

Sample Report



Analytical Report

Client: Air Quality Inspections
3212 NW 12th St.
Baltimore, MD 21224
U.S.A.

COC: 6010
Laboratory ID: 6010-1

Sampled By: Alex Carter
Project: Recent renovation.
Location: 123 W. Maple Ave.
Boston, MA 25478

Received Date: 12/03/2014
Approved Date: 01/02/2013
Scanned Date: 01/04/2013
Report Date: 01/09/2013

Client Sample ID: Living Room
Volume: 24.4 g
Date Sampled: 12/01/2014
Sample Type: TDT 112J

Comp-Air Survey Analysis

Comp-Air Survey Analysis Report Description

The Comp-Air (Comprehensive-Air) Survey Analysis is designed to provide additional information beyond the high quality chemical data from the air sample. This additional information may aid in interpretation of results.

Your Report is divided into several sections describing different aspects of the chemical composition of your sample.

- 1. Sample Summary:** listing of some of the aggregate values from this air sample (e.g., Total VOCs).
- 2. Top 5:** listing of the five highest concentration compounds in the air sample from both the quantitative TO17 and Semiquantitative Compounds (see below for a description of TO17 and Semiquantitative Compounds).
- 3. TO17 Compounds:** listing of the chemical compounds characterized by EPA method TO17. Some of these are Hazardous Air Pollutants (HAPs) and others are typical of industrial/manufacturing sources. Accuracy for TO17 compounds is within $\pm 15\%$.
- 4. Semiquantitative Compounds:** listing of chemical compounds that have not been calibrated but have some reference information indicating the validity of the compound identification, an acceptable reference library match, or some other supporting evidence of identification. Also listed in this section are compounds that are not specifically identified but for which some information is available (e.g., C10-C12 Hydrocarbons; probably an alcohol). Instrument and media response have not been confirmed for most chemical compounds reported semiquantitatively, conferring an accuracy on the order of $\pm 50\%$ based on an instrument and media response of unity. Semiquantitative results should be interpreted relative to other chemical compounds.
- 5. Supplemental Information: Odorants:** listing of the odor characteristics of chemical compounds present in this air sample. Almost all chemical compounds have an odor and a mixture of various chemical compounds could alter the odor characteristics. Some chemical compounds have a strong odor at relatively low concentrations so the individual chemical compound concentrations may be of secondary importance relative to the odor characteristics for odor concerns.
- 6. Supplemental Information: EPA Hazardous Air Pollutants (HAPs):** listing of the chemical compounds detected in this air sample that are known or suspected to have serious health or environmental effects (also known as air toxics). HAPs include VOCs, metals, some pesticides/insecticides that are primarily semi-volatile, inorganic compounds, and very volatile organic compounds. Of the 187 compounds or groups defined as HAPs, approximately 65 are VOCs that can be detected with this analysis.
- 7. Additional Information:** definitions, calculations, and other useful information.

Sample Summary

General information regarding the sample and aggregate concentrations, e.g., Total VOCs, are listed below. The top five highest concentration compounds in the air sample from both the quantitative TO17 and Semiquantitative Compounds are also listed. The full list of compounds and their concentrations in this air sample are listed later in the report and may be displayed more than once depending on the categorization of specific compounds.

Compound	Sample Concentration	Reporting Limit	Additional Information
	ng/L	ng/L	
Total VOCs	2500	200	Total volatile organic compounds calculated based on internal standard ratio; does not include C1, C2, or methanol.

Compound	Sample Concentration	Reporting Limit	Additional Information
	ng/L	ng/L	
Total Mold VOCs (TMVOC)	25	3	TMVOC is an assessment of the quantity of actively growing mold in the sample location.

Compound	Sample Concentration	Additional Information
	%	
Paint-Range VOCs	25	This is an estimate of the fraction of Total VOCs represented by the sum of compounds typically associated with latex paints, lacquers, enamels, varnishes, sealers, thinners, and polyurethane finishes.

Top 5

The top five highest concentration compounds in the air sample from both the quantitative TO17 and Semiquantitative Compounds are listed below.

TO17 Compounds

Compound	CAS	Sample Concentration		Reporting Limit	RI	Additional Information
		ng/L	ppb	ng/L		
Toluene	108-88-3	110	29	0.2	808	J*

Semiquantitative Compounds

Compound	CAS	Sample Concentration		Reporting Limit	RI	Additional Information
		ng/L	ppb	ng/L		
Ethanol	64-17-5	720	380	4	525	
Acetic acid	64-19-7	120	46	4	715	
Isopropanol	67-63-0	65	26	4	562	
a-Pinene	80-56-8	55	10	4	970	

TO17 Compounds

EPA Method TO17 focuses on chemical compounds that are typical of industrial/manufacturing sources, many of these compounds are also found in commercial and residential environments. Accuracy for these chemical compounds is within ±15%.

This section lists all the TO17 compounds in alphabetical order (compounds not present or with concentrations below the reporting limit are listed with '<'; compounds above the reporting limit have bold text for the Sample Concentration). The concentrations are reported in two different units for easy comparison to exposure limits or other information. The Retention Index (RI) indicates volatility relative to adjacent n-alkanes. A more detailed description of reporting units and RI can be found at the end of the report.

Compound	CAS	Sample Concentration		Reporting Limit	RI	Additional Information
		ng/L	ppb	ng/L		
Benzene	71-43-2	3.0	0.9	0.2	698	
Bromobenzene	108-86-1	< 0.2	< 0.03	0.2	998	
Bromochloromethane	74-97-5	< 0.2	< 0.04	0.2	668	
Bromodichloromethane	75-27-4	< 0.2	< 0.03	0.2	764	
Bromoform	75-25-2	< 0.2	< 0.02	0.2	962	
tert-Butylbenzene	98-06-6	< 0.2	< 0.04	0.2	1043	
sec-Butylbenzene	135-98-8	< 0.2	< 0.04	0.2	1061	
n-Butylbenzene	104-51-8	< 0.2	< 0.04	0.2	1107	
Carbon Tetrachloride	56-23-5	< 0.2	< 0.03	0.2	684	
Chlorobenzene	108-90-7	< 0.2	< 0.04	0.2	899	
Chlorodibromomethane	124-48-1	< 0.2	< 0.02	0.2	860	
Chloroform	67-66-3	< 0.2	< 0.04	0.2	671	
2-Chlorotoluene	95-49-8	< 0.2	< 0.04	0.2	1012	
4-Chlorotoluene	106-43-4	< 0.2	< 0.04	0.2	1021	
1,2-Dibromo-3-chloropropane	96-12-8	< 0.2	< 0.02	0.2	1189	
1,2-Dibromoethane	106-93-4	< 0.2	< 0.03	0.2	869	
Dibromomethane	74-95-3	< 0.2	< 0.03	0.2	755	
1,3-Dichlorobenzene	514-73-1	< 0.2	< 0.03	0.2	1074	
1,4-Dichlorobenzene	106-46-7	< 0.2	< 0.03	0.2	1082	
1,2-Dichlorobenzene	95-50-1	< 0.2	< 0.03	0.2	1115	
1,1-Dichloroethane	75-34-3	< 0.2	< 0.05	0.2	622	
1,2-Dichloroethane	107-06-2	1.5	0.4	0.2	704	
trans 1,2-Dichloroethene	156-60-5	< 0.2	< 0.05	0.2	594	
1,1-Dichloroethene	75-35-4	< 0.2	< 0.05	0.2	541	

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Compound	CAS	Sample Concentration		Reporting Limit	RI	Additional Information
		ng/L	ppb	ng/L		
cis 1,2-Dichloroethene	156-59-2	< 0.2	< 0.05	0.2	655	
2,2-Dichloropropane	594-20-7	< 0.2	< 0.04	0.2	653	
1,2-Dichloropropane	78-87-5	< 0.2	< 0.04	0.2	749	
1,3-Dichloropropane	142-28-9	< 0.2	< 0.04	0.2	848	
1,1-Dichloropropene	563-58-6	< 0.2	< 0.04	0.2	686	
trans 1,3-Dichloropropene	10061-02-6	< 0.2	< 0.04	0.2	824	
cis 1,3-Dichloropropene	10061-01-5	< 0.2	< 0.04	0.2	789	
Ethylbenzene	100-41-4	5.9	1.3	0.2	908	
Hexachlorobutadiene	87-68-3	< 0.2	< 0.02	0.2	1274	
Isopropylbenzene	98-82-8	< 0.2	< 0.04	0.2	970	
p-Isopropyltoluene	99-87-6	1.5	0.3	0.2	1077	
Methylene Chloride	75-09-2	1.3	0.4	0.2	630	
Methylene Chloride	75-09-2	< 0.2	< 0.06	0.2	579	
2-Methylnaphthalene	91-57-6	< 0.2	< 0.03	0.2	1405	
Naphthalene	91-20-3	0.7	0.1	0.2	1296	
n-Propylbenzene	103-65-1	1.1	0.2	0.2	1006	
Styrene	100-42-5	1.2	0.3	0.2	949	
1,1,1,2-Tetrachloroethane	630-20-6	< 0.2	< 0.03	0.2	905	
1,1,2,2-Tetrachloroethane	79-34-5	< 0.2	< 0.03	0.2	999	
Tetrachloroethene	127-18-4	0.9	0.1	0.2	842	
Toluene	108-88-3	110	29	0.2	808	J*
1,2,4-Trichlorobenzene	120-82-1	< 0.2	< 0.03	0.2	1263	
1,2,3-Trichlorobenzene	87-61-6	< 0.2	< 0.03	0.2	1314	
1,1,1-Trichloroethane	71-55-6	< 0.2	< 0.04	0.2	678	
1,1,2-Trichloroethane	79-00-5	< 0.2	< 0.04	0.2	836	
Trichloroethene	79-01-6	< 0.2	< 0.04	0.2	733	
Trichlorofluoromethane	75-69-4	< 2	< 0.4	2.0	501	
1,2,3-Trichloropropane	96-18-4	< 0.2	< 0.03	0.2	1003	
1,3,5-Trimethylbenzene	108-67-8	1.6	0.3	0.2	1021	
1,2,4-Trimethylbenzene	95-36-3	5.8	1.2	0.2	1052	

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Compound	CAS	Sample Concentration		Reporting Limit	RI	Additional Information
		ng/L	ppb	ng/L		
1,2,3-Trimethylbenzene	526-73-8	1.3	0.3	0.2	1088	
Vinyl Chloride	75-01-4	< 0.4	< 0.2	0.4	320	
m,p-Xylene	108-38-3; 106-42-3	11	2.4	0.4	917	
o-Xylene	95-47-6	6.9	1.6	0.2	948	

Compound Notes

J* The accuracy of this determination may be degraded because the reported value exceeded the calibrated range by more than a factor of 10.

Semiquantitative Compounds

Semiquantitative data includes compounds that have not been calibrated but have some reference information indicating the validity of the compound identification, an acceptable reference library match, or some other supporting evidence as part of the extensive Prism compound database.

This section lists the Semiquantitative compounds detected in this air sample above the reporting limit in alphabetical order. The concentrations are reported in two different units for easy comparison to exposure limits or other information. Note that the conversion to ppb requires the molecular weight of the chemical compound so those compounds that are non-specific (e.g., C10-C12 Hydrocarbon) do not have a concentration in ppb listed. The Retention Index (RI) indicates volatility relative to adjacent n-alkanes. A more detailed description of these terms can be found at the end of the report.

Compound	CAS	Sample Concentration		Reporting Limit	RI	Additional Information
		ng/L	ppb	ng/L		
Acetaldehyde	75-07-0	15	8	4	363	
Acetic acid	64-19-7	120	46	4	715	
Acetone	67-64-1	45	18	4	551	
Benzothiazole	95-16-9	14	3	4	1349	
1-Butoxy-2-propanol	5131-66-8	18	3	4	1002	
2-Butoxyethanol	111-76-2	29	6	4	977	
C10-C12 Hydrocarbon	N/A	15	N/A	4	1188	
C13-C15 Hydrocarbon	N/A	13	N/A	4	1412	
C4-C6 Hydrocarbon	N/A	9	N/A	4	518	At least one degree of unsaturation; possibly cyclic
C4-C6 Hydrocarbon	N/A	9	N/A	4	590	
C4-C6 Hydrocarbon	N/A	10	N/A	4	531	At least one degree of unsaturation; possibly cyclic
C6-C8 Hydrocarbon	N/A	32	N/A	4	860	Sum of at least two overlapping hydrocarbons; one is n-butylacetate (CAS 123-86-4)
C8-C10 Hydrocarbon	N/A	16	N/A	4	1176	Sum of two overlapping hydrocarbons; one is nonanal (CAS 124-19-6)
C8-C10 Hydrocarbon	N/A	21	N/A	4	1184	Contains oxygen; appears to be ethylene glycol monoethyl ether (CAS 112-25-4)
C8-C10 Hydrocarbon	N/A	15	N/A	4	1060	Sum of two overlapping hydrocarbons
Carbon disulfide	75-15-0	0.8	0.3	0.5	598	
Dimethylhexane	N/A	21	4	4	765	Cannot determine isomer
2,3-Dimethylpentane	565-59-3	7	2	4	680	
2,4-Dimethylpentane	108-08-7	7	2	4	638	
Ethanol	64-17-5	720	380	4	525	

Compound	CAS	Sample Concentration		Reporting Limit	RI	Additional Information
		ng/L	ppb	ng/L		
Ethylacetate	141-78-6	24	7	4	660	
m,p-Ethylmethylbenzene	622-96-8	20	4	4	1014	
Heptane (C 7)	142-82-5	11	3	4	709	
Hexadecane (C 16)	544-76-3	4	0.4	4		
Hexane (C 6)	110-54-3	15	4	4	608	
Isopropanol	67-63-0	65	26	4	562	
Limonene	138-86-3 or 5989-27-5	20	4	4	1071	Limonene (CAS 138-86-3) or d-Limonene (CAS 5989-27-5)
2-Methylbutane	78-78-4	48	16	4	459	
3-Methylhexane	589-34-4	11	3	4	685	
2-Methylpentane	107-83-5	22	6	4	574	
Pentadecane (C 15)	629-62-9	14	2	4	1512	
Pentane (C 5)	109-66-0	20	7	4	508	
a-Pinene	80-56-8	55	10	4	970	
Texanol-A	74367-33-2	30	3	4	1474	
Texanol-B	74367-34-3	7	0.8	4	1487	
2,2,4-Trimethylpentane	540-84-1	46	10	4	697	

These results pertain only to this sample as it was collected and to the items reported.
These results have been reviewed and approved by the Laboratory Director or authorized representative.



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Supplemental Information: Odorants

Many chemical compounds have odors associated with them, some pleasant and some unpleasant. These odors can combine to create different odors, making odor identification more difficult. The odor descriptions for the compounds reported in this air sample are listed below as well as some of the more common sources.

Compound	CAS	Conc. (ng/L)	Odor Description	Common Sources
Carbon disulfide	75-15-0	0.8	Concentration dependent: sweet ether like to decaying cabbage	Solvent; fumigant; contaminated drywall; combustion byproduct; preservative; disinfectant
Methylene Chloride	75-09-2	1.3	Chloroform-like	Automotive products; degreasing solvent; paint stripper; adhesive remover; aerosol propellant; insecticide
Hexane (C 6)	110-54-3	15	Mild; gasoline	Solvent; adhesive; grease; lubricant; paints and coatings; petroleum fuel component
Benzene	71-43-2	3.0	Paint-thinner-like	Primarily gasoline and other petroleum products. Also some industrial solvents; printing and lithography; paints and coatings; rubber; dry cleaning; adhesives; detergents
1,2-Dichloroethane	107-06-2	1.5	Pleasant, chloroform-like	PVC production; solvent for rubber, insecticides, oils, waxes, gums, resins; rug and upholstery cleaners
Toluene	108-88-3	110	Aromatic	Gasoline; adhesives (building and arts/crafts); contact cement; solvent; heavy duty cleaner; inks; cosmetics; asphalt
Tetrachloroethene	127-18-4	0.9	Ether or chloroform-like	Dry cleaning; adhesives, automotive cleaners, polishes; degreaser
Ethylbenzene	100-41-4	5.9	Aromatic	Gasoline; paints and coatings; solvent; pesticide
m,p-Xylene	108-38-3; 106-42-3	11	Sweet	Gasoline; paints and coatings; adhesives and cements; solvent; print cartridges
o-Xylene	95-47-6	6.9	Aromatic	Gasoline; paints and coatings; adhesives and cements; solvent; print cartridges
Styrene	100-42-5	1.2	Sweet, aromatic	Polystyrene foam; other polymers; synthetic rubber; flavoring agent; paints and coatings
Naphthalene	91-20-3	0.7	Mothballs, tar, creosote	Gasoline; diesel fuel; fuel oil; kerosene; moth balls/crystals; insecticide; room deodorant; urinal blocks

Supplemental Information: EPA Hazardous Air Pollutants (HAPs)

Hazardous air pollutants, also known as toxic air pollutants or air toxics, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. Of the 187 compounds or groups defined as HAPs, approximately 65 can be detected with this analysis. Listed below are those HAPs that were detected in this air sample. For more information about HAPs visit the EPA [Air Toxics website](#). The exposure limits listed below can also be found in the [NIOSH Guide to Chemical Hazards](#).

Compound	CAS	Conc. (ng/L)	NIOSH TWA REL	Potential Health Effects
Carbon disulfide	75-15-0	0.8	3,000 ng/L (1,000 ppb)	Dizziness, head, poor sleep, lass, anxi, anor, low-wgt; psychosis; polyneur; Parkinson-like syndrome; ocular changes; coronary heart disease; gastritis; kidney, liver inj; eye, skin burns; dermat; reproductive effects
Methylene Chloride	75-09-2	1.3	Carcinogen	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numbness, tingle limbs; nausea; [potential occupational carcinogen]
Hexane (C 6)	110-54-3	15	180,000 ng/L (50,000 ppb)	Irritation (eyes, nose); nausea, headache; peripheral neuropathy: numb extremities, muscle weakness; dermatitis; dizziness
Benzene	71-43-2	3.0	320 ng/L (100 ppb)	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]
1,2-Dichloroethane	107-06-2	1.5	Carcinogen; 4,000 ng/L (1,000 ppb)	Irritation eyes, corneal opacity, CNS depression, nausea, vomiting, dermatitis, liver, kidney, VCS damage, possible carcinogen
Toluene	108-88-3	110	375,000 ng/L (100,000 ppb)	Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage
Tetrachloroethene	127-18-4	0.9	Carcinogen	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]
Ethylbenzene	100-41-4	5.9	435,000 ng/L (100,000 ppb)	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma
m,p-Xylene	108-38-3; 106-42-3	11	435,000 ng/L (100,000 ppb)	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis
o-Xylene	95-47-6	6.9	435,000 ng/L (100,000 ppb)	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis
Styrene	100-42-5	1.2	215,000 ng/L (50,000 ppb)	Irritation eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects
Naphthalene	91-20-3	0.7	50,000 ng/L (10,000 ppb)	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage

Additional Information

Glossary of Terms

Total VOCs (TVOC): TVOC is one of the most common general air quality indicators. It allows comparison of multiple samples with each other or with target levels.

The following formula depicts the calculation that determines TVOC. Typically, TVOC includes compounds that contain between 3 and 15 carbon atoms (along with the associated hydrogen, as well as oxygen, nitrogen, sulfur, silicon, etc.), although certain compounds outside this range of carbon atoms may be included depending on the type of compound.

$$TVOC \left(\frac{ng}{L} \right) = \frac{\left[(A_s - A_b) \times W_s \right]}{A_i L_s}$$

Where:

As – C3-C15 TIC (Total Ion Chromatogram from GC-MS) area of the sample

Ab – C3-C15 TIC area of the media blank

Ws – Weight of the internal standard added in ng

Ai – average TIC area of the internal standard peak(s)

Ls – Volume of the sample in L

CAS: The Chemical Abstract Service (CAS) assigns a unique number to chemical compounds, commonly referred to as the CAS number. This number is usually the best way to search for additional information about the compound since some compounds may have many names but only one CAS number.

Reporting Units - ng/L: Most concentrations for air samples will be reported in units of ng/L, which translates to ng of that specific chemical compound present per liter of air sampled. Concentration in ng/L is equivalent to $\mu\text{g}/\text{m}^3$.

Reporting Units - ppb: Some sections of this will have a second column with compound concentrations displayed in units of ppb (parts per billion), which are also commonly used in exposure or reference limits. The concentration in ng/L (or $\mu\text{g}/\text{m}^3$) can be converted easily to ppb using the following formula derived from the Ideal Gas Law.

$$Conc (ppb) = \frac{Conc \left(\frac{ng}{L} \right) \times 24.04 \left(\frac{L}{mol} \right)}{MW \left(\frac{g}{mol} \right)}$$

Where:

Vm = Molar Volume as 24.04 L/mol at 1 atm pressure and 20 °C (68 °F)

MW = Molecular Weight in g/mol

Reporting Limit: The Reporting Limit column displays the lowest possible concentration that could be reported for that compound for that sample and analysis. Typically the reporting limit is displayed in units of ng/L but other units may be used as appropriate.

Retention Index (RI): The retention index is a means of converting a compound GC-MS retention time, which is dependent on the type of system and specific operating parameters, into an independent and universal value based on the elution of the adjacent n-alkanes. Each n-alkane is assigned a retention index based on its carbon number, e.g., pentane (C5) has a retention index of 500 and hexane (C6) has a retention index of 600, etc. For example, a hydrocarbon with a retention index of 550 would be expected to elute at the midpoint between pentane and hexane. Using the elution of the n-alkanes as the reference point allows the resulting retention index of organic compounds to be applicable across almost any GC-MS system. The non-isothermal retention index, which is most applicable to the GC-MS instruments used by Prism, can be determined using the following formula derived from the Kovats isothermal retention index.

$$RI_x = 100n + 100 \times \frac{(RT_x - RT_n)}{(RT_{n+1} - RT_n)}$$

Where:

RIx – retention index of target compound x

n – Carbon number of n-alkane eluting before the target compound x

RTx – retention time of target compound x

RT_n – retention time of n-alkane eluting before target compound x
RT_{n+1} – retention time of n-alkane eluting after target compound x

Odor Description: Description of the odor (e.g., fruity)

HAPs: Hazardous Air Pollutants

NIOSH: National Institute for Occupational Safety and Health

TWA: Time Weighted Average

REL: Recommended Exposure Limit

Ca: Potential carcinogen

Sources for Additional Compound Information:

The compound information displayed in this report (e.g., odor description, exposure limits, etc.) is gathered from a variety of sources, including but not limited to, the [NIST Chemistry Webbook](#), the [NIOSH Pocket Guide to Chemical Hazards](#), the [Household Products Database](#), the University of Akron [Chemical Database](#), the [WISER](#) (for Emergency Responders), [IRIS](#), [ToxNet](#), [ATSDR](#). Prism does not guarantee the accuracy of this information or endorse any of the views or opinions expressed.

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