5	Propane, 1,2-dichloro-	7.5	0.02	22491	hist.
78-92-2	2-Butanol	10	0.273	22491	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
78-93-3	2-Butanone	20	19.9	SWIHD	hist.
78-94-4	3-Buten-2-one	0.02	1.14	COPC	hist.
78-96-6	2-Propanol, 1-amino	0.2	0.19	15640	hist.
79-00-5	Ethane, 1,1,2-trichloro-	1	0.083	SWIHD	hist.
79-01-6	Ethene, trichloro-	1	0.912	SWIHD	hist.
79-09-4	Propanoic acid	1	0.00514	22491	hist.
79-10-7	2-Propenoic acid	n/a	n/a	n/a	n/a
79-16-3	Acetamide, N-methyl-	0.1	0.00037	15640	hist.
79-20-9	Acetic acid, methyl ester	20	0.0425	22491	hist.
79-29-8	Butane, 2,3-dimethyl-	2.8	0.00832	kerosene	hist.
79-31-2	Propanoic acid, 2-methyl-	1	0.01	15640	hist.
79-34-5	Ethane, 1,1,2,2-tetrachloro-	0.1	0.0214	SWIHD	hist.
79-38-9	Ethene, chlorotrifluoro-	n/a	n/a	n/a	n/a
79-46-9	Propane, 2-nitro-	1	0.11	10% of ACGIH TLV	IH
80-39-7	Benzenesulfonamide, N-ethyl-4-methyl-	0.0015	0.00142	15640	hist.
814-78-8	3-Buten-2-one, 3-methyl-	0.002	0.0213	COPC	hist.
816-79-5	2-Pentene, 3-ethyl-	2.4	0.00251	kerosene	hist.
81983-71-3	Cyclohexane, 1,1-dimethyl-2-propyl-	1.5	0.047	kerosene	hist.
819-97-6	Butanoic acid, 1-methylpropyl ester	1.5	0.00016	15640	hist.
820-29-1	5-Decanone	0.5	0.00674	15640	hist.
82085-14-1	3-Hexene, 2,4-dimethyl-	2.1	0.043	kerosene	hist.
821-41-0	5-Hexen-1-ol	0.02	0.0163	15640	hist.
821-55-6	2-Nonanone	1.7	2.19	AOEL	hist.
821-74-9	4,5-Nonadiene	1.9	0.108	kerosene	hist.
821-95-4	1-Undecene	1.5	0.0493	kerosene	hist.
821-96-5	2-Undecene, (Z)-	1.5	0.029	kerosene	hist.
821-98-7	4-Undecene, (Z)-	1.5	0.026	kerosene	hist.
822-50-4	Cyclopentane, 1,2-dimethyl-, trans-	2.4	0.138	kerosene	hist.
83321-16-8	3-Cyclopenten-1-one, 2,3,4-trimethyl-	0.15	0.00081	15640	hist.
84-64-0	1,2-Benzenedicarboxylic acid, butyl cyclohexyl ester	0.055	0.00929	15640	hist.
84-66-2	1,2-Benzenedicarboxylic acid, diethyl ester	0.055	0.128	COPC	hist.
84-74-2	1,2-Benzenedicarboxylic acid,	0.04	0.000483	22491	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
	dibutyl ester				
85-69-8	1,2-Benzenedicarboxylic acid, butyl 2-ethylhexyl ester	0.0055	0.000603	15640	hist.
865-40-7	Methane, nitroso-	0.2	0.096	15640	hist.
86-73-7	9H-Fluorene	0.0029	0.0625	10% of ACGIH TLV	hist.
871-71-6	Formamide, N-butyl-	0.1	0.0177	15640	hist.
871-83-0	Nonane, 2-methyl-	1.7	0.071	kerosene	hist.
872-05-9	1-Decene	1.7	0.03	kerosene	hist.
872-50-4	2-Pyrrolidinone, 1-methyl-	1	0.0262	22491	hist.
872-56-0	Cyclobutane, (1-methylethyl)-	2.4	0.039	kerosene	hist.
873-94-9	Cyclohexanone, 3,3,5-trimethyl-	0.2	0.0383	15640	hist.
87-68-3	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	n/a	n/a	n/a	n/a
883-93-2	Benzothiazole, 2-phenyl-	n/a	n/a	n/a	n/a
88-72-2	Benzene, 1-methyl-2-nitro-	0.2	0.00163	22491	hist.
89-82-7	Cyclohexanone, 5-methyl-2-(1-methylethylidene)-, (R)-	0.25	0.37	AOEL	hist.
90-12-0	1-Methylnaphthalene	1.7	0.00412	kerosene	hist.
91-17-8	Naphthalene, decahydro-	1.7	0.3	kerosene	hist.
91-20-3	Naphthalene	1	0.0152	SWIHD	hist.
91-57-6	Naphthalene, 2-methyl-	1.7	0.00446	kerosene	hist.
91695-32-8	2-Undecene, 4-methyl-	1.4	0.000532	kerosene	hist.
91894-15-4	4-Methoxy-6-methyl-6,7-dihydro-4H-furo[3,2-c]pyran	1	0.0784	15640	hist.
921-47-1	Hexane, 2,3,4-trimethyl-	1.9	0.016	kerosene	hist.
922-28-1	Heptane, 3,4-dimethyl-	1.9	0.0397	kerosene	hist.
922-63-4	Butanal, 2-methylene-	0.2	0.0122	15640	hist.
922-65-6	1,4-Pentadien-3-ol	0.02	0.0073	15640	hist.
924-16-3	1-Butanamine, N-butyl-N-nitroso	0.00001	0.00123	55-18-5	IH
92-51-3	1,1`-Bicyclohexyl	1.4	0.00619	kerosene	hist.
92-52-4	1,1`-Biphenyl	0.02	2.2	COPC	hist.
925-54-2	Hexanal, 2-methyl-	1	0.0687	15640	hist.
925-78-0	3-Nonanone	0.5	0.141	15640	hist.
926-42-1	1-Propanol, 2,2-dimethyl-, nitrate	0.25	0.0784	15640	hist.
926-82-9	Heptane, 3,5-dimethyl-	1.9	0.0384	kerosene	hist.
928-45-0	Nitric acid, butyl ester	0.25	0.36	COPC	hist.
928-68-7	2-Heptanone, 6-methyl-	0.8	2.27	COPC	hist.
930-02-9	Octadecane, 1-(ethenyloxy)-	0.5	0.0441	15640	hist.

CAS or TWINS Number	Chemical	Screening Value (ppm)	Maximum Concentration (ppm)	Screening Value Source Code	Concentration Source Code
930-18-7	Cyclopropane, 1,2-dimethyl-, cis-	3.4	0.37	kerosene	hist.
930-22-3	Oxirane, ethenyl-	n/a	n/a	n/a	n/a
930-36-9	1H-Pyrazole, 1-methyl-	0.02	0.0018	15640	hist.
930-55-2	Pyrrolidine, 1-nitroso	0.0004	0.0000435	SWIHD	IH
930-57-4	Cyclopropane, butyl-	2.4	0.632	kerosene	hist.
93-55-0	1-Propanone, 1-phenyl-	0.1	0.047	15640	hist.
948-65-2	1H-Indole, 2-phenyl-	0.1	0.00065	15640	hist.
95-16-9	Benzothiazole	1	0.00994	15640	hist.
95-47-6	Benzene, 1,2-dimethyl-	10	0.324	1330-20-7	hist.
95-48-7	Phenol, 2-methyl-	0.5	0.0124	SWIHD	hist.
95-50-1	Benzene, 1,2-dichloro-	2.5	0.00822	22491	hist.
95-63-6	Benzene, 1,2,4-trimethyl-	2.5	0.022	22491	hist.
96-14-0	Pentane, 3-methyl-	2.8	0.719	kerosene	hist.
96-17-3	Butanal, 2-methyl-	0.5	0.0223	15640	hist.
96-22-0	3-Pentanone	20	0.062	22491	hist.
96-37-7	Cyclopentane, methyl-	2.9	0.611	kerosene	hist.
96-41-3	Cyclopentanol	0.5	2.54	AOEL	hist.
96-47-9	Furan, tetrahydro-2-methyl-	0.5	0.039	15640	hist.
96-48-0	2(3H)-Furanone, dihydro-	75	3.21	15640	hist.
97475-10-0	(7E,9E)-Dodecadienal	5	0.067	15640	hist.
97-87-0	Propanoic acid, 2-methyl-, butyl ester	1.5	0.00464	15640	hist.
97-95-0	1-Butanol, 2-ethyl-	1	0.0212	15640	hist.
97-99-4	2-Furanmethanol, tetrahydro-	0.2	0.0175	22491	hist.
98-06-6	Benzene, (1,1-dimethylethyl)-	1.8	0.028	kerosene	hist.
98-54-4	Phenol, 4-(1,1-dimethylethyl)-	0.05	0.00149	15640	hist.
98-82-8	Benzene, (1-methylethyl)-	5	0.0878	22491	hist.
98-83-9	Benzene, (1-methylethenyl)-	5	0.031	22491	hist.
98-86-2	Ethanone, 1-phenyl-	1	0.512	SWIHD	hist.
98-95-3	Benzene, nitro-	0.1	0.00274	SWIHD	hist.
99-08-1	Benzene, 1-methyl-3-nitro-	0.2	0.000212	22491	hist.
993-07-7	Silane, trimethyl-	n/a	n/a	n/a	n/a
99-82-1	Cyclohexane, 1-methyl-4-(1-methylethyl)-	3	0.0472	22491	hist.
998-35-6	Nonane, 5-propyl-	1.4	0.000526	kerosene	hist.
99-99-0	Benzene, 1-methyl-4-nitro-	0.2	0.000326	22491	hist.

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