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EMISSION DIFFERENCE BETWEEN NATURAL GAS USAGE AND DIGESTER
GAS USAGE

By

Mahyar Ghorbanian
B.S., Petroleum University of Technology, Iran, 2008

A Thesis
Submitted to the Faculty of the
University of Louisville
J. B. Speed School of Engineering
As Partial Fulfillment of the Requirement
For the Professional Degree

MASTER OF SCIENCE

Department of Civil and Environmental Engineering

August 2010

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DEDICATION

This dissertation is dedicated to my parents

Mr. Mohsen Ghorbanian

and

Mrs. Roghayeh Mirhassannia

who have given me invaluable educational opportunities.

ACKNOWLEDGEMENTS

I am heartily thankful to my supervisors, Dr. J.P. Mohsen and Mr. Russell A Barnett, whose encouragement, guidance and support from the initial to the final level enabled me to develop an understanding of the subject. It is an honor for me to offer my regards and blessings to my mom and dad for their love and support in any respect during the completion of the project. I also would like to thank my family for their support. I also would like to thank my friends.

ABSTRACT

EMISSION DIFFERENCE BETWEEN NATURAL GAS USAGE AND DIGESTER GAS USAGE

Mahyar Ghorbanian

July 23, 2010

It is important to burn the air toxics and harmful gases which come from water and wastewater treatment processes. In common practice, instead of natural gas, digester gas is used for economical reasons. This burning process takes place in the Regenerative Thermal Oxidizer (RTO).

The current research was conducted to identify if there exists any differences between natural gas and digester gas in outlet emission. The location of the experiment was at Morris Forman Wastewater Treatment Plant of Metropolitan Sewer District (MSD) of Jefferson County, Kentucky, USA. In this experiment, the RTO was run in two cases: one fueling by digester gas and next fueling by natural gas; then samples were obtained from a sampling port during each case. The captured samples were analyzed in the laboratory at the University of Louisville, Kentucky. The resulted data from these two cases showed that there are not much emission differences between these two fuels. Therefore, use of digester gas instead of natural gas is an economical move without causing any harmful emission.

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CHAPTER I

INTRODUCTION

The most important needs for human beings are food, water and a continuous supply of air. The amounts of water and air are relatively constant and steady (1-2 liters per day and 10-20 m³, respectively) (1). A person can live about five weeks without food and about five days without water, but only five minutes without air (2). It's an essential human right that all people need to freely access an acceptable quality of water and air in their life (1), but the atmosphere, that invisible ocean of different gases called air, is as susceptible to pollution from human activities (2).

The quality of air will be affected by chemicals from both natural and man-made (anthropogenic) sources. The various chemicals are emitted into the atmosphere. The quantities of these chemicals may vary in the range from hundreds to millions of tons annually (1). U.S. Environmental Protection Agency (USEPA) had designated a list of Hazardous Air Pollutants (HAPs) in the Clean Air Act (CAA). This list includes 188 HAPs (3).

Natural air pollution is caused by several biotic and abiotic sources like plants, radiological decomposition, forest fires, volcanoes and other geothermal sources, and emissions from land and water. These result in a natural background concentration that varies according to local sources or specific weather conditions.

Man-made or anthropogenic air pollution has existed from when people learned to use fire, but it has increased rapidly since the industrialization period began. The increase in air pollution resulting from the expanding use of fossil fuel energy sources and use of chemicals has been accompanied by mounting public concern about its detrimental effects on health and the

environment. Moreover, knowledge of the nature, quantity, physiochemical behavior and effects of air pollutants has greatly increased in recent years. Nevertheless, more needs to be known. Certain aspects of the health effects of air pollutants require further assessment (4). Air pollution certainly is not a new phenomenon. Indeed, early references are to the Middle Ages, when smoke from burning coal was already considered such a serious problem before industrial revolution, King Edward I banned its use in London. In more recent times, though still decades ago, several serious episodes focused attention on the need to control the quality of the air we breathe. The worst of these occurred in London, in 1952. A week of intense fog and smoke resulted in over 4000 deaths that were directly attributed to the pollution. In the United States the most catastrophic episode occurred during a 4-day period in 1948 in Donora, Pennsylvania, when 20 deaths and almost 6000 illnesses occurred during an air inversion. At the time, Donora had a population of only 14000, making this the highest per capita death rate ever recorded from an air pollution episode (5).

The impact of air pollution is broad. In humans, the pulmonary deposition and absorption of inhaled chemicals can have direct effects for health. Nevertheless public health can also be indirectly affected by air pollutants in environmental media and by plants and animals, resulting in chemicals entering the food chain or being present in drinking water and therefore producing additional sources of human exposure. Furthermore the direct effect of air pollutants on plants, animal, and soil can influence the structure and function of the ecosystems.

In recent decades, major efforts have been made to reduce air pollution globally. The emission of the main air pollutants has declined significantly (4). International efforts to combat emissions are undertaken, for instance within the framework of the Convention on Long-range Transboundary Air Pollution established by the United Nations Economic Commission (6, 7).

The task of reducing levels of exposure to air pollutants is a complex one. It begins with an analysis to determine which chemicals are present in the air and at what exposure level is hazardous to human health and the environment. It can then be determined whether an unacceptable risk is present. When a problem is identified, mitigation strategies should be

developed and implemented so as to prevent excessive risk to public health in the most efficient manner (8).

“Analyses of air pollution problems are exceedingly complicated. Some are national in scope (such as the definition of actual levels of exposure of the population, the determination of acceptable risk, and the identification of the most efficient control strategies), while others are of a more basic character and are applicable in all countries (such as analysis of the relationship between chemical exposure levels, and doses and their effects)” (8).

Indoor pollution and occupational exposure contributes to overall human exposure, since 90% of human’s time is spent indoors. Indoor exposure of nitrogen dioxide (NO₂), carbon monoxide (CO), particulate matters (PM₁₀ and PM_{2.5}), ozone (O₃) and sulfur dioxide (SO₂) are higher than outdoor exposure (8).

Outdoor air pollution can be caused from a single point source, which may affect only a relatively small area. More often, outdoor air pollution is caused by a mixture of pollutants from a variety of sources, such as transportation and heating, and from point sources. Finally, in addition to those emitted by local sources, pollutants transported over long distances contribute further to the overall level of air pollution.

The relative contribution of emission sources to human exposure to air pollution may vary according to regional and lifestyle factors. As far as some pollutants are concerned, indoor air pollution is more important than outdoor pollution, because people spend 90% or more their time indoors. However this does not diminish the importance of outdoor pollution. In terms of amounts of substances released, the latter is far more important and may have harmful effects on animals, plants and materials as well as effects on human health. Pollutants produced outdoors may penetrate into the indoor environment and may affect human health by exposure both indoors and outdoors (9).

In this study, the outdoor air pollution control system in the Morris Forman Wastewater Treatment Plant of Metropolitan Sewer District (MSD), Louisville, Kentucky was investigated. In this plant, Regenerative Thermal Oxidizers (RTO) are used to burn the air toxics and Volatile Organic Compounds that are discharged from the solid waste handling processes. Thermal oxidizers achieve VOC destruction through high temperature thermal oxidation, converting the

VOCs to carbon dioxide and water vapor, and recycling released energy to reduce operating costs. Regeneration refers to regenerating the heat of a large thermal mass. For generating high temperatures in thermal oxidation, the RTO can be fueled by either digester gas or natural gas. FIGURE 1 shows the RTOs which are being used at the plant.

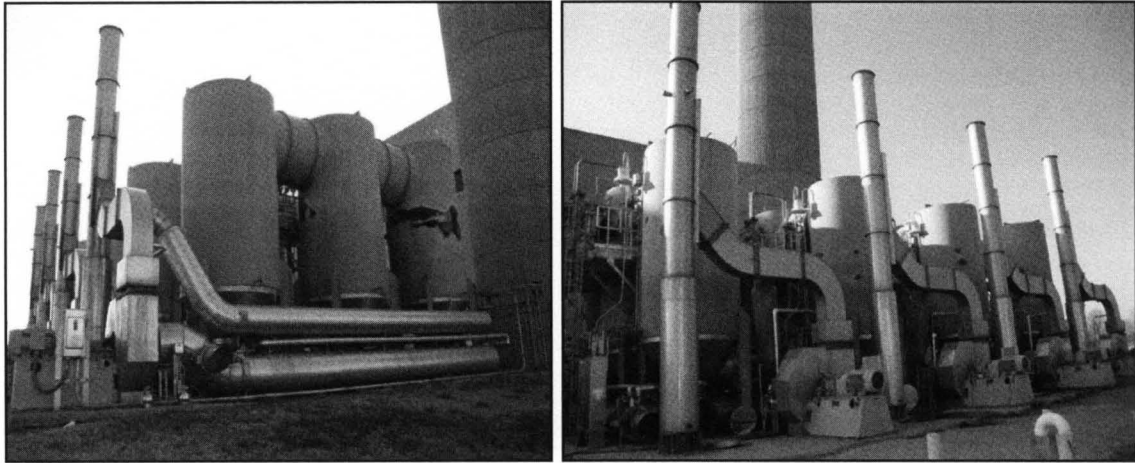


Figure 1- Regenerative Thermal Oxidizer at Morris Forman plant

The required digester gas will be produced in the plant from anaerobic digestion of solid in the wastewater. The typical compounds (by volume) in digester gas are: Methane (50-75%), Carbon Dioxide (25-50), and Nitrogen, Hydrogen, Hydrogen Disulfide, and Oxygen. From an economical point of view, it is better to use digester gas than pipeline Natural gas; but theoretically and environmentally, natural gas is cleaner than digester gas. The purpose of this study is to find out the difference of pollutant emissions between the two cases when the plant is fueled by the mentioned gases. This study will answer questions like what pollutants are in both cases emissions, what pollutants have higher concentration in digester gas usage than pipeline natural gas usage or vice versa, how these pollutants come, which of them are more critical than others and etc. If the pollution from using digester gas is not too much and does not exceed the regulatory emission limit, it will be proposed using digester gas rather than natural gas for fueling at RTO.

CHAPTER II

LITERATURE REVIEW

Historical Background

Air pollution from human activities can be said to have originated with the discovery of fire; even today, most air contaminants are produced in combustion processes from mobile and stationary sources.

In the 17th century, the development of the steam engine and the beginning of the industrialization outstand a new era of air pollution. Early in the 20th century, yet another significant air pollution era began when the gasoline-powered automobile became a major contributing source. But it was not until the mid-1900s that any lasting efforts were made to protect air quality. Meaningful efforts to control air pollution were initiated about that time, largely as the result of deadly air pollution episodes, particularly those in Donora, Pennsylvania; London, England; and the Meuse Valley, Belgium (2).

Those air pollution episodes were the result of exceptionally high concentrations of sulfur oxides and particulate matter, the primary constituents of “industrial smog” or “sulfurous smog”. Sulfurous smog is caused almost entirely by combustion of fossil fuels, especially coal, in stationary sources such as power plants and smelters. In contrast, the air pollution problem in many cities is caused by emissions of carbon monoxide, oxides of nitrogen, and various hydrocarbons that move around in the atmosphere reacting with each other and with sunlight to form “photochemical smog”. Although stationary sources also contribute to photochemical smog, the problem is most closely associated with motor vehicles.

Much of the work on air pollution in the last few decades has centered on six compounds, called criteria pollutants (will be described later in this chapter), that have been identified as contributors to both sulfurous and photochemical smog problems (5).

The Donora episode, London's "Killer Smog" and other events helped focus public attention on air pollution and prompted development of new approaches, laws, and technologies needed to solve the problem (2).

Summary of the Clean Air Act

Initial efforts on the part of the U.S. Congress to address the nation's air pollution problem began with the section of the Air Pollution Control Act of 1955. Although it provided funding only for research, and not control, it was an important event because it opened the door to federal participation in efforts to deal with air pollution. Up until that time, air pollution had been thought to be a state and local problem. This was followed by a series of legislative actions by Congress that included the Clean Air Act of 1963, the Motor Vehicle Air Pollution Control Act of 1965, the Air Quality Act of 1967, the Clean Air Act Amendments of 1970, the Energy Supply and Environmental Coordination Act of 1974, and the Clean Air Act Amendments of 1977, all of which are sometimes lumped together and referred to as the Clean Air Act (CAA) (5).

Much of the real structure to the Clean Air Act was established in the 1970 Amendments. In those amendments, the Environmental Protection Agency (EPA) was required to establish National Ambient Air Quality Standards (NAAQS), and states were required to submit State Implementation Plans (SIPs) that would show how they would meet those standards. In addition, the Act required New Source Performance Standards (NSPS) to be established that would limit emissions from certain specific types of industrial plants. Emission standards were also written for mobile sources that required manufacturers to reduce emissions from new cars by 90 % (5).

There is a difference between these two types of standards that should be noted. Ambient air quality standards are acceptable concentrations of pollution in the atmosphere, whereas emission standards are the allowable rates which pollutants can be released from a source (5).

Air Quality Standards

National Ambient Air Quality Standards have been established by the EPA for two cases: primary and secondary. Primary standards are at levels that will protect public health and include "adequate margin of safety," regardless of whether the standards are economically or technologically achievable. Primary standards must protect the most sensitive individuals, including children, the elderly and those with respiratory ailments. NAAQS are conceptually different from maximum contaminant levels (MCLs) that have been set drinking water (5).

Secondary air quality standards were set to be even more stringent than primary standards. Secondary air quality standards are established to protect public welfare such as animals and fabrics. Table I lists the current NAAQS standards (5).

Table I - National Ambient Air Quality Standards (Source: USEPA)

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide	9 ppm (10 mg/m ³)	8-hour ⁽¹⁾	None	
	35 ppm (40 mg/m ³)	1-hour ⁽¹⁾		
Lead	0.15 µg/m ³ ⁽²⁾	Rolling 3-Month Average	Same as Primary	
	1.5 µg/m ³	Quarterly Average	Same as Primary	
Nitrogen Dioxide	0.053 ppm (100 µg/m ³)	Annual (Arithmetic Mean)	Same as Primary	
Particulate Matter (PM ₁₀)	150 µg/m ³	24-hour ⁽³⁾	Same as Primary	
Particulate Matter (PM _{2.5})	15.0 µg/m ³	Annual ⁽⁴⁾ (Arithmetic Mean)	Same as Primary	
	35 µg/m ³	24-hour ⁽⁵⁾	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour ⁽⁶⁾	Same as Primary	
	0.08 ppm (1997 std)	8-hour ⁽⁷⁾	Same as Primary	
	0.12 ppm	1-hour ⁽⁸⁾	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Mean)	0.5 ppm (1300 µg/m ³)	3-hour ⁽¹⁾
	0.14 ppm	24-hour ⁽¹⁾		

⁽¹⁾ Not to be exceeded more than once per year.

⁽²⁾ Final rule signed October 15, 2008.

⁽³⁾ Not to be exceeded more than once per year on average over 3 years.

⁽⁴⁾ To attain this standard, the 3-year average of the weighted annual mean PM_{2.5} concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m³.

⁽⁵⁾ To attain this standard, the 3-year average of the 98th %ile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m³ (effective December 17, 2006).

⁽⁶⁾ To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)

⁽⁷⁾ (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.

⁽⁸⁾ (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.

(b) As of June 15, 2005 EPA has revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone nonattainment Early Action Compact (EAC) Areas. For one of the 14 EAC areas (Denver, CO), the 1-hour standard was revoked on November 20, 2008. For the other 13 EAC areas, the 1-hour standard was revoked on April 15, 2009. (Source: USEPA)

Emission Standards

Besides establishing National Ambient Air Quality Standards (NAAQS), the Clean Air Act (CAA) also requires EPA to establish emission standards for some certain industries. New Source Performance Standards (NSPS) have been promulgated for a large number of stationary sources such as fossil-fuel-fired power plants, incinerators, Portland cement plants, nitric acid plants, petroleum refineries, sewage treatment plants, and smelters of various sorts" (5). Notice the allowable emissions are expressed as pounds of pollutants per million BTU of heat input to power plant. Table II is an example of NSPS for electric power plants (5).

Table II - NSPS for Steam Electric Power Plants (lb/10⁶ Btu Heat Input) (5)

Particulates	0.03 lb/10 ⁶ Btu of heat input (13 g/10 ⁶ kJ)
Nitrogen oxides (NO _x)	
Gas-fired	0.20 lb/10 ⁶ Btu (86 g/10 ⁶ kJ)
Oil-fired	0.30 lb/10 ⁶ Btu (130 g/10 ⁶ kJ)
Coal-fired	0.60 lb/10 ⁶ Btu (260 g/10 ⁶ kJ)
Sulfur dioxide (SO ₂)	
Gas or Oil	0.20 lb/10 ⁶ Btu (86 g/10 ⁶ kJ) for gas or oil.
Coal-fired	Allowable emission rates are based on the sulfur content and heating value of the fuel. Controls must reduce emissions by at least 70%. If emissions reduction is less than 90%, emissions cannot exceed 0.6 lb/10 ⁶ Btu; above 90%, emissions cannot exceed 1.2 lb/10 ⁶ Btu.

Atmospheric Factors

To understand topics related to the effects and control of air pollution, it is first necessary to know something about the composition and physical behavior of the atmosphere. What does "pure" air consist of, and how do meteorological or weather conditions affect the mixing and dispersion of pollutants? Meteorology, the science of the atmosphere and weather forecasting, in-

volves the study of both large-scale and small-scale atmospheric circulation patterns. During some types of adverse weather conditions, small-scale circulation patterns are such that emitted pollutants are confined to a restricted volume of air. It is necessary to know how these weather patterns develop and to understand their impact on air pollution control requirements. Large-scale weather patterns are also of concern with regard to global air pollution problems (2).

Composition of the Atmosphere

The atmosphere is a mixture of many different gases, but mostly it consists of molecular nitrogen and oxygen (N_2 and O_2). About 78 % of dry air is nitrogen and about 21 % is oxygen. These %ages are expressed on a volume basis. For example, a container holding 1 m^3 or 1000 L of air (at standard pressure) includes about 780 L of nitrogen and 210 L of oxygen.

The nitrogen and oxygen combined make up approximately 99 % of the atmosphere. The remaining 1 % of clean air is a mixture of several other gases. Most of that remaining 1 % (about 0.9 %) is the inert gas argon. The rest of it includes carbon dioxide, methane, hydrogen, helium, neon, ozone, and numerous other gases in trace (very small) amounts. Figure 2 shows the relative amounts of atmospheric gases. It is seen that the "pure" atmosphere is normally a mixture of many different substances.

The relative amounts or concentrations of gases in air can be expressed in terms of part per million (ppm) as well as in terms of %age. For example, since $1\% = 10,000\text{ ppm}$, an oxygen level of 21 % in air can also be expressed as 21,000 ppm. Obviously, it is more convenient to express that concentration in %. On the other hand, the concentration of carbon dioxide in the atmosphere, about 0.034 %, may be more conveniently expressed as 340 ppm. A very wide range of concentrations is related to air quality; for instance, natural ozone concentrations can be as low as 0.02 ppm. Concentrations of air pollutants are also expressed in terms of mass per unit volume.

Water vapor is also a normal component of the atmosphere, but the amount may vary significantly over time and location. Local climate is a major factor that affects the amount of water vapor or moisture in the air. In very humid regions, for example, moisture content may be as high as 5 %. Moisture affects air quality in several ways. For instance, as it condenses or evaporates, water releases or absorbs heat, which affects atmospheric stability and air circulation patterns.

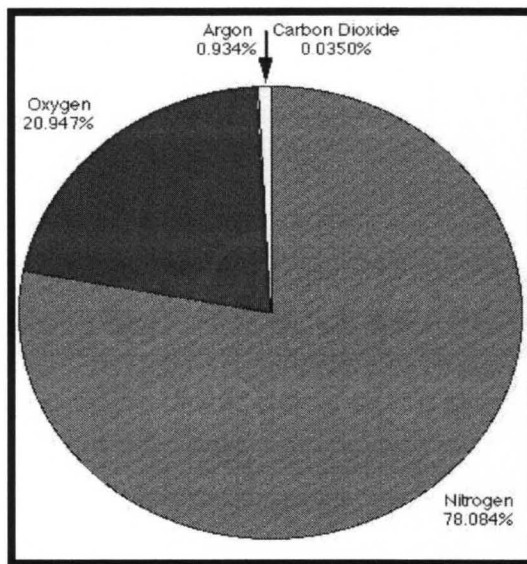


Figure 2 - Air Composition

Also, when atmospheric moisture condenses, fogs are formed; fogs tend to occur more frequently in urban areas due to higher levels of particulates, which serve as nuclei for the formation of fog droplets. Fogs are typically involved in serious pollution episodes (for example, at Donora) because the droplets help the conversion of sulfur oxides into sulfuric acid. Fogs also block heat energy from the sun and extend weather circulation patterns that tend to capture the pollutants (2).

Atmospheric Layers

The full atmosphere extends upward roughly 160 km (100 mi) above the surface of Earth. But the mixture of gases just discussed refers only to the troposphere the lowest surface layer of the atmosphere. The troposphere, which is roughly 12 km (8 mi) in depth, contains about 95 % of the

Total air mass. It is in this relatively thin layer of air that oxygen-dependent life is sustained, clouds are formed, weather patterns develop, and most air pollution problems occur. The density of air increases significantly with a decrease in altitude or distance above Earth's surface, and it is for this reason that most of the total air mass is in the bottom layer. The "skin of the apple" refers to this life-supporting layer. Above the troposphere, there is not enough oxygen to support life.

The layer of air above the troposphere, called the stratosphere, is a stable layer (in terms of air circulation patterns) that extends upward from Earth's surface to an altitude of about 50 km (30 mi). Even though it is deeper than the troposphere, the stratosphere contains only a small part of the total air mass because of its lower air density. It does, however, contain much more naturally occurring ozone (O₃) than the troposphere.

This stratospheric ozone plays a crucial role as a barrier to harmful ultraviolet (UV) radiation from the sun. Layers of the atmosphere existing above the stratosphere include the mesosphere, the ionosphere, and the thermosphere. These portions of the atmosphere are essentially unaffected by air pollution.

A basic physical characteristic that distinguishes one atmospheric layer from the next is the temperature gradient, that is, the gradual change of air temperature with altitude. For example, air temperature normally decreases with increasing altitude in the troposphere, but increases with altitude in the stratosphere. This is illustrated in Figure 3. Naturally occurring variations in the temperature gradient of the troposphere cause certain weather patterns that directly affect air quality (2).

Effects of Weather

Air quality at any given location can vary greatly over time, even though the rate of emission of pollutants remains relatively constant. This is because the air pollutants are mixed, dispersed, and diluted within the troposphere by movement of air masses, both horizontally and vertically. (2)

Air movements and therefore air quality are very dependent on local as well as regional weather conditions. Knowledge of horizontal and vertical circulation patterns is of importance with regard to implementation of air pollution survey site selection for new industrial plants, establishment of maximum allowable air pollutant emission rates (2).

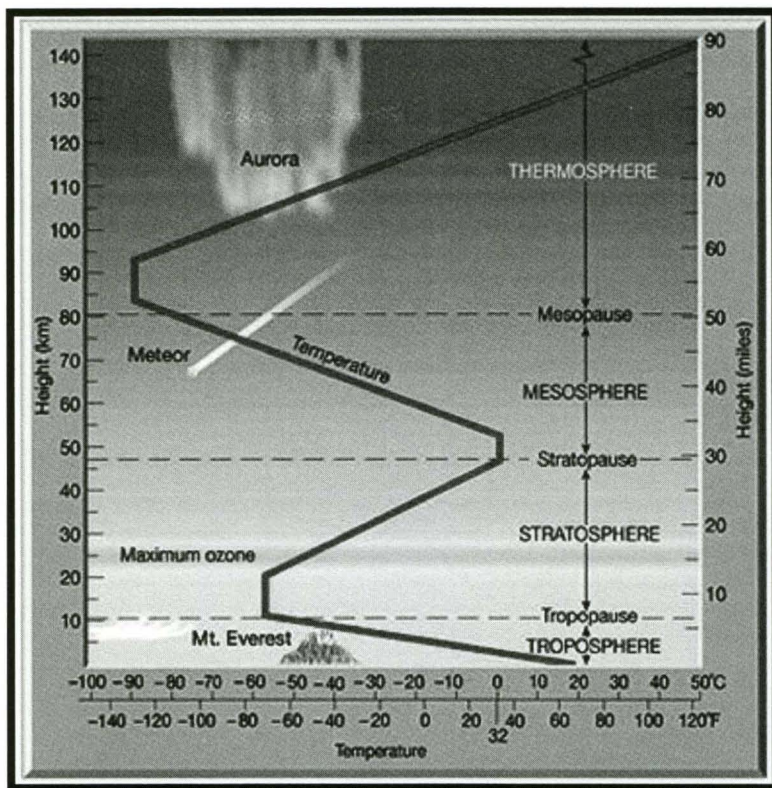


Figure 3 - Changing temperature in atmospheric layers with regard to altitude

Horizontal Dispersion of Pollutants

Horizontal dispersion of air pollutants depends on wind speed and direction: The concentration of air pollutants decreases with increasing wind speed because, as the pollutants are discharged from the source, they are more rapidly separated and dispersed by the quickly moving air. Knowledge of prevailing wind speed and direction in a given locality makes it possible to select sites for new industrial facilities or power plants so as to minimize local air pollution effects.

Locating such sites downwind of residential areas is preferable, naturally, to upwind location. Wind velocity data plotted in a graph called a “wind rose”, gives a picture of the speed and direction from which the wind tends to come.

Vertical Dispersion of Pollutants

In addition to wind patterns and horizontal dispersion, the vertical motion of air is very important with regard to air quality. Vertical mixing of air and dispersion of pollutants depends on the kind of atmospheric stability prevailing at any given time. The atmosphere is considered to be stable when there is little or no vertical movement of air masses and therefore little or no mixing and dispersion of pollutants in vertical direction. Air pollution tends to accumulate near the ground under stable conditions, and severe pollution episodes may occur. An unstable atmosphere, on the other hand, is one in which the air moves naturally in a vertical direction, increasing mixing and dispersion of the pollutants. With regard to local or regional air quality, a condition of atmospheric instability is preferable to a stable condition. (2)

Atmospheric stability depends on the rate of change of air temperature with altitude, that is, on the temperature gradient (or profile) that may prevail at a particular time and location. Normally, air temperatures in the troposphere decrease with increasing altitudes. But the rate at which the air temperature drops, called the “environmental lapse rate” which is important with regard to atmospheric stability (Environmental lapse rate is also called prevailing or ambient lapse rate). To understand the relationships among lapse rates, stability, and vertical mixing, a brief discussion of basic atmospheric physics is necessary. (2)

Atmospheric pressure decreases with increasing height above the ground. As a volume or parcel of air rises, it naturally expands and cools, provided that heat energy is not added or withdrawn a physical process in which there is no heat transfer is called an adiabatic process. Since a parcel of air that is not in immediate contact with the ground is well insulated by its surroundings, it can be assumed that naturally occurring expansion (or compression) of air parcels, as they move vertically, is adiabatic. (2)

Environmental lapse rates are classified as being either strong or weak (superadiabatic or subadiabatic), as illustrated in Figure 4. Strong lapse rates are associated with an unstable atmosphere, while weak lapse rates are associated with a stable atmosphere. A lapse rate characterized by an increase in actual air temperature with increasing altitude is called a “temperature inversion” and results in an extremely stable atmosphere. Temperature inversions, which effectively prevent the upward mixing and dispersion of contaminants, are usually the major causes of air pollution episodes, such as those in Donora and London. In urban areas, air quality will decrease rapidly due to the lack of movement caused by an inversion until weather conditions change and a superadiabatic lapse rate is restored. (2)

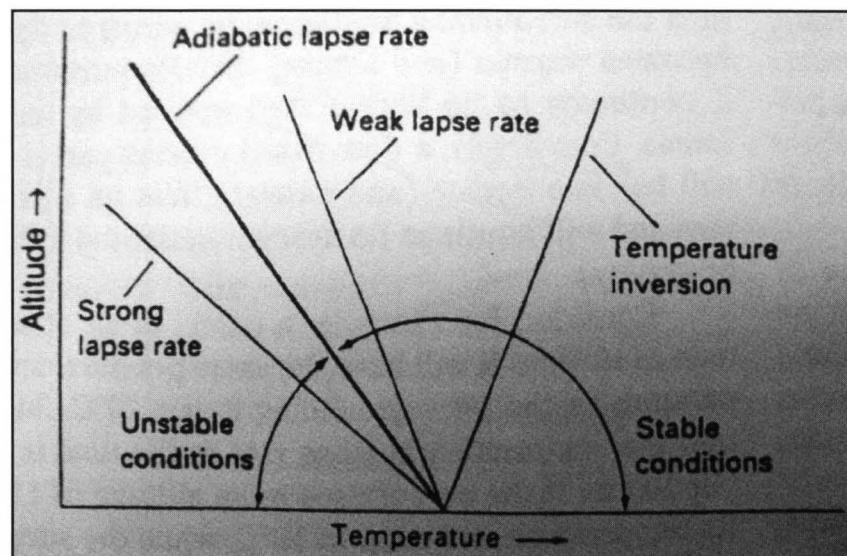


Figure 4 - Environmental lapse rate in temperature profile

Temperature inversions can be caused by a variety of local meteorological conditions, and they can occur just about anywhere, but certain geographic conditions can increase their frequency and duration; An inversion can be particularly severe, for example, for a community located in a valley, which acts as a holding basin or sink for the cold, denser air masses near the ground. Hills surrounding the valley tend to block much of the horizontal air motion, thus adding to the lack of movement problem. The city of Los Angeles, for example, lies in a mountain-bordered bowl that

traps air pollutants during the frequent temperature inversions that occur in Louisville which is located in a major river valley. (2)

Three types of temperature inversions, each associated with a specific weather pattern, are “frontal inversions”, “subsidence inversions”, and “radiation inversions”. Frontal inversions generally develop at relatively high altitudes when a warm air mass exceeds a cold air mass; they are not particularly important with regard to air quality control. Subsidence inversions, however, are very important. Although they also develop at relatively high altitudes, subsidence inversions may persist for several days or even weeks, especially in the summer months. This inversion is caused, as its name implies, when a large warm mass of air subsides over a community (for example, Los Angeles). The actual inversion may occur at an altitude of 300 m, for example, while the lapse rate below is sub- or superadiabatic. This kind of inversion forms a lid or cap that literally traps pollutants and prevents further vertical mixing, as shown in FIGURE 5. The plume from a smokestack will abruptly stop rising when it reaches the inversion altitude. If the ambient lapse rate below the inversion is superadiabatic, a fumigating condition may develop near ground level due to the strong mixing effects. Fumigation results in very high ground-level pollutant concentrations. Radiation inversions develop at low altitudes and are caused by the rapid cooling of the ground due to radiation, mostly on clear winter nights. The temperature of the air in contact with the ground also drops, causing the inversion. Air pollutants emitted during the night are trapped and do not disperse until later the next day, when the ground warms sufficiently to break the inversion. Fumigating conditions are common during radiation inversions; fortunately, these inversions are not long-lasting, although they are frequent. (2)

Sophisticated mathematical models have been developed to calculate and predict ground-level concentrations of pollutants downwind from sources such as smokestacks. Most computer programs that relate emissions to air quality use the Gaussian dispersion equation. Although the results of the calculations are uncertain, the Gaussian model provides engineers and scientists with an analytical tool useful for comparing various pollution control strategies (2).

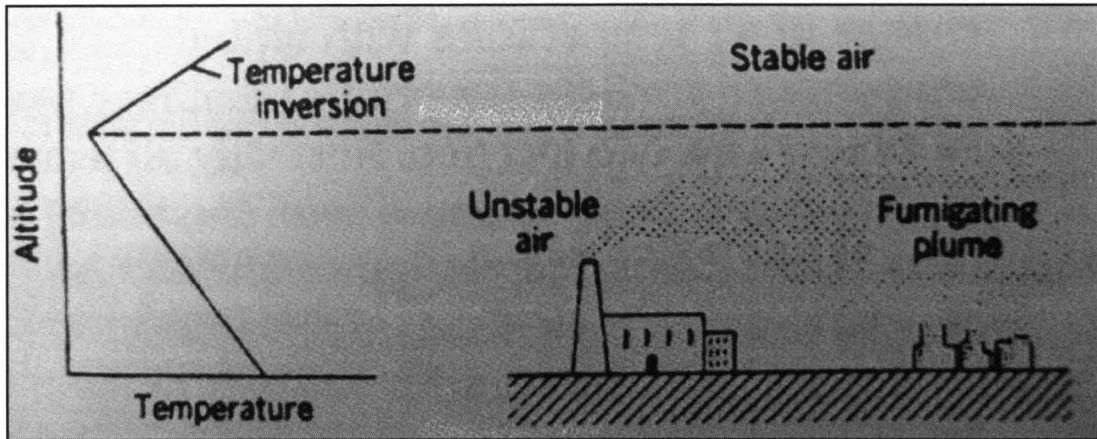


Figure 5 - Temperature Inversions

Types, Sources, and Effects of Pollutants

Air pollution may be simply defined as the presence of certain substances in the air in high enough concentrations and for long enough duration to cause undesirable effects. "Certain substances" may be any gas, liquid, or solid, although certain specific substances are considered significant pollutants because of very large emission rates or harmful and unwanted effects. "Long enough durations" can be anywhere from a few hours to several days or weeks; on a global scale, durations of months and years are of concern. Before considering those substances as the major pollutants, it is useful to first consider some of the general distinctions among the various types of air contaminants. Implicit in this definition is the assumption that the air pollution is anthropogenic, that is, caused by human activities. But air pollution may also result from natural causes. In fact, at certain times pollution from natural sources can be far more severe and longer lasting than air pollution from human activities. For example, the 1991 volcanic eruption of Mount Pinatubo in the Philippines spewed vast quantities of dust and gases into the atmosphere in a relatively short period of time. Pollutants from this eruption reached the upper atmosphere and acted as sunlight reflectors, causing global temperatures to fall slightly for a few years. Obviously, there is not much that can be done to control or regulate these natural occurrences, although there may be certain actions that can be taken to mitigate their harmful effects. (2)

Another general distinction among air pollutants involves the difference between primary pollutants and secondary pollutants. Primary pollutants are emitted directly into the air from a specific source, such as a power plant stack. Secondary pollutants, however, are not emitted directly from a source, but are formed in the atmosphere by complex chemical reactions involving the primary pollutants and sunlight. The sources of primary air pollutants are either mobile (for example, automobiles) or stationary (for example, coal-fired electric power generating stations). The distinction between mobile and stationary sources of pollutants is important because of the different pollution control technology applied to each type, as well as the different kinds of contaminants that they emit. (2)

Air pollution occurs indoors as well as outdoors. Until recently, outdoor or ambient air quality problems received most of the attention of scientists, engineers, and regulatory agencies. Two kinds of ambient pollutants are regulated under the Clean Air Act: criteria pollutants and hazardous air pollutants. According to the National Ambient Air Quality Standards (NAAQS) under the Clean Air Act, there are five primary pollutants and one secondary pollutant as criteria air pollutants. These six pollutants are emitted in relatively large quantities by various sources and tend to threaten human health or welfare. Although the discharge of hazardous air pollutants is not the same as that of the criteria pollutants, they are considered to be immediately harmful to human health (2).

Criteria Pollutants

As a result of the Clean Air Act, most of the monitoring of emissions, concentration and effects of air pollution have been directed toward the criteria pollutants. The EPA has published many volumes of Air Quality Criteria documents, which summarize all of the pertinent literature on each of the criteria pollutants. It is from this information that standards have been written. The documents are an invaluable source of detailed information.

Table III summarizes 2005 U.S. Pollutant emissions by source category and compares the total to that released in 1970. The emissions correspond to the criteria pollutants, except particulates refers to all particulates regardless of size. Also, a class of pollutants known as volatile

organic compounds (VOCs) substitutes for ozone. Ozone is a secondary pollutant; that is, it is not actually emitted but rather is formed by reactions that take place in the atmosphere. VOCs are inputs to the photochemical reactions that produce ozone (5).

Table III - US Emission Estimates (1012 g/yr) (Source: USEPA 2005)

Source	Particulates	SO _x	NO _x	VOC	CO	Lead
Transportation	12	0.5	11	7	70	0.001
Stationary source fuel combustion	3.5	12.5	6.5	1.2	8.5	0.0002
Industrial processes	1.8	1.2	1.2	6	2.2	0.001
Solid waste disposal	0.6	0.0	0.2	0.5	2	0.0001
Miscellaneous	8	0.0	0.0	1.6	0.0	0.0001
Total (2005)	25.9	14.2	18.9	16.3	82.7	0.0024
Total (1970)	18.5	28.4	18.1	27.5	98.7	0.2038

Carbon Monoxide (CO)

Carbon Monoxide is a colorless, toxic gas composed of carbon and oxygen. The sources which produce this pollutant are from combustion of carbon containing materials such as coal, oil, refuse or gasoline. As you see from the table, the major source of CO is coming from Transportation.

Breathing CO affects the oxygen carrying capacity of the blood, because it binds with hemoglobin in the bloodstream to form carboxyhemoglobin (COHb). In fact CO has a greater affinity to bind with hemoglobin than oxygen; therefore this diminishes the carrying capacity of oxygen. CO can be harmful for either human or animals (2).

Nitrogen Dioxide (NO₂)

NO₂ is a reddish-brown gas made of nitrogen and oxygen. It is produced when nitric oxide (NO) combines with oxygen in the atmosphere. In addition to being a criteria pollutant, nitrogen dioxide is also a precursor for ozone and contributes to acid rain. NO which is needed for

the formation of NO_2 is produced during high temperature combustion of fossil fuels in electric power generating facilities, industrial operations, automobiles and chemical processing plants.

Nitrogen dioxide can directly affect a human's health by causing acute bronchitis or pneumonia and by causing a lowered resistance to respiratory infections. It also has effect on plants to interfere with the chlorosis and make the leaves yellowish. Because of its color, it may interrupt human's visibility in polluted air (2).

Sulfur Dioxide (SO_2)

"Sulfur dioxide is a gaseous compound of Sulfur and Oxygen. The main sources are from burning of fossil fuels, including fuels used in vehicles, containing sulfur compounds. Sulfur dioxide can be transformed into other products such as fine particulate sulfates and sulfuric acid mist".

"The most obvious health effects are irritation and inflammation of body tissues that are contacted by the gas. It also constricts air passages making it difficult to breathe. The injury that SO_2 can cause on vegetation occurs between veins and on the margins and produces a bleached appearance. It can also reduce level of visibility due to sulfates which are a major component of fine particulate matters. It has being said that SO_2 is suspected to cause acid rain. Acid rain causes to decrease the pH of soil and natural waters" (2).

Particulate Matter ($\text{PM}_{2.5}$ and PM_{10})

Particulates are made of small particles of solid and liquid material. This term includes both solid particles and liquid droplets. Many manmade and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. Particles less than 2.5 micrometer in diameter are "fine" particulate matters, and particles with the diameter between 2.5 and 10 micrometer are referred to as "coarse".

The major sources of PMs are fuel burning, industrial operations, incinerators, agricultural tilling and motor vehicles. Both fine and coarse particles can accumulate in respiratory system and cause lots of harmful health effects. It can interfere with photosynthesis and plant growth by making a film on plant leaves. It also may cause degradation of property which can be costly for

cleaning and maintaining. The same as SO_2 and NO_2 , it will reduce visibility by scattering visible light (2).

Ozone (O_3)

Ozone is a colorless, odorless gas formed when nitrogen oxides (from fuel burning sources like automobiles, electric utilities and industrial boilers) and volatile organic compounds (from sources such as gasoline, paints and solvents) react in the presence of sunlight. These two categories of pollutants are also referred to as ozone precursors. The formation of ozone is dependent on the volume of air available for dilution, air temperature and the amount of sunlight (2).

Ozone can irritate the respiratory system, reduce lung function, and make breathing difficult. Children and elder people are even at the greater risk, because their respiratory systems are so sensitive. Ozone will accelerate the aging of many materials like making erosion in paints. This is a toxic gas; therefore it has many harmful effects on plants and trees. The most common symptom of ozone on leafy plants is small flecks visible on the upper leaf surface (2).

Lead (Pb)

Lead is in the fourth column of the periodic table of elements. Its atomic number is 82. Lead compounds can exist in the forms of gases or particles in the atmosphere. The major sources are leaded gasoline, lead-based paints and industrial processes. (2)

It has many harmful health effects on the nervous, kidney and cardiovascular systems. It may also cause severe reaction such as brain diseases. Because of reducing leaded gasoline and removal of lead from soldered cans, the lead emissions declined 78% between 1976 and 1980 and from 1988 to 1991 (2).

Hazardous Air Pollutants (HAPs)

Air pollutants that pose a threat to human health are called air toxics or hazardous air pollutants (HAPs). The risks are greatest for people living in polluted cities and environments. Hazardous air pollution increases the occurrence of cancer and other harmful health effects and also associates with widespread environmental harm. While emission of the criteria pollutants is steady and gradual, there is the possibility for hazardous air pollutants to be released in sudden and often catastrophic accidents. As mentioned before, one of these catastrophic accidents is the 1984 event at a pesticide factory in Bhopal, India, where cyanide gas released into the air and killed approximately 20,000 people and injured 120,000. Though, not as severe as the incident in Bhopal, there are hundreds of instances each year in the United States in which extremely hazardous substances are released into the air accidentally (2).

The air toxics program was established by the Clean Air Act Amendments of 1990 for pollution prevention in industry. A list of 188 toxic air pollutants has been created, along with a 10-year schedule for setting standards for all for pollution prevention in industry. Industries will be required to install the best control technologies that are achievable to meet the new standards. It is expected that this 10-year regulatory effort will reduce emissions of hazardous air pollutants by more than 1 million tons per year in the United States.

Approximately, 70% of these hazardous air pollutants are volatile organic compounds (VOCs). One source of VOCs emissions is a Water and Wastewater Treatment plant, but it may not be as high emission as other major sources. In most water and wastewater treatment plants, Thermal Oxidizers are used to remove many toxic gases from the air and water stream, where the air stream is heated to gas temperatures several hundred degrees Fahrenheit above "autoignition temperatures" of organic compounds that need to be oxidized. The fuel used to produce the necessary amount of heat is digester gas. However, it can be fueled with natural gas. The digester gas contains about 65 to 70 % CH₄ by volume, 25 to 30 % CO₂, and small amounts of N₂, H₂, H₂S, water vapor, and other gases. The two main gases, CH₄ and CO₂, are

Greenhouse Gases (GHGs); therefore, discharging digester gas is a significant contributor to global pollution. Using digester gas is more economical than natural gas, because natural gas prices now are four to five times more than 10 years ago. Digester gas is actually natural gas, just very “young natural gas”.

Digester gas is a by-product of anaerobic digestion in wastewater treatment plants. Major application of anaerobic digestion is in the stabilization of concentrated sludge produced from the treatment of wastewater and in the treatment of some industrial wastes. Aerobic digestion needs to supply oxygen to the sludge. In anaerobic digestion, the sludge is fed into an air-free vessel; the digestion produces a gas which is mostly a mixture of methane and carbon dioxide (13, 14).

VOC emissions from wastewater treatment plants are possibly due to incomplete ignition of some toxic gases in the air stream and emissions from fueling of digester gas. Some of these harmful gases are briefly described below. The reason which these are more concerning than others in this study will be discussed later in Chapter IV:

1, 3 – Butadiene

“This is a simple conjugated diene with the formula C_4H_6 and the molecular weight is 54.09 g/mol. 1,3-Butadiene is a colorless gas with a mild gasoline-like odor. The odor threshold for 1,3-butadiene is 1.6 parts per million (ppm). The vapor pressure for 1,3-butadiene is 2100 mm Hg at 25 °C, and it has an octanol/water partition coefficient ($\log K_{ow}$) of 1.99” (13).

“Human studies show that acute exposure to 1,3-butadiene by inhalation results in irritation of the eyes, nasal passages, throat, and lungs. Neurological effects, such as blurred vision, fatigue, headache, and vertigo, have also been reported at very high exposure levels. One epidemiological study reported that chronic (long-term) exposure to 1,3-butadiene via inhalation resulted in an increase in cardiovascular diseases, such as rheumatic and arteriosclerotic heart diseases, while other human studies have reported effects on the blood. Animal studies have reported effects on the respiratory and cardiovascular systems, blood, and liver from chronic inhalation exposure to 1,3-butadiene. EPA has established a Reference Concentration (RfC) for a chronic reference level of 0.002 milligrams per cubic meter (mg/m^3) (0.9 ppb) for 1,3-butadiene based on reproductive effects in mice. The RfC is an exposure concentration at or below which adverse health effects are not likely to occur” (13).

Carbon Disulfide

“The chemical formula for carbon disulfide is CS₂, and its molecular weight is 76.14 g/mol. The pure carbon disulfide occurs as a colorless liquid that is not very soluble in water; impure carbon disulfide is yellowish. Carbon disulfide evaporates rapidly at room temperature and is flammable. It has a sweet, pleasant, chloroform-like odor, with an odor threshold of 0.05 mg/m³. Commercial grades of carbon disulfide have a foul odor, smelling like rotten eggs. The vapor pressure for carbon disulfide is 352.6 mm Hg at 25 °C, and its log octanol/water partition coefficient (log K_{ow}) is 1.84 to 2.16” (14).

“Acute inhalation exposure of humans caused changes in breathing and some chest pains during an accidental release of carbon disulfide. Nausea, vomiting, dizziness, fatigue, headache, mood changes, lethargy, blurred vision, delirium, and convulsions have also been reported in humans acutely exposed by inhalation. Neurotoxic effects have been observed in chronic human and animal inhalation studies. Behavioral and neurophysiological changes, reduced nerve conduction velocity, peripheral neuropathy, and polyneuropathy have been observed in chronically exposed workers. The Reference Concentration for carbon disulfide is 0.7 milligrams per cubic meter (mg/m³) based on neurological effects in humans. The Reference Dose for carbon disulfide is 0.1 milligrams per kilogram body weight per day (mg/kg/d) based on fetal toxicity/malformations in rabbits” (14).

1, 4 – Dichlorobenzene

“The chemical formula for 1,4-dichlorobenzene is C₆H₄Cl₂ and the molecular weight is 147.02 g/mol. It is a white solid with a sweet taste and a strong odor. The odor threshold for 1,4-dichlorobenzene is 0.18 parts per million (ppm). The vapor pressure for 1,4-dichlorobenzene is 1.76 mm Hg at 25 °C, and it has a log octanol/water partition coefficient of 3.52” (15).

“Acute exposure to 1,4-dichlorobenzene via inhalation in humans results in irritation to the eyes, skin, and throat. Animal studies have reported effects on the blood, liver, and kidneys from oral exposure to 1,4-dichlorobenzene. Chronic exposure to 1,4-dichlorobenzene by inhalation in humans results in effects on the liver and skin. Animal studies have reported effects on the respiratory system, liver, and kidneys from inhalation exposure to 1,4-dichlorobenzene, while oral studies have reported effects on the blood, liver, and kidneys. The Reference Concentration for 1,4-dichlorobenzene is 0.8 milligrams per cubic meter (mg/m³) based on increased liver weights in rats. EPA has not established a Reference Dose for 1,4-dichlorobenzene” (15).

Methylene Chloride

“A common synonym for methylene chloride is dichloromethane. Methylene chloride is a colorless liquid with a sweetish odor. The chemical formula for methylene chloride is CH₂Cl₂, and the molecular weight is 84.93 g/mol. The vapor pressure for methylene chloride is 349 mm Hg at 20 °C, and it has an octanol/water coefficient (log K_{ow}) of 1.30. Methylene chloride has an odor threshold of 250 parts per million (ppm). Methylene chloride is slightly soluble in water and is nonflammable” (16).

“Case studies of methylene chloride poisoning during paint stripping operations have demonstrated that inhalation exposure to extremely high levels can be fatal to humans. The major effects from chronic inhalation exposure to methylene chloride in humans are effects on the CNS, such as headaches, dizziness, nausea, and memory loss. Animal studies indicate that the inhalation of methylene chloride causes effects on the liver, kidney, CNS, and cardiovascular system. EPA has calculated a provisional Reference Concentration of 3 milligrams per cubic meter (mg/m³) based on liver effects in rats. The Reference Dose for methylene chloride is 0.06 milligrams per kilogram body weight per day (mg/kg/d) based on liver toxicity in rats” (16).

Methyl Ethyl Ketone

“The chemical formula for methyl ethyl ketone is C₄H₈O and the molecular weight is 72.10 g/mol. Methyl ethyl ketone is a colorless volatile liquid that is soluble in water. The odor threshold for methyl ethyl ketone is 5.4 parts per million (ppm), with an acetone-like odor reported. The vapor pressure for methyl ethyl ketone is 95.1 mm Hg at 25 °C, and it has a log octanol/water partition coefficient (log K_{ow}) of 0.261. Methyl ethyl ketone is also referred to as 2-butanone” (17).

“Acute exposure of humans to high concentrations of methyl ethyl ketone produces irritation to the eyes, nose, and throat. Other effects reported from acute inhalation exposure in humans include central nervous system depression, headache, and nausea. Limited information is available on the chronic effects of methyl ethyl ketone in humans from inhalation exposure. One study reported nerve damage in individuals who sniffed a glue thinner containing methyl ethyl ketone and other chemicals. Slight neurological, liver, kidney, and respiratory effects have been reported in chronic inhalation studies of methyl ethyl ketone in animals. The Reference Concentration for methyl ethyl ketone is 1 milligram per cubic meter (mg/m³) based on decreased fetal birth weight in mice. The Reference Dose for methyl ethyl ketone is 0.6 milligrams per kilogram body weight per day (mg/kg/d) based on decreased fetal birth weight in rats” (17).

Natural Gas

Natural gas is an important source of energy to reduce pollution and having clean and healthy air. In addition to being a domestically abundant and secure source of energy, the use of natural gas also offers a number of environmental benefits over other fossil fuels. This section will discuss the environmental effects of natural gas, in terms of emissions and the environmental impact of the natural gas industry itself. (18)

Natural gas is the cleanest among all fossil fuels. Composed mainly of methane, the products of the combustion of natural gas are carbon dioxide and water vapor, the same compounds we exhale when we are breathing. Table IV shows the typical composition of natural

gas. Coal and oil are composed of more complex molecules, with a higher carbon ratio and containing higher nitrogen and sulfur molecules. This means at combustion, coal and oil release higher levels of harmful gases, including a higher ratio of carbon emissions, nitrogen oxides, and sulfur dioxide. Coal and fuel oil also release ash particles into the atmosphere. (18)

Table IV - Typical Composition of Natural gas (18)

Compound	Chemical Formula	Volume
Methane	CH ₄	70-90%
Ethane	C ₂ H ₆	0-20%
Propane	C ₃ H ₈	
Butane	C ₄ H ₁₀	
Carbon Dioxide	CO ₂	0-8%
Oxygen	O ₂	0-0.2%
Nitrogen	N ₂	0-5%
Hydrogen sulphide	H ₂ S	0-5%
Rare gases	A, He, Ne, Xe	trace

However, the combustion of natural gas releases very small amounts of sulfur dioxide and nitrogen oxides, no ash or particulate matter, and lower emissions of carbon dioxide and carbon monoxide. TABLE V shows each fossil fuel emission levels. (18)

Table V - Fossil Fuel Emission Levels (lb per 106 Btu of Energy Input)

Pollutant	Natural gas	Oil	Coal
Carbon Dioxide	117,000	164,000	208,000
Carbon Monoxide	40	33	208
Nitrogen Oxides	92	448	457
Sulfur Dioxide	1	1,122	2,591
Particulates	7	84	2,744
Mercury	0.000	0.007	0.016

(Source: Energy Information Administration, 1998)

The use of fossil fuels for energy causes a number of environmental problems. Natural gas can be used to help reduce the emissions of pollutants into the atmosphere. Burning natural gas in the place of other fossil fuels emits fewer harmful gases into the atmosphere. (18)

One issue that has arisen with regard to natural gas and the greenhouse gas (GHG) effect is the fact that methane, the main component of natural gas, is itself a very potent greenhouse gas. Methane has an ability to trap heat almost 21 times more effectively than carbon dioxide. According to the Energy Information Administration, although methane emissions account for only 1.1 % of total U.S. greenhouse gas emissions, they account for 8.5 % of the greenhouse gas emissions based on global warming potential. The sources for methane emissions in the United States include the waste management and operations industry, and the agricultural industry. (18)

“A major study performed by the EPA and the Gas Research Institute (GRI) in 1997 sought to discover whether the reduction in carbon dioxide emissions from increased natural gas use would be offset by a possible increased level of methane emissions. The study concluded that the reduction in emissions from increased natural gas use strongly outweighs the detrimental effects of increased methane emissions.” (18)

“Acid rain is another environmental problem that affects much of the Eastern United States, damaging crops, forests, wildlife populations, and causing respiratory and other illnesses in humans. Acid rain is formed when sulfur dioxide and nitrogen oxides react with water vapor and other chemicals in the presence of sunlight to form various acidic compounds in the air. The principal source of acid rain causing pollutants, sulfur dioxide and nitrogen oxides, are coal-fired power plants. Since natural gas emits virtually no sulfur dioxide, and up to 80 % less nitrogen oxides than the combustion of coal, increased use of natural gas could provide for fewer acid rain causing emissions” (18).

“Natural gas can be used in the transportation sector to cut down on these high levels of pollution from gasoline and diesel powered cars, trucks, and buses. In fact, according to the EPA, compared to traditional vehicles, vehicles operating on compressed natural gas have reductions in carbon monoxide emissions of 90 to 97 %, and reductions in carbon dioxide emissions of 25 %. Nitrogen oxide emissions can be reduced by 35 to 60 %, and other non-methane hydrocarbon emissions could be reduced by as much as 50 to 75 %. In addition, because of the relatively simple makeup of natural gas in comparison to traditional vehicle fuels, there are fewer toxic and carcinogenic emissions from natural gas vehicles, and virtually no particulate emissions” (18).

Global Air Pollution

Air pollution cannot be necessarily limited to a local or regional scale. Atmospheric circulation causes pollution problems to get distributed around the world. Some air pollutants are potent to associate with climate changes of earth; therefore, international actions are needed to restrict their impacts (2).

The two types of compounds involved in global climate change are those that produce free halogen atoms by photochemical reaction which deplete the stratospheric ozone layer, and those that absorb energy in the near infrared region, which may ultimately produce global temperature change (Global Warming) (3). Global warming means the average surface temperature of the earth is increasing globally. Actually, the decade of the 1990s was the warmest decade ever recorded, and this trend of increasing seems to be continuing (2).

The first group mentioned above is comprised mostly of chlorofluorocarbons (CFC), hydrofluorocarbons (HFC), and perfluorocarbons (PFC). Control of these gas emissions involves control of leaks, as from refrigeration systems, and eliminating use of the substances. While chlorofluorocarbon aerosol propellants are useful and convenient, they are not necessary for most applications. For example, aerosol deodorant, cleaners, paint, and hairspray can be replaced by roll-on deodorant, wipe-on cleaners, rolled-on paint, hair mousse (10).

These gases are forms of Greenhouse Gases (GHGs). According to the definition in Section 202(a) of the Clean Air Act of the USEPA, there are six greenhouse gases: carbon dioxide, methane, nitrous oxide, HFC, PFC, and sulfur hexafluoride. These gases can result from human activities, which are known as anthropogenic greenhouse gases, and can be produced naturally and are known as natural greenhouse gases. These six GHGs have common physical properties with regard to the climate change problem: all are long-lived in the atmosphere; all can be well mixed globally regardless of where emitted; all trap heat from the sun; and all are directly emitted as greenhouse gases rather than being formed as greenhouse gas in the atmosphere after emission of precursor gas. Carbon dioxide is the dominant gas among all greenhouse gases.

Air Pollution Control

The need to minimize or control air pollution has been evident for several hundred years. Today, it is obvious that smoke can be more than just a temporary hurt; smoke and other air

pollutants affect health and quality of life, esthetic sensibilities, and even climate on a global scale. In a modern industrial society, it is hard to avoid generating at least some waste products that will enter the atmosphere, in one way or another. All in all pollution control strategies, laws, and air quality standards are necessary; and logical principles of engineering and technology must be directed toward the development and use of pollution control equipment (2).

Air Sampling and Measurement

To evaluate air quality and design an efficient air pollution control system, emission rates must be determined from the sources and analyze the type and amounts of pollutants in the gas and surrounding air. Before such measurements can be done, appropriate samples must be collected. The quantification and evaluation of air quality involves accurate determination of pollutant concentrations, which are typically expressed as a ratio of the mass of the pollutant to the volume of air or gas in which it is found.

Measurement of mass is primarily made in an analytical laboratory, while determination of volume is usually measured in the field at the time of sampling. There exist hundreds of methods and types of instruments that can measure pollutant mass. Some instruments require a few milligrams of pollutant for accurate analysis, while others can detect and accurately measure very small amounts, even in the range of a few molecules. There are possibly also many methods and devices for measuring volume, velocity, flow rate. The choice of a technique for sampling and measuring the mass and volume depends on the properties of the sampled gas or air and the specification of the pollutants to be analyzed.

There are three kinds of air sampling: source sampling, ambient sampling, and indoor sampling (2).

Source Sampling

Source (or emission) sampling can be done at the location of a pollutant discharge, such as the exhaust gas from a chimney of any factory, ventilation system, or the tailpipe of an automobile. Source sampling is also termed “stack sampling” at power plant, wastewater treatment plant, or factories where the discharge comes from a chimney or smokestack (2).

Ambient Sampling

Ambient (or atmospheric) sampling is suitable for the measurement of outdoor air pollution levels. Samples are collected from air after pollutants from various sources have been completely dispersed and mixed together under natural conditions. Ambient sampling provides broad areas or background air quality data in urban or rural areas, and uses as a basis for assessing health effects, determining compliance with federal or state ambient air quality standards, and can predict the effects of proposed new sources of air pollution (2).

Indoor Sampling

Indoor air sampling is a kind of industrial and residential health sampling. Industrial hygiene air sampling is made in factories or other workplaces to protect the health of people who may be exposed to pollutants in the whole workday. Residential air sampling, on the other hand, provides data regarding the quality of indoor air in private homes to protect the health of residents (2).

CHAPTER III

SAMPLING PROCEDURE

To capture a valid sample at the RTO of the Morris Forman Wastewater Treatment Plant, first it was determined which sampling ports could provide a representative sample of atmospheric emissions. For safety reasons, ports were installed to allow sampling to occur at ground-level, avoiding, the need to use a ladder with the inherent safety risks. SilcoCan Canisters were used to store the samples to transport them easily to the laboratory and analyze them. Figure 6 shows the type of SilcoCan Canisters used.

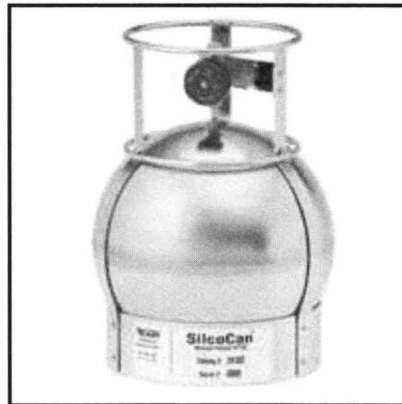


Figure 6 - SilcoCan Canister ("stable to 250 C, Volume of 6 L, and valve of ¼ inch")

It has the following features:

- High quality, metal-to-metal seal, 2/3-turn valve with stainless steel diaphragms.
- Various sizes to support a wide range of sampling needs.
- 2-port or 3-port valve available; 3-port valve includes -30" Hg/60psi vacuum/pressure gauge.

- Unsurpassed inertness, even for sulfur-containing or brominated compounds.

The white tube (1/4 inch internal diameter, Tygon tubing) was used to connect the canisters to the port of the sampling. Figure 7 shows how to set the sampling up.

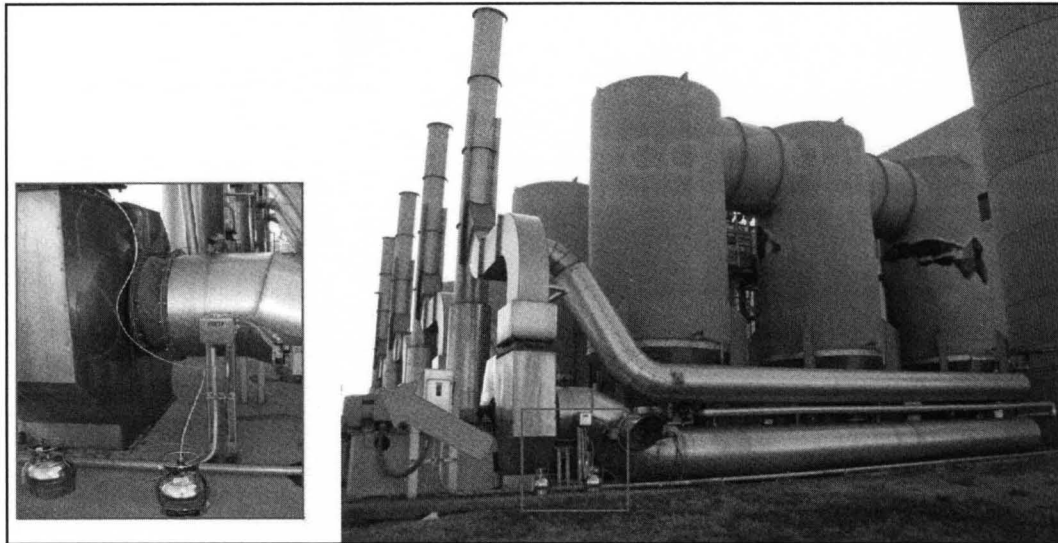


Figure 7 - Sampling set up

Two types of samples were retrieved: one under “Normal Condition” where the system was operated by digester gas, the second type of sample was captured when the system was operated by natural gas. In each case 15 to 20 minutes were allowed for sampling. In order to allow for removal of digester gas from the process, a 5 to 10 minute delay was allowed between the two sampling modes.

First a total of 12 samples were collected, six of which, were from digester gas and the other six were from natural gas operations on Train # 4 and # 1. These samples were taken over five days, including four consecutive days between December 14 to 18, 2009. Then because of some abnormality (like high concentrations of some chemicals in first and/or second events rather than other events, or some chemicals just showed up in one or two events) in this data, another six samples were captured to get a reliable result. Out of the secondary sampling events, the first two events were done on two different Trains. This means that due to some operational conflict in

those days, digester gas samples were captured from Train # 1 and natural gas samples were captured from Train # 4. But for the last event, two samples were made using the same procedure as primary sampling (they were retrieved from Train # 4). Also for quality assurance, one field blank sample was captured on the first event of secondary sampling. Table VI shows the Sampling events information. See Appendix B for extended information on the samples chain of custody.

Table VI - Sampling events information

Sampling Date	Canister #	Pre-Sampling Pressure (mm Hg)	Post-Sampling Pressure (mm Hg)	Sampling Site	Analysis Date
12/04/09	6458	50	820	Natural gas, RTO Train # 4, MSD	12/11/09
	6455	50	820	Digester Gas, RTO Train # 4, MSD	12/11/09
12/14/09	2167	50	800	Natural gas, RTO Train # 4, MSD	12/16/09
	2168	50	800	Digester Gas, RTO Train # 4, MSD	01/04/10
12/15/09	2165	50	830	Natural gas, RTO Train # 4, MSD	01/04/10
	2166	50	820	Digester Gas, RTO Train # 4, MSD	01/04/10
12/16/09	2173	50	820	Natural gas, RTO Train # 4, MSD	01/04/10
	2172	50	830	Digester Gas, RTO Train # 4, MSD	01/04/10
12/17/09	2169	50	800	Natural gas, RTO Train # 4, MSD	01/04/10
	2171	50	800	Digester Gas, RTO Train # 4, MSD	01/04/10
12/18/09	2174	50	800	Natural gas, RTO Train # 4, MSD	01/04/10
	6445	50	800	Digester Gas, RTO Train # 4, MSD	01/04/10
02/26/10	6445	50	830	Natural gas, RTO Train # 4, MSD	03/23/10
	6437	50	760	Digester Gas, RTO Train # 1, MSD	03/23/10
	6458			Field Blank	03/23/10
03/05/10	6455	50	830	Natural gas, RTO Train # 4, MSD	03/23/10
	6443	50	810	Digester Gas, RTO Train # 1, MSD	03/23/10
03/12/10	6447	50	780	Natural gas, RTO Train # 4, MSD	03/23/10
	6449	50	790	Digester Gas, RTO Train # 4, MSD	03/23/10

ANALYSIS OF THE SAMPLES

After taking samples from the plant, they were transferred to the Air Quality Laboratory at Ernst Hall. They were analyzed with a Gas Chromatography-Mass Spectrometry (GC-MS) instrument (GC System 6890 series) shown Figure 8 and 9. As the name of GC/MS implies, it is actually two techniques that are combined to form a single method of analyzing mixtures of chemicals. Gas chromatography separates the components of a mixture, and mass spectrometry characterizes each of the components individually. By combining the two techniques, it is possible to both qualitatively and quantitatively evaluate a solution containing a number of chemicals.

“GC-MS can be applied in environmental analysis, fire investigation, explosives investigation drug detection, and identification of some unknown samples. Another important GC-MS application is to be used in airport security to detect substances in luggage or on human bodies. Also it can identify trace elements in materials that were previously thought to have disintegrated beyond identification” (21).

“The GC-MS has been widely heralded as a "gold standard" for forensic substance identification because it is used to perform a specific test. A specific test positively identifies the actual presence of a particular substance in a given sample. A non-specific test merely indicates that a substance falls into a category of substances. Although a non-specific test could statistically suggest the identity of the substance, this could lead to false positive identification” (21). Figure 9 shows the schematic of GC-MS works.

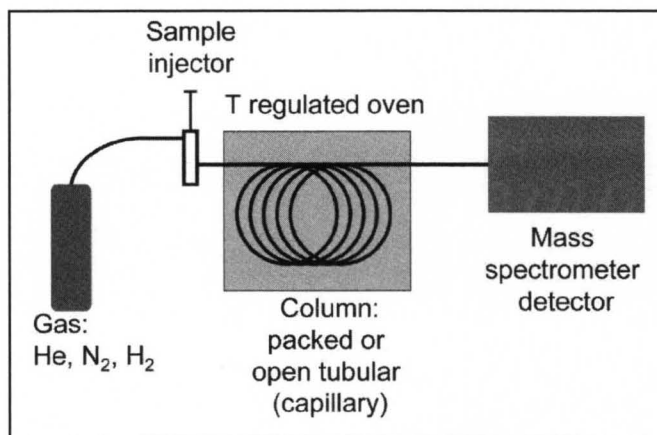


Figure 8 - The schematic view of GC-MS

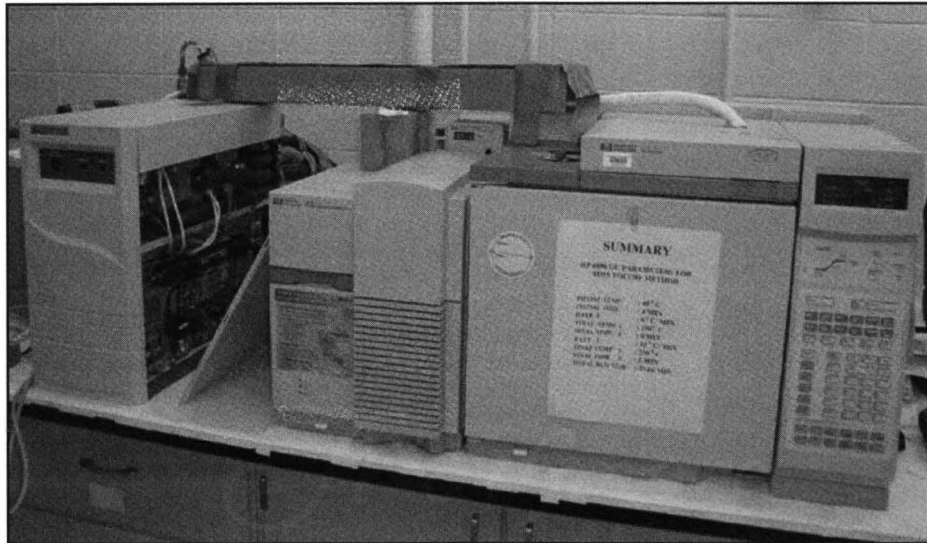


Figure 9 - GC System 6890 series

These series of instruments are very sensitive to highly polluted and molecular weight compounds; before any sampling, one sample was retrieved to get the idea of how much dilution is needed for samples analysis. After that, it was decided that the samples need to be diluted 30 times with helium gas.

There are two methods for the determination of toxic volatile organic compounds (VOCs) in air samples. These two methods are Method TO-14A and Method TO-15. Method TO-15 is applicable to a subset of the 87 volatile organic compounds (VOCs) that are from the list of 189 hazardous air pollutants (HAPs) included in Title III of the Clean Air Amendments. By employing water management steps, this method reduces the loss of water-soluble VOCs. Because of this, the analysis list includes polar and non-polar VOCs. In general, Method TO-15 provides information on alternative water management systems that allow for the analysis of polar compounds, has a more complete quality control section, provides performance criteria for any monitoring technique employed, and provides guidance specifically directed at compound identification by mass spectrometry. Table VII shows each method's specification.

Table VII - Method TO-14A and Method TO-15 Specifications (Source: USEPA)

Method Specifications	TO-14A	TO-15
Non-polar VOCs (e.g., toluene, benzene)	X	X
Polar VOCs (e.g., methanol, alcohols, ketones)	-	X
GC/MS instrumentation	X	X
Sample collection by prepared canister (holding time = 30d)	X	X
Sample collection by sorbent tube	X	X
Water management techniques (avoid loss of polar compds)	-	X
Enhanced provisions for quality control	-	X
Method performance criteria	-	X
Selected Ion Monitoring (SIM)	-	X
Specific Cleaning procedures	-	X
Air sample concentrated onto solid sorbent trap	X	X
Use of other detectors for GC (e.g., GC/MD)	X	-
Detection Limit 0.2 – 25 ppbV	X	X

Method TO-15 was selected for this analysis because of the need for an expanded analysis list (especially polar compounds), the need for special canister considerations, and the need for specified quality control tools (method performance criteria for acceptance of data) (EPA, Report # 625/R-96-010b).

Analysis dates were mentioned in Table V. The data from GC-MS will be presented and the limitations on the accuracy of the data and how it may contribute to some of the variability will be explained later in Chapter IV.

CHAPTER IV

DATA AND RESULTS

The data from Gas Chromatography and Mass Spectrometry are in ppb. In order to compare with Inhalation Reference Concentration (RfC), data in both ppb and $\mu\text{g}/\text{m}^3$ are needed. Based on each chemical's molecular weight and Ideal gas constant, R, all concentrations were converted to $\mu\text{g}/\text{m}^3$. Based on the formula below, it can be converted to $\mu\text{g}/\text{m}^3$:

$$C_1 = \frac{C_2 * MW}{R}$$

Where

C_1 = Concentration of the compound ($\mu\text{g}/\text{m}^3$)

C_2 = Concentration of the compound (ppb)

MW = Molecular Weight

R = Ideal Gas Constant at 22 Deg. C = 24.205

For instance, the concentration of 1, 3 – Butadiene in the digester gas sample of Event # 3 is 36.42 ppb. By plugging in the numbers to the formula, the concentration is $81 \mu\text{g}/\text{m}^3$.

Totally, 24 chemicals have been found in the samples. Table VIII and IX show the chemical's concentration in each sampling event. All units are $\mu\text{g}/\text{m}^3$.

Table VIII - Tabular form of data from Event 1 to Event 4 (All unit in $\mu\text{g}/\text{m}^3$).

COMPOUND	MW	DG 1	NG 1	DG 2	NG 2	DG 3	NG 3	DG 4	NG 4
1, 4 Difluorobenzene	114	19	19	19	19	19	19	19	19
Chlorobenzen-d5	112.56	19	19	19	19	19	19	19	19
Bromochloromethane	129.39	24	24	23	23	22	23	21	22
P-Bromofluorobenzene	174	28	28	28	30	31	29	29	29
Chloromethane	64.52	11	0	0	14	18	21	14	11
1, 3 - Butadiene	54.09	84	16	22	108	81	102	14	13
Acetone	58	354	357	215	660	553	850	500	615
Carbon Disulfide	76.14	14	21	6	18	17	10	14	14
Methyl Ethyl Ketone	72.1	304	73	46	151	135	206	120	135
Benzene	78.1	77	80	39	178	140	191	154	142
Toluene	100.19	16	18	11	57	37	66	45	45
1, 4 - Dichlorobenzene	147.01	45	22	0	0	0	0	0	0
Methylene Chloride	84.94	0	0	11	12	10	10	0	9
Naphthalene	128.16	0	0	12	32	23	10	16	35
Methyl Butyl Ketone	100.16	0	0	0	0	7	17	0	0
Xylene (m or p)	106.17	10	0	0	10	0	9	0	0
Chlorobenzene	112.56	0	0	0	0	0	6	0	0
Styrene	104.16	0	0	0	0	0	7	0	0
Freon 22	86.47	0	0	0	0	0	0	0	0
Methyl Methacrylate	100.12	0	0	0	0	0	0	0	0
Ethylbenzene	106.17	0	0	0	0	0	0	0	0
Hexane	86.18	0	0	0	0	0	0	0	0
O-Xylene	106.17	0	0	0	0	0	0	0	0
1,2,4-TrimethylBenzene	120.2	0	0	0	0	0	0	0	0

Table IX - Tabular form of data from Event 5 to Event 9 (All unit in $\mu\text{g}/\text{m}^3$).

COMPOUND	MW	DG 5	NG 5	DG 6	NG 6	DG 7	NG 7	DG 8	NG 8	DG 9	NG 9
1, 4 Difluorobenzene	114	19	19	19	19	19	19	19	19	19	19
Chlorobenzene-d5	112.56	19	19	19	19	19	19	19	19	19	19
Bromochloromethane	129.39	21	22	23	21	23	22	22	22	22	23
P-Bromofluorobenzene	174	30	30	27	29	29	30	32	30	32	31
Chloromethane	64.52	9	2	10	7	58	15	75	60	10	40
1, 3 - Butadiene	54.09	25	11	21	9	78	0	157	165	75	116
Acetone	58.08	425	313	348	354	961	639	1319	927	447	940
Carbon Disulfide	76.14	9	5	7	5	18	15	25	20	15	36
Methyl Ethyl Ketone	72.1	94	51	77	43	383	188	349	293	213	358
Benzene	78.1	122	50	98	45	220	176	296	270	191	355
Toluene	100.19	32	14	22	13	74	49	122	83	67	146
1, 4 - Dichlorobenzene	147.01	0	0	0	0	31	17	41	37	51	53
Methylene Chloride	84.94	0	9	11	0	15	0	12	16	11	13
Naphthalene	128.16	41	36	10	23	6	12	0	15	22	34
Methyl Butyl Ketone	100.16	0	0	0	0	9	0	15	12	0	14
Xylene (m or p)	106.17	0	0	0	0	0	0	0	0	0	0
Chlorobenzene	112.56	0	0	0	0	10	8	19	11	11	25
Styrene	104.16	0	0	0	0	0	0	12	8	9	14
Freon 22	86.47	0	0	0	0	0	37	0	0	0	0
Methyl Methacrylate	100.12	0	0	0	0	6	0	10	0	0	0
Ethylbenzene	106.17	0	0	0	0	5	0	8	5	0	10
Hexane	86.18	0	0	0	0	0	0	4	0	0	0
O-Xylene	106.17	0	0	0	0	0	0	8	0	0	6
1,2,4-TrimethylBenzene	120.2	0	0	0	0	0	0	0	0	0	8

Discussion

In the RTO, any volatile organics have been treated during the process and what is sampled at the outlet seems safe. From the tables above, it can be observed that some chemicals like Xylene only have been in a few sampling events, and some others (with regard to their RfC value) like Naphthalene, have a low concentration that are of no concern for health issues because they don't have a considerable risk to health. Because of that, these chemicals can be neglected. The chemicals which were not neglected are:

1. 1, 3 – Butadiene;
2. Carbon Disulfide;
3. 1, 4 – Dichlorobenzene;
4. Methylene Chloride;
5. Methyl Ethyl Ketone.

The physical and chemical properties of these hydrocarbons have been described briefly in chapter II. Based on U.S. EPA researches, these chemicals have the Inhalation Reference Concentrations (RfC) (shown in Table X), the concentrations which are likely to be without risk of deleterious non-cancer effects during a lifetime. The average concentration of nine events, for both digester gas and natural gas samples, for all chemicals were calculated except for 1, 4 – Dichlorobenzene and Methylene Chloride. For 1, 4 – Dichlorobenzene, the average of four events, which it showed up in the samples, was calculated; and for Methylene Chloride, the average of eight events was calculated.

The Detection Limits and the Confidence Interval (95% Confidence Level) of these five chemicals are shown in the Table X. Detection Limit is the lowest quantity of a substance that can be distinguished from the absence of that substance:

Table X - RfC, Average concentration and MQL for five chemicals

Chemical	RfC (Source: EPA) ($\mu\text{g}/\text{m}^3$)	Avg concentration ($\mu\text{g}/\text{m}^3$)		95 % Confidence Interval		Detection Limit ($\mu\text{g}/\text{m}^3$)
		NG	DG	NG	DG	
1, 3 - Butadiene	2	60	62	19 - 101	32 - 92	0.23
Carbon Disulfide	700	16	14	13 - 19	10 - 18	0.33
1, 4 - Dichlorobenzene	800	32	42	21 - 43	37 - 47	0.63
Methylene Chloride	3000	9	9	5 - 13	7 - 11	0.36
Methyl Ethyl Ketone	1000	17	19	96 - 236	109 - 273	0.29

Observation

As can be observed from the table above, except for 1, 3 – Butadiene, all other hydrocarbon concentrations are below the RfC values. The graphs of concentration in each event for these five chemicals are presented in Figure 10 to 14. As they show, in the last two or three events the concentrations are high among all sampling events; it is possibly because of operational problems in those days or different weather condition.

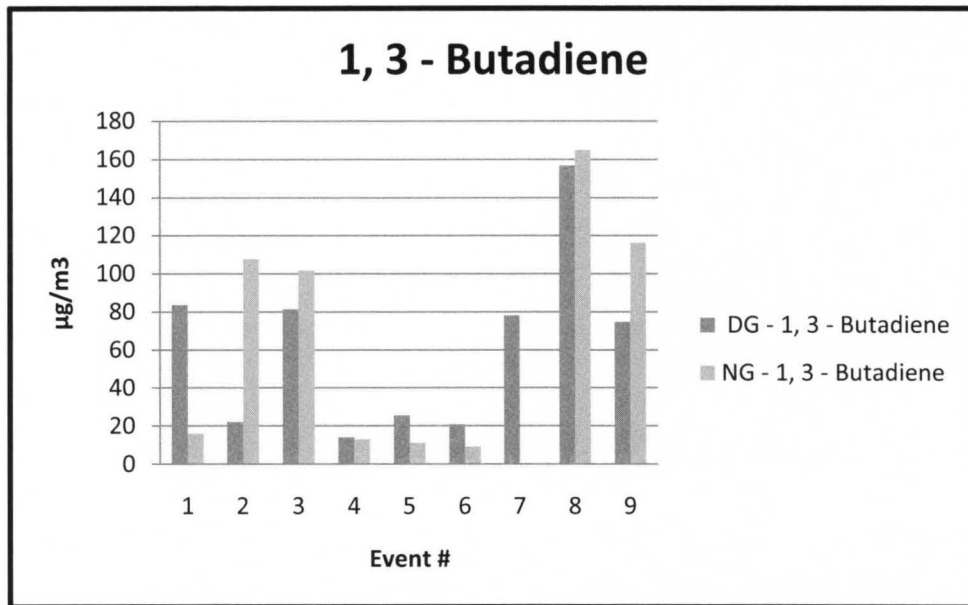


Figure 10 - Graph of concentrations for 1,3 – Butadiene

MQL = 0.23 µg/m³, RfC = 2 µg/m³

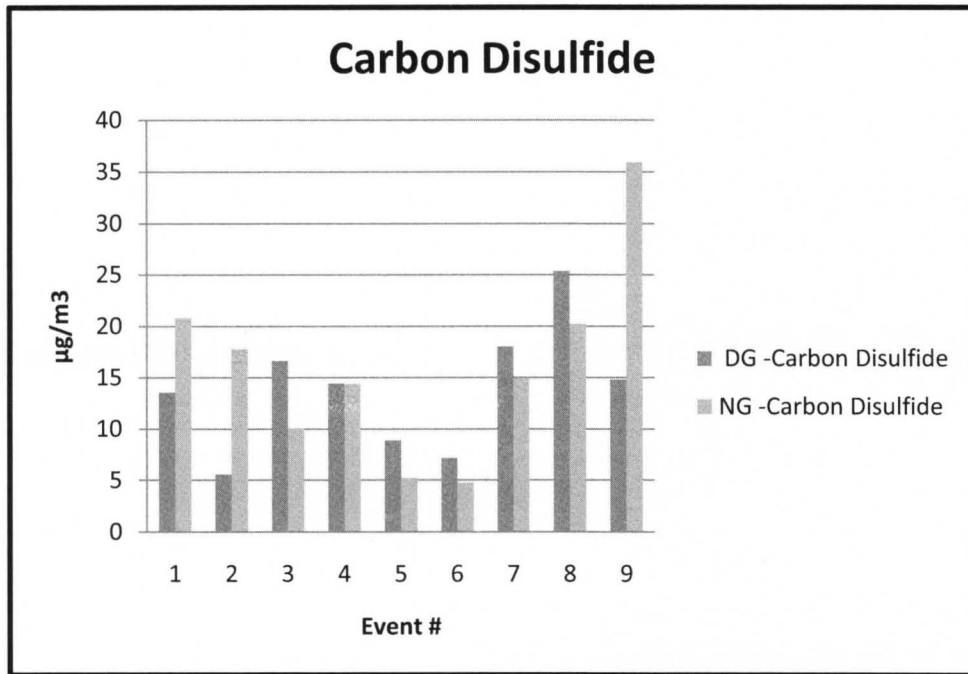


Figure 11 - Graph of concentrations for Carbon Disulfide

MQL = 0.33 µg/m3, RfC = 700 µg/m3

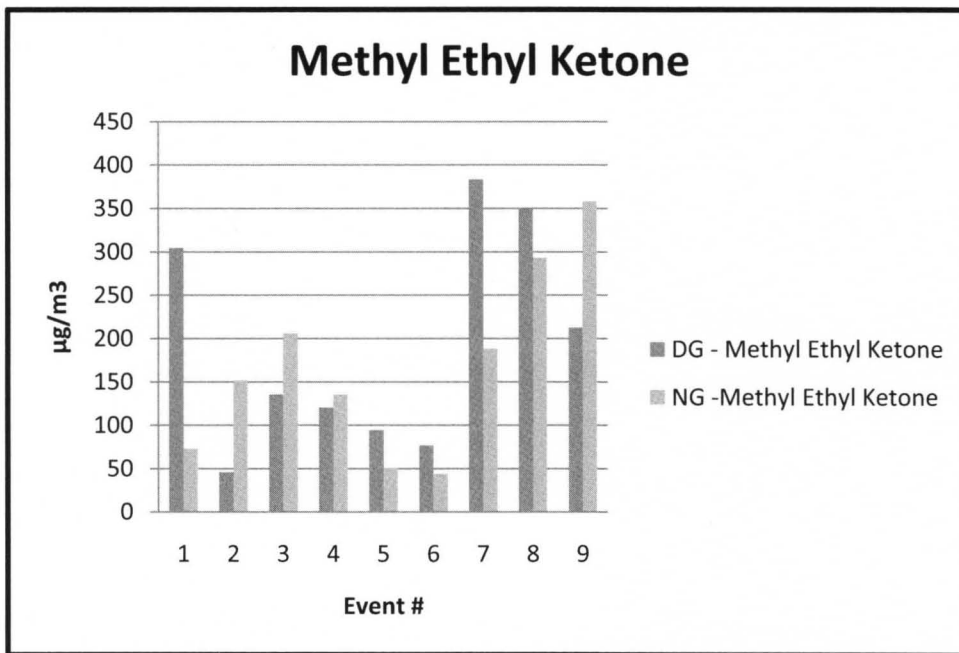


Figure 12 - Graph of concentrations for Methyl Ethyl Ketone

MQL = 0.29 µg/m3, RfC = 1000 µg/m3

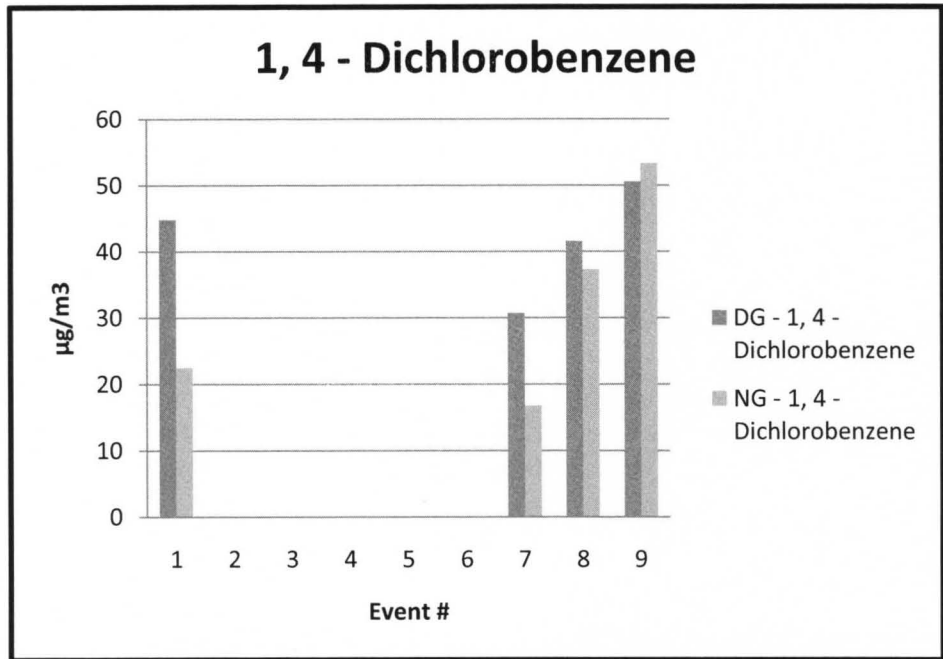


Figure 13 - Graph of concentrations for 1,4 – Dichlorobenzene

MQL = 0.63 µg/m³, RfC = 800 µg/m³

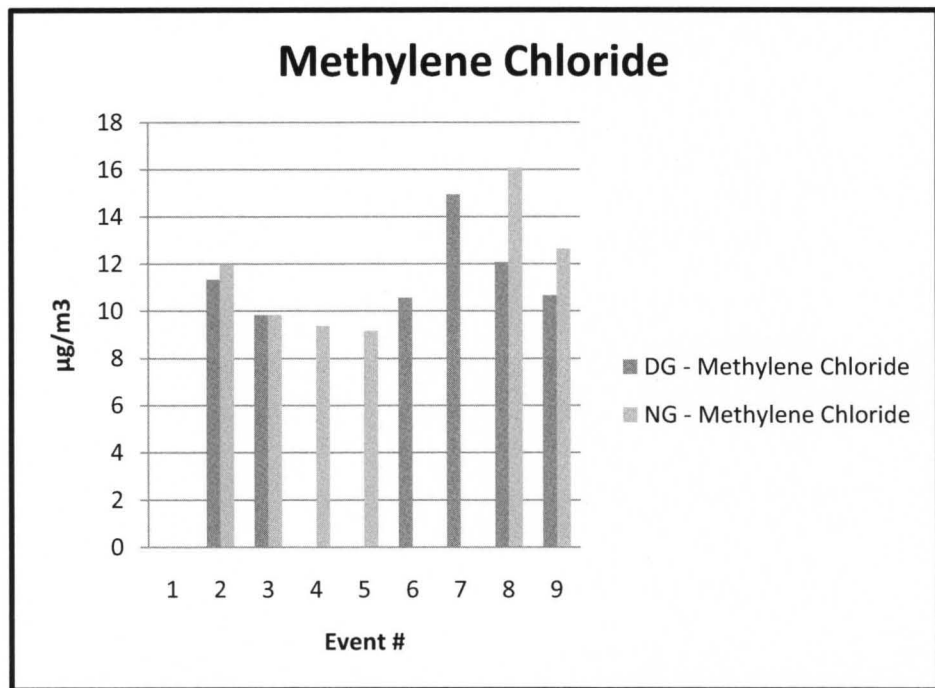


Figure 14 - Graph of concentrations for Methylene Chloride

MQL = 0.36 µg/m³, RfC = 3000 µg/m³

As mentioned before and can be observed from these graphs, the concentrations of these five chemicals are high in last the two to three events. And 1,4 – Dichlorobenzene only showed up in four events. Also the concentrations of these five chemicals in Events 4, 5, and 6 are lower than in other events. Such variability can be observed from these graphs and caused by some limitations in sampling and analysis procedures. These limitations can be:

1. 10 to 15 minutes time for purging the regenerative thermal oxidizer to change the mode from digester gas to natural gas feeding,
2. Having some residual solids and semisolids on the canister valve after sampling in Events 7, 8, and 9. Effort was made to avoid carryover of these semi-solids into the analysis; but within ppb concentrations, it is hard to avoid perfectly.
3. Measuring the samples once, more measurements make more accuracy,
4. Measurement of samples based on 1:30 dilution factor,
5. Accuracy of TO-15 methodology for measurement which is + or – 25% (EPA approved),
6. Possibility of the existence of some VOC residue in the tube used for the connection of the sampling port to canister valve,
7. Possibility of the existence of some VOC residue in the canisters remained after cleaning them for reuse for subsequent events,
8. Sampling in one season of the year; sampling in different weather conditions may be more accurate,
9. Sampling from one port at the outlet of gases. Sampling from different ports leads to have more accuracy.

It should be pointed out that based on the typical composition of natural gas which is shown in Table IV (Chapter II, Page 23), theoretically after the combustion of natural gas, the typical gases which should be at the outlet of RTO are water vapor, carbon dioxide, and carbon monoxide. Therefore, the gases, which were found in the natural gas samples in this study, might result from the residuals of digester gas burning at the combustion chamber of the RTO. In order

to address this issue, it may be necessary to allot more than 10 minutes for purging the residual gases at the RTO.

CHAPTER V

CONCLUSIONS

Based on the current study, the result showed there is not much difference between natural gas emission and digester gas emission (as shown in Table X, Chapter IV, and Page 37). In the same table, it was showed that all chemicals concentrations are below RfC value except for 1, 3 – Butadiene.

Use of digester gas instead of natural gas proves to be an economical move without causing any harmful emission. Digester gas as a by-product of water and wastewater treatment is an economical source of energy that can be utilized to greatly reduce operating costs for wastewater treatment facilities. And there is no need to dispose this of by-product. This possible source of energy should not be wasted.

CHAPTER VI

RECOMMENDATION

To further validate the result obtained in this study, further research similar to current research is recommended. In addition to the limitations and observations mentioned in Chapter IV, it is recommended to try to sample from various water and wastewater treatment plants, send the captured samples to different laboratories for analysis, use a better tube for connection of canisters to the sampling port, and use different types of canisters for sampling.

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APPENDIX A – SAMPLE CHAIN OF CUSTODY

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 6437 Circle Sample Type: 24 Hr
 Sampler ID # _____ Grab
 Other: _____

Sampling Event # and Date: 12/2/09
 Sampling Location: MSD TRAW # 2 (Natural Gas)

Pre-Sampling Information
 Date/Time Prepared: 6/4/07 4:45 PM By: MG/Jan
 Composite Cleaning File: C0604-15.D
 Instrument Blank File: _____
 Pressure of Canister: -29.2 in Hg 40 mm Hg

Field Data
 Setup By: MG/Jan Collected By: JAC/Jan
 Start Date/Time: _____ Stop Date/Time: _____
 Initial Pressure: _____ in Hg Final Pressure: _____ mm Hg

Post-Sampling Information
 Date/Time Analyzed: 12/2/09 3:15 PM By: J
 GC/MS Sample File: 1130-17.D
 Sequence File: 11302009
 Pressure of Canister: _____ in Hg _____ mm Hg

Chain of Custody

#	Recipient(Print)	Signature	Date/Time	Reason for transfer
1				Set up for sampling
2	Jan	<i>John Medley</i>	12/2/09	Lab analysis
3				

Notes: _____

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 6458 Circle Sample Type: 24 Hr
 Sampler ID # — Grab 15 min
 Other: _____
 Sampling Event # and Date: #1, 12/04/09
 Sampling Location: MSD, Natural Gas Train # 4

Pre-Sampling Information
 Date/Time Prepared: 6/4/07 4:58P By: Jm
 Composite Cleaning File: C0604-11.D
 Instrument Blank File:
 Pressure of Canister: -29.2 in Hg 50 mm Hg

Field Data
 Setup By: M.G Collected By: M.G
 Start Date/Time: 8:30 AM Stop Date/Time: 8:45 AM
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information
 Date/Time Analyzed: 12/11/09 3:12P By: J
 GC/MS Sample File: ~~30604-11.D~~ 1210-11.D
 Sequence File: ~~30604-11.D~~ 1210209
 Pressure of Canister: in Hg 820 mm Hg

Chain of Custody

	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	M.G	<i>M.G</i>	12/04/09	Set up for sampling
2	Jm	<i>Jm</i>	12/11/09	Lab analysis
3				

Notes: 1st dilution = Used 3X dil protocol 14.9 → 44.7 Ppa w/zero N.
 2nd dilution = Used 50 cc of sample instead of 500 cc = 10X dil
 Total dilution = 30 (3 x 10)

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 6455 Circle Sample Type: 24 Hr
 Grab 15 Min
 Sampler ID # — Other:

Sampling Event # and Date: #1, 12/04/09
 Sampling Location: MSD DIGESTER GAS ^{room} #4

Pre-Sampling Information
 Date/Time Prepared: 11/12/08 4 PM By: J
 Composite Cleaning File: C1110-14.D
 Instrument Blank File: —
 Pressure of Canister: -29 in Hg 50 mm Hg

Field Data
 Setup By: M.G Collected By: M.G
 Start Date/Time: 9:15 AM Stop Date/Time: 9:30 AM
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information
 Date/Time Analyzed: 12/11/09 4:01 PM By: J
 GC/MS Sample File: 1210-17.0
 Sequence File: 12102009
 Pressure of Canister: in Hg 820 mm Hg

Chain of Custody

	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	M.G	<i>M. G. Galt</i>	12/04/09	Set up for sampling
2	Johanna	<i>Johanna</i>	12/14/09	Lab analysis
3				

Notes: 1st dilution: Used 3x dil protocol 14.8 → 44.9 psia w/ zero N.
2nd dilution = Used 50 cc of sample instead of 500 cc = 10x dil
Total dilution = 30 (3x10)

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 2167 Circle Sample Type: 24 Hr Natural gas
 Sampler ID # — Grab 20 min
 Other: —

Sampling Event # and Date: #2 - 12/14/2009
 Sampling Location: MSD - train #4

Pre-Sampling Information
 Date/Time Prepared: 12/9/09 6:30P By: J
 Composite Cleaning File: —
 Instrument Blank File: —
 Pressure of Canister: -29 in Hg 50 mm Hg

Field Data
 Setup By: M Collected By: M
 Start Date/Time: 1:00 PM Stop Date/Time: 1:30 PM
 Initial Pressure: — in Hg Final Pressure: — in Hg

Post-Sampling Information
 Date/Time Analyzed: 12/16/09 11:45A By: J
 GC/MS Sample File: 1216-04.D
 Sequence File: 12162009
 Pressure of Canister: — in Hg 800 mm Hg

Chain of Custody

#	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	MJ	<i>[Signature]</i>	12/14/09	Set up for sampling
2	Jm	<i>[Signature]</i>	12/14/09	Lab analysis
3				

Notes: 1st dilution = Used 3X dil protocol 14.5-43.5 psia w/zero N₂
2nd dilution = Used 50 cc of sample instead of 500 cc = 10x dil
Total dilution = 30 (3X10)

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
Phone 502-852-2734

Digester gas

Canister ID # 2168 Circle Sample Type: 24 Hr
 Sampler ID # — Grab
 Other:

Sampling Event # and Date: #2 - 12/14/2009
 Sampling Location: MSD - train #4

Pre-Sampling Information
 Date/Time Prepared: 12/9/09 4:30 PM By: Jiv
 Composite Cleaning File:
 Instrument Blank File:
 Pressure of Canister: -29 in Hg 50 mm Hg

Field Data
 Setup By: M Collected By: M
 Start Date/Time: 1:40 PM Stop Date/Time: 1:55 PM
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information
 Date/Time Analyzed: By:
 GC/MS Sample File:
 Sequence File:
 Pressure of Canister: in Hg 800 mm Hg

Chain of Custody

#	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	M.G	<i>[Signature]</i>	12/14/09	Set up for sampling
2	J.M	<i>[Signature]</i>	12/14/09	Lab analysis
3				

Notes: 1st dilution = Used 3x dil protocol 14.5 → 43.5 psia w/ zero N₂
2nd dilution = Used 50 cc of sample instead of 500 cc = 10x dil
Total dilution = 30 (3x10)

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 2165 Circle Sample Type: 24 Hr Natural gas
 Sampler ID # — Grab 15 min
 Other: —

Sampling Event # and Date: #3 - 12/15/09
 Sampling Location: —

Pre-Sampling Information
 Date/Time Prepared: 12/9/09 4:30pm By: JW
 Composite Cleaning File: —
 Instrument Blank File: —
 Pressure of Canister: -29 in Hg 50 mm Hg

Field Data
 Setup By: M.G Collected By: M.G
 Start Date/Time: 2:00 PM Stop Date/Time: 2:15 PM
 Initial Pressure: — in Hg Final Pressure: — in Hg

Post-Sampling Information
 Date/Time Analyzed: — By: —
 GC/MS Sample File: —
 Sequence File: —
 Pressure of Canister: — in Hg 830 mm Hg

Chain of Custody

#	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	M.G	<i>M.G</i>		Set up for sampling
2	JW	<i>John Maloney</i>	12/15/09 3:30pm	Lab analysis
3				

Notes: 1st dilution = Used 30 dil protocol 14.5 → 43.6 psia w/ zero N₂
2nd dilution = Used 50 cc of sample instead of 500 cc = 10 x dil
Total dilution = 30 (3x10)

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
Phone 502-852-2734

Canister ID #

2166

Circle Sample Type: 24 Hr

Grab

15 min

Sampler ID #

—

Other:

Sampling Event # and Date:

#3 - 12/15/2009

Sampling Location:

MSD - train #4

Pre-Sampling Information

Date/Time Prepared:

12/9/09 4:30 PM

By:

JW

Composite Cleaning File:

Instrument Blank File:

Pressure of Canister:

-29 in Hg

58 mm Hg

Field Data

Setup By:

M.G

Collected By:

M.G

Start Date/Time:

1:30 PM

Stop Date/Time:

1:45 PM

Initial Pressure:

in Hg

Final Pressure:

in Hg

Post-Sampling Information

Date/Time Analyzed:

By:

GC/MS Sample File:

Sequence File:

Pressure of Canister:

in Hg

820 mm Hg

Chain of Custody

#	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	M.G	<i>M. G.</i>	12/15/09	Set up for sampling
2	J.M	<i>John Metayer</i>	12/15/09 3:30 PM	Lab analysis
3				

Notes: 1st dilution = Used 3x dil protocol 14.5 → 43.6 Psia w/ zero N₂
 2nd dilution = Used 50 cc of sample instead of 500 cc = 10x dil
 Total dilution = 30 (3x10)

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 2173 Circle Sample Type: 24 Hr Natural gas
 Sampler ID # Grab 15 min
 Other:

Sampling Event # and Date: # 4 - 12/16/09
 Sampling Location: MSD - train # 4

Pre-Sampling Information
 Date/Time Prepared: 12/14/09 2:15 PM By: J
 Composite Cleaning File:
 Instrument Blank File:
 Pressure of Canister: -24 in Hg 50 mm Hg

Field Data
 Setup By: M.G. Collected By: M.G.
 Start Date/Time: 1:40 PM Stop Date/Time: 1:55 PM
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information
 Date/Time Analyzed: 1/4/10 12:26 PM By: J
 GC/MS Sample File: 0104-04.D
 Sequence File: 01042010
 Pressure of Canister: in Hg 820 mm Hg

Chain of Custody

	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	M.G.	<i>M. G. Glavin</i>	12/16/09	Set up for sampling
2	J. P.	<i>John Malachuk</i>	1/4/10	Lab analysis
3				

Notes: 1st dilution = Used 3x dil protocol 14.7 → 44.1 Psia w/zero N₂
2nd dilution = Used 50 cc of sample instead of 500 cc = 10x dil
Total dilution = 30 (3x10)

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 2172 Circle Sample Type: 24 Hr
 Sampler ID # — Grab Digester gas
 Other: 18 Min

Sampling Event # and Date: #4 - 12/16/09
 Sampling Location: MSD - tram #4

Pre-Sampling Information
 Date/Time Prepared: 12/14/09 1:15 PM By: J
 Composite Cleaning File:
 Instrument Blank File:
 Pressure of Canister: -29 in Hg 50 mm Hg

Field Data
 Setup By: MG Collected By: M.G
 Start Date/Time: 1:10 PM Stop Date/Time: 1:28 PM
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information
 Date/Time Analyzed: 1/4/10 1:13 PM By: Jr
 GC/MS Sample File: 0104-05.D
 Sequence File: 01042010
 Pressure of Canister: in Hg 830 mm Hg

Chain of Custody

#	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	M G	<i>M. G.</i>	12/16/09	Set up for sampling
2	J. Jr	<i>John Meluskey</i>	12/16/09	Lab analysis
3				

Notes: 1st dilution: Used 3x dilution protocol 14.8 → 44.4 psia w/ zero N₂
2nd dilution: Used 50 cc of sample instead of 500 cc = 10x dil
Total dilution = 30 (3x10)

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 2169 Circle Sample Type: 24 Hr
 Sampler ID # — Grab
 Other:

Natural
gas
15 min

Sampling Event # and Date: #5 - 12/17/09

Sampling Location: MSD - train #4

Pre-Sampling Information

Date/Time Prepared: 12/17/09 1 PM By: JN

Composite Cleaning File:

Instrument Blank File:

Pressure of Canister: -29 in Hg 50 mm Hg

Field Data

Setup By: M.G Collected By: M.G

Start Date/Time: 2:00 PM Stop Date/Time: 2:16 PM

Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information

Date/Time Analyzed: 01/04/10 2:01 PM By: JN

GC/MS Sample File: 0104-06.D

Sequence File: 01042010

Pressure of Canister: in Hg 800 mm Hg

Chain of Custody

	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	M.G	<i>M. G. ...</i>	12/17/09	Set up for sampling
2	JN	<i>John Metcalf</i>	12/17/09	Lab analysis
3				

Notes: 1st dilution = Used 3x dilution protocol 14.5 → 43.5 psia w/ zero N₂
 2nd dilution: Used 50 cc of sample instead of 500 cc = 10x dil
 Total dilution = 30 13x10

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
Phone 502-852-2734

Digester
gas
15 min

Canister ID # 2171 Circle Sample Type: 24 Hr
 Sampler ID # — Grab
 Other:

Sampling Event # and Date: #5 - MSD train #4 - 12/17/09
 Sampling Location: MSD train #4

Pre-Sampling Information
 Date/Time Prepared: 12/15/09 By: J.M.
 Composite Cleaning File:
 Instrument Blank File:
 Pressure of Canister: -19 in Hg 50 mm Hg

Field Data
 Setup By: M.G. 1:20 PM Collected By: M.G.
 Start Date/Time: 1:20 PM Stop Date/Time: 1:35 PM
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information
 Date/Time Analyzed: 1/4/10 2:49 PM By: J
 GC/MS Sample File: 0104-07.D
 Sequence File: 01042010
 Pressure of Canister: in Hg 00 mm Hg

Chain of Custody

	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	M.G.	<i>M.G.</i>	12/17/2009	Set up for sampling
2	J.M.	<i>J.M.</i>	12/17/09	Lab analysis
3				

Notes: 1st dilution = Used 3x dilution protocol 14.7 → 44.1 Ppm w/20% N₂
2nd dilution = used 50 cc of sample instead of 500 cc = 10x dilution
Total dilution = 30 (3x10)

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 2174 Circle Sample Type: 24 Hr Natural gas
 Sampler ID # Grab
 Other: 15 Min

Sampling Event # and Date: #6 - 12/18/09
 Sampling Location: MSD - train #4

Pre-Sampling Information
 Date/Time Prepared: 12/14/09 2:15 PM By: J
 Composite Cleaning File:
 Instrument Blank File:
 Pressure of Canister: -29 in Hg 50 mm Hg

Field Data
 Setup By: M.G Collected By: M.G
 Start Date/Time: 1:25 PM Stop Date/Time: 1:40 PM
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information
 Date/Time Analyzed: 1/4/10 3:43 PM By: J
 GC/MS Sample File: 0104-08.D
 Sequence File: 01042010
 Pressure of Canister: in Hg 500 mm Hg

Chain of Custody

	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	M.G	<i>M. G. Galt</i>	12/18/09	Set up for sampling
2	J	<i>John</i>	12/18/09	Lab analysis
3				

Notes: 1st dilution = used 3x dilution protocol 14.9 → 44.7 Psia w/ zero N₂
2nd dilution = used 50 cc of sample instead of 500 cc = 10 x dilution
Total dilution = 30 (3x10)

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 6445 Circle Sample Type: 24 Hr Pigester
 Sampler ID # gas
Grab 17min
 Other:

Sampling Event # and Date: #6 - 12/18/09
 Sampling Location: MSD - train #4

Pre-Sampling Information

Date/Time Prepared: 6/4/07 4:12pm By: J
 Composite Cleaning File: C060X-15-D
 Instrument Blank File: ✓
 Pressure of Canister: -29.1 in Hg 50 mm Hg

Field Data

Setup By: M.G Collected By: M.G
 Start Date/Time: 12:58 PM Stop Date/Time: 1:15 PM
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information

Date/Time Analyzed: 1/4/10 4:31pm By: J
 GC/MS Sample File: 0104-09.D
 Sequence File: 01042000
 Pressure of Canister: in Hg 800 mm Hg

Chain of Custody

#	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	M.G	<i>Mary G. Calhoun</i>	12/18/09	Set up for sampling
2	Jm	<i>John Maloney</i>	1/4/10	Lab analysis
3				

Notes: 1st dilution - Used 3X dil protocol 14.5 → 43.5 μ g / 200 μ l
 2nd dilution - used 50 μ l of sample instead of 100 μ l = 10X dil
 Total dilution = 30 (3X10)

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 6445 Circle Sample Type: 24 Hr **Grab**
 Sampler ID # Other: 15 min train #4
Just on natural gas today
 Sampling Event # and Date: Event 7 - 02/26/10
 Sampling Location: MSD - train #4

Pre-Sampling Information
 Date/Time Prepared: 1/19/10 11:30 AM By: J
 Composite Cleaning File: C0114-02.D
 Instrument Blank File:
 Pressure of Canister: -25 in Hg 50 mm Hg

Field Data
 Setup By: M.G Collected By: M.G
 Start Date/Time: 10:18 Stop Date/Time: 10:33
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information
 Date/Time Analyzed: 3/23/10 11:50 AM By: J
 GC/MS Sample File: 0323-04.D
 Sequence File: 0323 2010
 Pressure of Canister: in Hg 830 mm Hg 3/24/10 12:00

Chain of Custody

	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	analyzed (6/4)	analyzed (6/4)	02/26/10	Set up for sampling
2	J	J	3/1/10 12:00	Lab analysis
3				

Notes: _____

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 6437 Circle Sample Type: 24 Hr 15 min
 Sampler ID # Grab Digester
 Other: gas
 Sampling Event # and Date: #7 - 02/26/10 train # 1
 Sampling Location: MSD - train # 1

Pre-Sampling Information
 Date/Time Prepared: 1/19/10 11:30A By: J
 Composite Cleaning File: C0114-02.D
 Instrument Blank File: —
 Pressure of Canister: -29 in Hg 50 mm Hg

Field Data
 Setup By: M.G Collected By: M.G
 Start Date/Time: 10:37 Stop Date/Time: 10:52
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information
 Date/Time Analyzed: 3/23/10 12:39pm By: J
 GC/MS Sample File: 0323-05.D
 Sequence File: 03232010
 Pressure of Canister: in Hg 760 mm Hg 3/10/10
11:50A

Chain of Custody

#	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	Mahyar Chosrobanan	<i>[Signature]</i>	02/26/10	Set up for sampling
2	J	<i>[Signature]</i>	2/6/10 12:15P	Lab analysis
3				

Notes: _____

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Natural gas
 15 min

Canister ID # 6455 Circle Sample Type: 24 Hr
 Sampler ID # Grab
 Other:

Sampling Event # and Date: #8 - 03/05/10
 Sampling Location: MSD - Train #4

Pre-Sampling Information
 Date/Time Prepared: 1/19/10 11:30 AM By: J
 Composite Cleaning File: C0114-02.D
 Instrument Blank File:
 Pressure of Canister: -29 in Hg 50 mm Hg

Field Data
 Setup By: M.G Collected By: M.G
 Start Date/Time: 10:30 AM Stop Date/Time: 10:45 AM
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information
 Date/Time Analyzed: 3/23/10 1:27 PM By: J
 GC/MS Sample File: 0323-06.D
 Sequence File: 03232010
 Pressure of Canister: in Hg 830 mm Hg

*3/22/10
 12:25 PM*

Chain of Custody

#	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	<i>Wendy G. Allen</i>	<i>Wendy G. Allen</i>	03/05/10	Set up for sampling
2	<i>J</i>	<i>John Detegan</i>	3/11/10	Lab analysis
3				

Notes: _____

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 6443 Circle Sample Type: 24 Hr
Grab Digester gas
 Sampler ID # 15 min
 Other:
 Sampling Event # and Date: #8 - MSD Train # 1 - 03/05/10
 Sampling Location: MSD - Train # 1

Pre-Sampling Information
 Date/Time Prepared: 1/9/09 2:45 PM By: J
 Composite Cleaning File: C0108-14.0
 Instrument Blank File: ✓
 Pressure of Canister: -29 in Hg 50 mm Hg

Field Data
 Setup By: M.G Collected By: M.G
 Start Date/Time: 10:48 AM Stop Date/Time: 11:03
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information
 Date/Time Analyzed: 3/23/10 2:14 PM By: J
 GC/MS Sample File: 0323-07.0
 Sequence File: 03232010
 Pressure of Canister: in Hg 810 mm Hg 3/22/10 12:20 PM

Chain of Custody

#	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	Meloyar White	<i>Meloyar White</i>	03/05/10	Set up for sampling
2	J.M	<i>John Matthews</i>	3/12/10	Lab analysis
3				

Notes: _____

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 6447 Circle Sample Type: 24 Hr *natural gas*
 Sampler ID # Grab
Other:

Sampling Event # and Date: 9 - 03/12/10
 Sampling Location: MSD - Train #4

Pre-Sampling Information
 Date/Time Prepared: 1/9/09 2:45 PM By: *J*
 Composite Cleaning File: C0109-14.D
 Instrument Blank File: -
 Pressure of Canister: -24 in Hg 50 mm Hg

Field Data
 Setup By: M.G Collected By: M.G
 Start Date/Time: 10:55 AM Stop Date/Time: ~~10~~ 11:10 AM
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information
 Date/Time Analyzed: 3/23/10 3:02 PM By: *J*
 GC/MS Sample File: 0323-08.D
 Sequence File: 03232010
 Pressure of Canister: in Hg 780 mm Hg *3/24/10 12:15 PM*

Chain of Custody

	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	Mahyar Chertobian	<i>Mahyar Chertobian</i>	03/12/10	Set up for sampling
2	<i>J</i>	<i>John Melakas</i>	3/12/10	Lab analysis
3				

Notes: _____

Air Toxics Sample Chain of Custody

University of Louisville Air Quality Laboratory
 Ernst Hall room 202, Univ. of Louisville, Louisville KY 40292
 Phone 502-852-2734

Canister ID # 6449 Circle Sample Type: 24 Hr Digester
 Sampler ID # Grab gas
 Other: 15 Min

Sampling Event # and Date: #9 - 03/12/10
 Sampling Location: MSD - Train #4

Pre-Sampling Information
 Date/Time Prepared: 1/9/09 2:45P By: J
 Composite Cleaning File: C0109-14.1
 Instrument Blank File:
 Pressure of Canister: -29 in Hg 50 mm Hg

Field Data
 Setup By: M G Collected By: M G
 Start Date/Time: 10:30AM Stop Date/Time: 10:45AM
 Initial Pressure: in Hg Final Pressure: in Hg

Post-Sampling Information
 Date/Time Analyzed: 3/23/10 3:49P By: Jv
 GC/MS Sample File: 0323-09.0
 Sequence File: 03232010
 Pressure of Canister: in Hg 790 mm Hg 3/24/10 12:22P

Chain of Custody

	Recipient(Print)	Signature	Date/Time	Reason for transfer
1	Mahyar Ghabanani	<i>Mahyar Ghabanani</i>	03/12/10	Set up for sampling
2	Jv	<i>John Metropoulos</i>	3/12/10	Lab analysis
3				

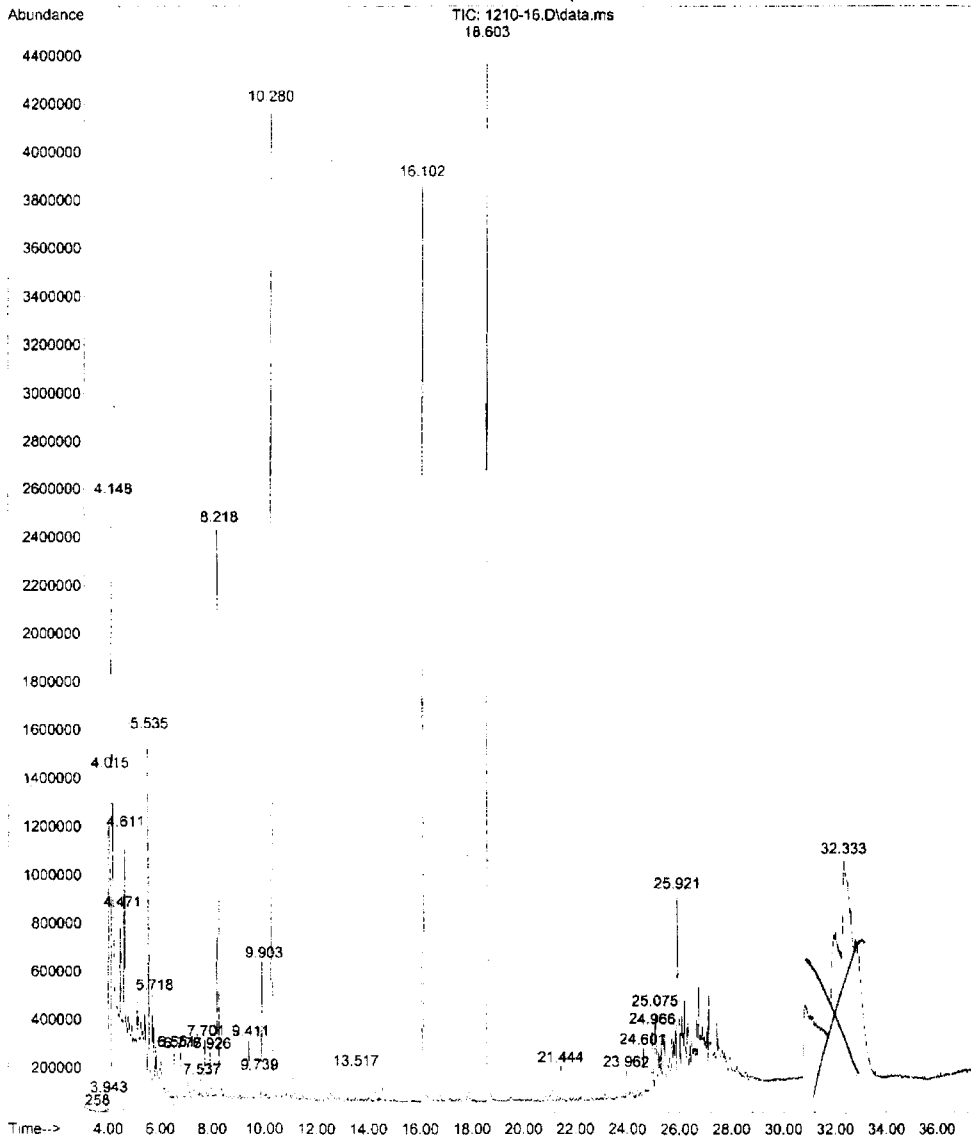
Notes: _____

APPENDIX B – CHROMATOGRAPHS AND QUANTITATION REPORTS FROM
GC/MS MEASUREMENTS

#1

File : C:\msdchem\1\DATA\12102009\Snapshot\1210-16.D
Operator : JM
Acquired : 11 Dec 2009 3:12 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name: 100cc IS, 50cc, AS15, 6458, TO15.mpt
Misc Info : MSD, Natural Gas, Train #4, 35-300amu @4.64min
Vial Number: 17

Collected 12/14/09



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\12102009\Snapshot\
 Data File : 1210-16.D
 Acq On : 11 Dec 2009 3:12 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS15,6458,TO15.mpt
 Misc : MSD,Natural Gas, Train #4, 35-300amu @4.64min
 ALS Vial : 17 Sample Multiplier: 30

Quant Time: Dec 14 10:18:22 2009
 Quant Method : C:\msdchem\1\METHODS\T015ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Fri Dec 11 10:00:41 2009
 Response via : Continuing Cal File: C:\msdchem\1\DATA\12102009\A1210-13.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.280	114	3815999	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.102	82	1731503	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.218	128	830837	4.39	ppbv	0.00
64) p-Bromofluorobenzene	18.603	174	1653193	3.89	ppbv	0.00

Target Compounds	R.T.	QIon	Response	Conc	Units	Qvalue
2) Freon 22 (Cl2F2Methane)	0.000	67	0	N.D.		
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.		
4) Chloromethane	0.000	50	0	N.D.		
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.		
6) Vinyl Chloride	0.000	62	0	N.D.		
7) 1,3- Butadiene	4.641	54	36359m	7.11	ppbv	
8) Bromomethane	0.000	94	0	N.D.		
9) Chloroethane	0.000	64	0	N.D.		
10) Acetone	5.535	58	609338m	148.63	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.		
12) Acrylonitrile	0.000	53	0	N.D.		
13) 1,1-Dichloroethene	0.000	96	0	N.D.		
14) Methylene Chloride	0.000	84	0	N.D.		
15) Methyl Acetate	0.000	43	0	N.D.		
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.		
17) Carbon Disulfide	6.551	76	153810m	6.62	ppbv	
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.		
19) 1,1-Dichloroethane	0.000	63	0	N.D.		
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.		
21) Methyl Ethyl Ketone(2-...)	7.707	43	381837	24.47	ppbv	98
22) Chloroprene(2-Cl-1,3-B...)	0.000	88	0	N.D.		
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.		
25) Hexane	0.000	57	0	N.D.		
26) Chloroform	0.000	83	0	N.D.		
27) 2,2-Dichloropropane	0.000	77	0	N.D.		
28) Dibromofluoromethane (...)	0.000	111	0	N.D.		
29) 1,2- Dichloroethane	0.000	62	0	N.D.		
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.		
31) 1,1- Dichloropropene	0.000	75	0	N.D.		
32) Benzene	9.909	78	616704	24.67	ppbv	99
33) Carbon Tetrachloride	0.000	117	0	N.D.		
34) Cyclohexane	0.000	84	0	N.D.		
35) Dibromomethane	0.000	174	0	N.D.		
36) 1,2-Dichloropropane	0.000	63	0	N.D.		
37) Ethyl Acrylate	0.000	55	0	N.D.		
38) Bromodichloromethane	0.000	83	0	N.D.		
39) Trichloroethene	0.000	132	0	N.D.		
40) Methyl Methacrylate	0.000	69	0	N.D.		
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.		
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.		
43) Methyl Cyclohexane	0.000	98	0	N.D.		
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.		

45)	1,1,2-Trichloroethane	0.000	97	0		N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0		N.D.	
47)	Toluene	13.517	91	127993		4.27 ppbv	96
48)	1,3-Dichloropropane	0.000	76	0		N.D.	
49)	Methyl Butyl Ketone(2-...	0.000	43	0		N.D.	
50)	Dibromochloromethane	0.000	129	0		N.D.	
51)	1,2- Dibromoethane	0.000	107	0		N.D.	
52)	Tetrachloroethene	0.000	166	0		N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0		N.D.	
55)	Chlorobenzene	0.000	112	0		N.D.	
56)	Ethylbenzene	0.000	91	0		N.D.	
57)	(m and /or p) Xylene	0.000	91	0		N.D.	
58)	Bromoform	0.000	173	0		N.D.	
59)	Butyl Acrylate	0.000	55	0		N.D.	
60)	Styrene	0.000	104	0		N.D.	
61)	1,1,2,2-Tetrachloroethane	0.000	83	0		N.D.	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0		N.D.	
63)	1,2,3-Trichloropropane	0.000	110	0		N.D.	
65)	Isopropylbenzene	0.000	105	0		N.D.	
66)	Bromobenzene	0.000	156	0		N.D.	
67)	o-Chlorotoluene	0.000	126	0		N.D.	
68)	n-Propylbenzene	0.000	120	0		N.D.	
69)	p-Chlorotoluene	0.000	126	0		N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0		N.D.	
71)	tert-Butylbenzene	0.000	134	0		N.D.	
72)	1,2,4-Trimethylbenzene	0.000	105	0		N.D.	
73)	1,3-Dichlorobenzene	0.000	146	0		N.D.	
74)	1,4-Dichlorobenzene	21.438	146	97498m		3.70 ppbv	
75)	sec-Butylbenzene	0.000	105	0		N.D.	
76)	p-Isopropyltoluene	0.000	119	0		N.D.	
77)	1,2-Dichlorobenzene	0.000	146	0		N.D.	
78)	n-Butylbenzene	0.000	91	0		N.D.	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0		N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0		N.D.	
81)	Naphthalene	0.000	128	0		N.D.	
82)	1,2,3-Trichlorobenzene	0.000	180	0		N.D.	
83)	Hexachlorobutadiene	0.000	225	0		N.D.	

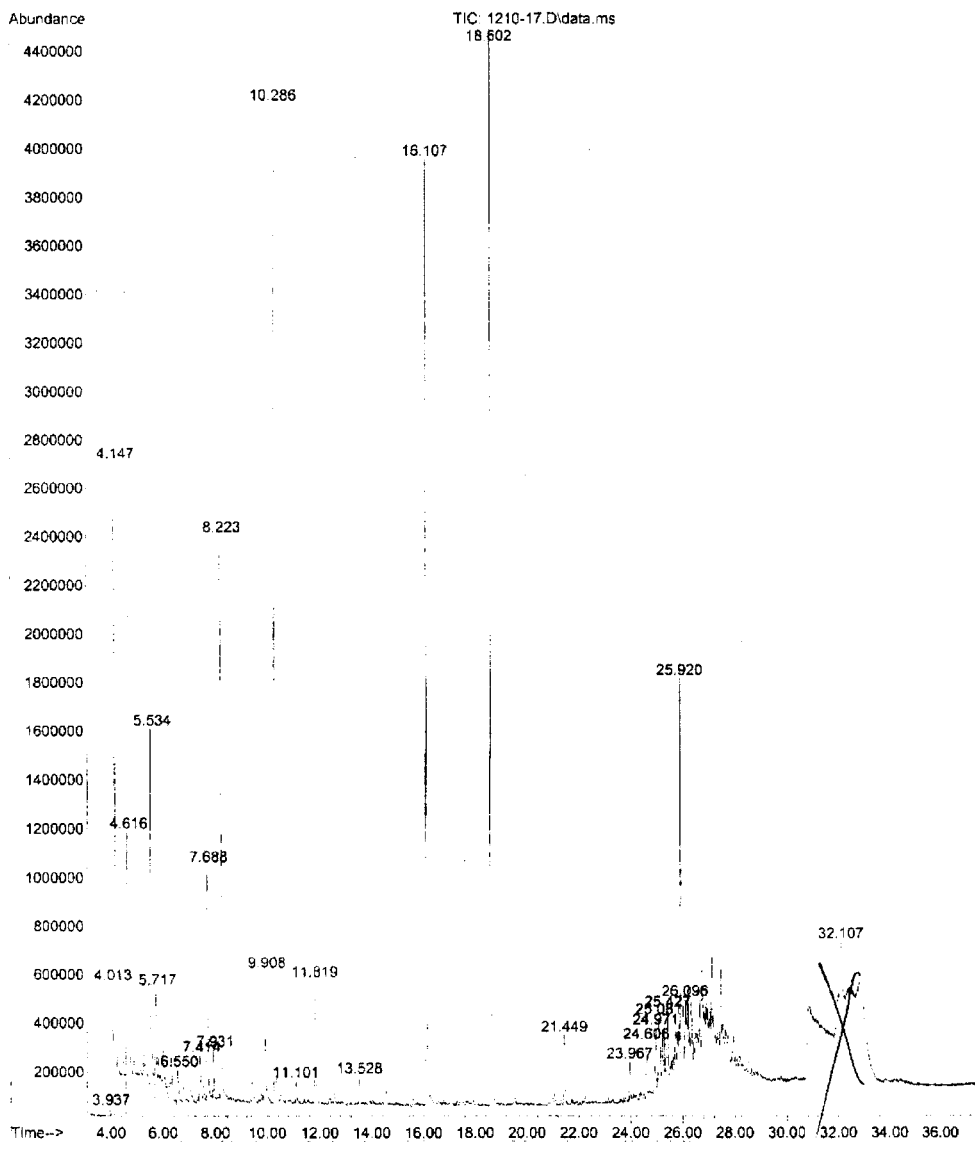
(#) = qualifier out of range (m) = manual integration (+) = signals summed

T015ppb8.M Thu Jan 07 13:45:27 2010

#1

File : C:\msdchem\1\DATA\12102009\1210-17.D
Operator : JM
Acquired : 11 Dec 2009 4:01 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name: 100cc IS, 50cc, AS16, 6455, TO15.mpt
Misc Info : MSD, Digestor Gas, Train #4 35-300amu @4.64min
Vial Number: 18

Collected 12/4/09



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\12102009\
 Data File : 1210-17.D
 Acq On : 11 Dec 2009 4:01 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS16,6455,TO15.mpt
 Misc : MSD,Digester Gas,Train #4 35-300amu @4.64min
 ALS Vial : 18 Sample Multiplier: 30

Quant Time: Jan 07 13:11:22 2010
 Quant Method : C:\msdchem\1\METHODS\T015ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Fri Dec 11 10:00:41 2009
 Response via : Continuing Cal File: C:\msdchem\1\DATA\12102009\A1210-13.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.286	114	3836463	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.107	82	1749266	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.223	128	846786	4.45	ppbv	0.00
64) p-Bromofluorobenzene	18.608	174	1693281	3.94	ppbv	0.00

Target Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)	Qvalue
2) Freon 22 (CLF2Methane)	0.000	67	0	N.D.			
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D. d			
4) Chloromethane	4.354	50	22452	4.28	ppbv		95
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.			
6) Vinyl Chloride	0.000	62	0	N.D.			
7) 1,3- Butadiene	4.640	54	192462m	37.45	ppbv		
8) Bromomethane	0.000	94	0	N.D.			
9) Chloroethane	0.000	64	0	N.D.			
10) Acetone	5.528	58	607853	147.48	ppbv		95
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.			
12) Acrylonitrile	0.000	53	0	N.D. d			
13) 1,1-Dichloroethene	0.000	96	0	N.D.			
14) Methylene Chloride	0.000	84	0	N.D. d			
15) Methyl Acetate	0.000	43	0	N.D. d			
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.			
17) Carbon Disulfide	6.550	76	100479m	4.30	ppbv		
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.			
19) 1,1-Dichloroethane	0.000	63	0	N.D.			
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.			
21) Methyl Ethyl Ketone(2-...)	7.688	43	1602835	102.18	ppbv		100
22) Chloroprene(2-Cl-1,3-B...)	0.000	88	0	N.D.			
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.			
25) Hexane	0.000	57	0	N.D.			
26) Chloroform	0.000	83	0	N.D. d			
27) 2,2-Dichloropropane	0.000	77	0	N.D.			
28) Dibromofluoromethane (...)	0.000	111	0	N.D.			
29) 1,2- Dichloroethane	0.000	62	0	N.D.			
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.			
31) 1,1- Dichloropropene	0.000	75	0	N.D.			
32) Benzene	9.908	78	598726	23.82	ppbv		99
33) Carbon Tetrachloride	0.000	117	0	N.D.			
34) Cyclohexane	0.000	84	0	N.D. d			
35) Dibromomethane	0.000	174	0	N.D.			
36) 1,2-Dichloropropane	0.000	63	0	N.D.			
37) Ethyl Acrylate	0.000	55	0	N.D.			
38) Bromodichloromethane	0.000	83	0	N.D.			
39) Trichloroethene	0.000	132	0	N.D.			
40) Methyl Methacrylate	0.000	69	0	N.D.			
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.			
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.			
43) Methyl Cyclohexane	0.000	98	0	N.D.			
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.			

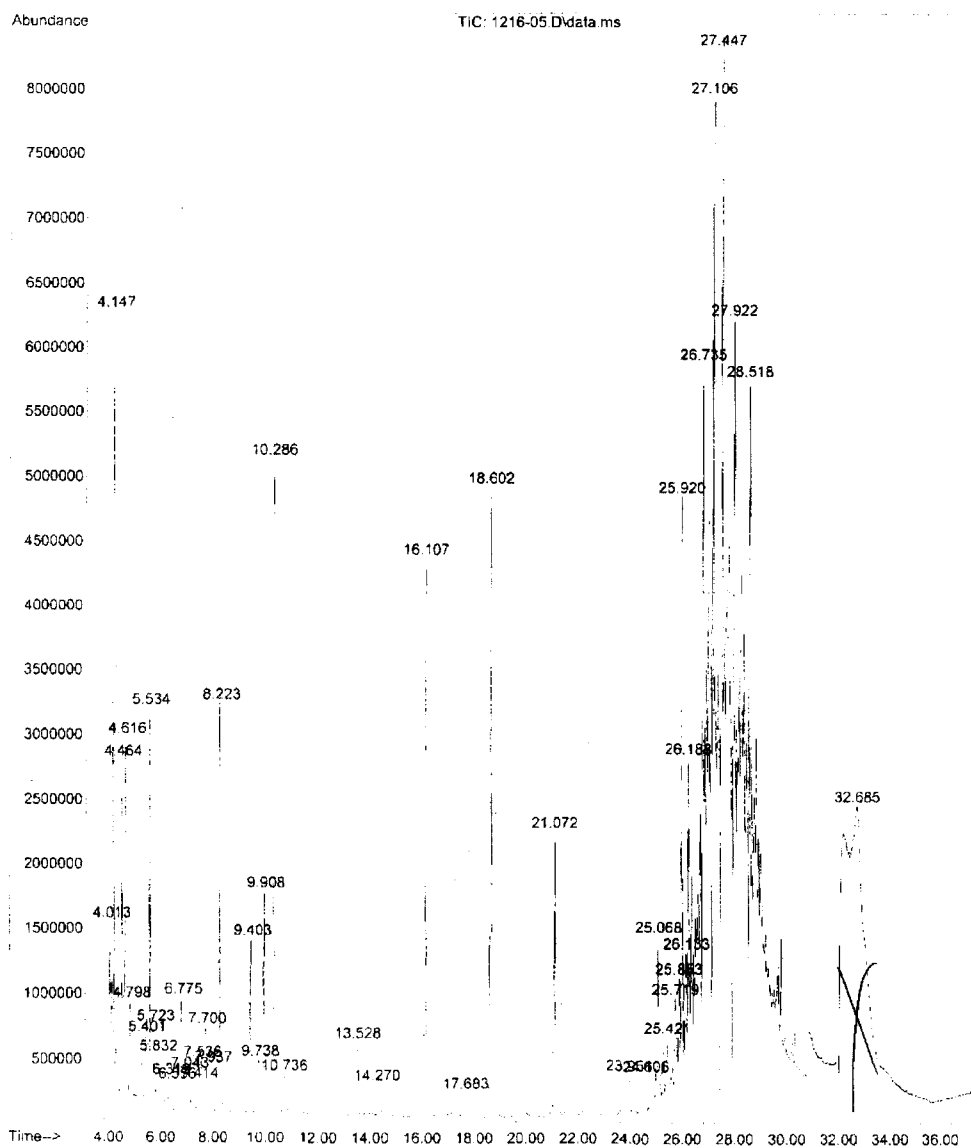
45) 1,1,2-Trichloroethane	0.000	97	0	N.D.	
46) Toluene-d8 (SMC)	0.000	98	0	N.D.	
47) Toluene	13.528	91	118820	3.94 ppbv	96
48) 1,3-Dichloropropane	0.000	76	0	N.D.	
49) Methyl Butyl Ketone(2-...	0.000	43	0	N.D. d	
50) Dibromochloromethane	0.000	129	0	N.D.	
51) 1,2- Dibromoethane	0.000	107	0	N.D.	
52) Tetrachloroethene	0.000	166	0	N.D.	
54) 1,1,1,2 - Tetrachloroe...	0.000	131	0	N.D.	
55) Chlorobenzene	0.000	112	0	N.D.	
56) Ethylbenzene	0.000	91	0	N.D. d	
57) (m and /or p) Xylene	0.000	91	0	N.D. d	
58) Bromoform	0.000	173	0	N.D.	
59) Butyl Acrylate	0.000	55	0	N.D. d	
60) Styrene	0.000	104	0	N.D. d	
61) 1,1,2,2-Tetrachloroethane	0.000	83	0	N.D.	
62) o-Xylene (1,2-Dimethyl...	0.000	91	0	N.D. d	
63) 1,2,3-Trichloropropane	0.000	110	0	N.D.	
65) Isopropylbenzene	0.000	105	0	N.D.	
66) Bromobenzene	0.000	156	0	N.D.	
67) o-Chlorotoluene	0.000	126	0	N.D.	
68) n-Propylbenzene	0.000	120	0	N.D.	
69) p-Chlorotoluene	0.000	126	0	N.D.	
70) 1,3,5-Trimethylbenzene	0.000	105	0	N.D.	
71) tert-Butylbenzene	0.000	134	0	N.D.	
72) 1,2,4-Trimethylbenzene	0.000	105	0	N.D.	
73) 1,3-Dichlorobenzene	0.000	146	0	N.D.	
74) 1,4-Dichlorobenzene	21.449	146	196139	7.37 ppbv	98
75) sec-Butylbenzene	0.000	105	0	N.D.	
76) p-Isopropyltoluene	0.000	119	0	N.D. d	
77) 1,2-Dichlorobenzene	0.000	146	0	N.D.	
78) n-Butylbenzene	0.000	91	0	N.D.	
79) 1,2-Dibromo-3-chloropr...	0.000	157	0	N.D.	
80) 1,2,4-Trichlorobenzene	0.000	180	0	N.D.	
81) Naphthalene	0.000	128	0	N.D. d	
82) 1,2,3-Trichlorobenzene	0.000	180	0	N.D. d	
83) Hexachlorobutadiene	0.000	225	0	N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

T015ppb8.M Thu Jan 07 13:11:57 2010

#2

File : C:\msdchem\1\DATA\12162009\1216-05.D
Operator : JM
Acquired : 16 Dec 2009 1:11 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name : 100cc IS, 50cc, AS15, 2167, TO15.mpt
Misc Info : MSD, NatGas, 121409, Train #4, 35-300amu @4.64mi
Vial Number: 5



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\12162009\
 Data File : 1216-05.D
 Acq On : 16 Dec 2009 1:11 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS15,2167,TO15.mpt
 Misc : MSD,NatGas,121409, Train #4,35-300amu @4.64mi
 ALS Vial : 5 Sample Multiplier: 30

Quant Time: Jan 07 11:10:32 2010
 Quant Method : C:\msdchem\1\METHODS\T015ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Mon Jan 04 13:09:57 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\12162009\A1216-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.286	114	5259120	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.107	82	2010843	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.223	128	1198926	4.36	ppbv	0.00
64) p-Bromofluorobenzene	18.602	174	2009652	4.21	ppbv	0.00

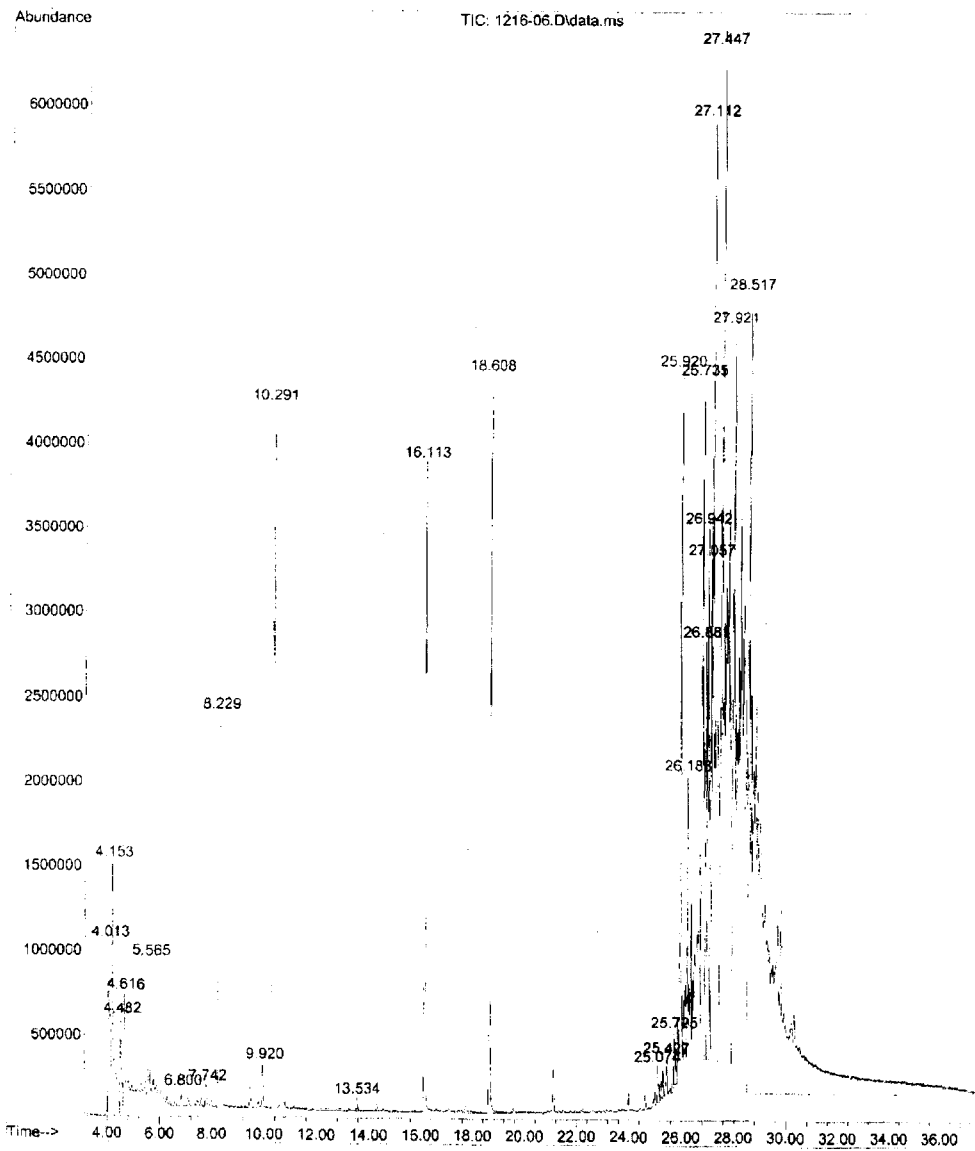
Target Compounds	R.T.	QIon	Response	Conc	Units	Qvalue
2) Freon 22 (CLF2Methane)	0.000	67	0	N.D.	d	
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.	d	
4) Chloromethane	4.348	50	41230	5.18	ppbv	93
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.	d	
6) Vinyl Chloride	0.000	62	0	N.D.	d	
7) 1,3- Butadiene	4.646	54	365455m	48.21	ppbv	
8) Bromomethane	0.000	94	0	N.D.	d	
9) Chloroethane	0.000	64	0	N.D.	d	
10) Acetone	5.534	58	1615537m	274.95	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.	d	
12) Acrylonitrile	0.000	53	0	N.D.	d	
13) 1,1-Dichloroethene	0.000	96	0	N.D.	d	
14) Methylene Chloride	6.246	84	42726	3.41	ppbv	94
15) Methyl Acetate	0.000	43	0	N.D.	d	
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.	d	
17) Carbon Disulfide	6.556	76	198017m	5.65	ppbv	
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.	d	
19) 1,1-Dichloroethane	0.000	63	0	N.D.	d	
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.	d	
21) Methyl Ethyl Ketone(2-...	7.700	43	1149427	50.86	ppbv	98
22) Chloroprene(2-Cl-1,3-B...	0.000	88	0	N.D.	d	
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.	d	
25) Hexane	0.000	57	0	N.D.	d	
26) Chloroform	0.000	83	0	N.D.	d	
27) 2,2-Dichloropropane	0.000	77	0	N.D.	d	
28) Dibromofluoromethane (...)	0.000	111	0	N.D.	d	
29) 1,2- Dichloroethane	0.000	62	0	N.D.	d	
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.	d	
31) 1,1- Dichloropropene	0.000	75	0	N.D.	d	
32) Benzene	9.908	78	1990146	55.06	ppbv	100
33) Carbon Tetrachloride	0.000	117	0	N.D.	d	
34) Cyclohexane	0.000	84	0	N.D.	d	
35) Dibromomethane	0.000	174	0	N.D.	d	
36) 1,2-Dichloropropane	0.000	63	0	N.D.	d	
37) Ethyl Acrylate	0.000	55	0	N.D.	d	
38) Bromodichloromethane	0.000	83	0	N.D.	d	
39) Trichloroethene	0.000	132	0	N.D.	d	
40) Methyl Methacrylate	0.000	69	0	N.D.	d	
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.	d	
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.	d	
43) Methyl Cyclohexane	0.000	98	0	N.D.	d	
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.	d	

45)	1,1,2-Trichloroethane	0.000	97	0		N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0		N.D.	
47)	Toluene	13.522	91	574081	13.84	ppbv	98
48)	1,3-Dichloropropane	0.000	76	0		N.D. d	
49)	Methyl Butyl Ketone(2-...	0.000	43	0		N.D. d	
50)	Dibromochloromethane	0.000	129	0		N.D. d	
51)	1,2- Dibromoethane	0.000	107	0		N.D.	
52)	Tetrachloroethene	0.000	166	0		N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0		N.D. d	
55)	Chlorobenzene	0.000	112	0		N.D. d	
56)	Ethylbenzene	0.000	91	0		N.D. d	
57)	(m and /or p) Xylene	17.044	91	81810	2.26	ppbv	95
58)	Bromoform	0.000	173	0		N.D. d	
59)	Butyl Acrylate	0.000	55	0		N.D. d	
60)	Styrene	0.000	104	0		N.D. d	
61)	1,1,2,2-Tetrachloroethane	0.000	83	0		N.D. d	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0		N.D. d	
63)	1,2,3-Trichloropropane	0.000	110	0		N.D.	
65)	Isopropylbenzene	0.000	105	0		N.D. d	
66)	Bromobenzene	0.000	156	0		N.D.	
67)	o-Chlorotoluene	0.000	126	0		N.D.	
68)	n-Propylbenzene	0.000	120	0		N.D.	
69)	p-Chlorotoluene	0.000	126	0		N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0		N.D. d	
71)	tert-Butylbenzene	0.000	134	0		N.D. d	
72)	1,2,4-Trimethylbenzene	0.000	105	0		N.D. d	
73)	1,3-Dichlorobenzene	0.000	146	0		N.D. d	
74)	1,4-Dichlorobenzene	0.000	146	0		N.D. d	
75)	sec-Butylbenzene	0.000	105	0		N.D. d	
76)	p-Isopropyltoluene	0.000	119	0		N.D. d	
77)	1,2-Dichlorobenzene	0.000	146	0		N.D. d	
78)	n-Butylbenzene	0.000	91	0		N.D. d	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0		N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0		N.D. d	
81)	Naphthalene	25.744	128	161937	5.98	ppbv	97
82)	1,2,3-Trichlorobenzene	0.000	180	0		N.D. d	
83)	Hexachlorobutadiene	0.000	225	0		N.D. d	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

T015ppb8.M Thu Jan 07 11:10:39 2010

File : C:\msdchem\1\DATA\12162009\1216-06.D #2
Operator : JM
Acquired : 16 Dec 2009 1:59 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name: 100cc IS, 50cc, AS16, 2168, TO15.mpt
Misc Info : MSD, Dig Gas, 121409, Train #4, 35-300amu @4.64mi
Vial Number: 6



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\12162009\
 Data File : 1216-06.D
 Acq On : 16 Dec 2009 1:59 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS16,2168,TO15.mpt
 Misc : MSD,Dig Gas,121409,Train #4,35-300amu @4.64mi
 ALS Vial : 6 Sample Multiplier: 30

Quant Time: Jan 07 11:00:02 2010
 Quant Method : C:\msdchem\1\METHODS\TO15ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Fri Dec 11 10:00:41 2009
 Response via : Continuing Cal File: C:\msdchem\1\DATA\12162009\A1216-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.291	114	4037904	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.113	82	1714366	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.229	128	877811	4.38	ppbv	0.00
64) p-Bromofluorobenzene	18.608	174	1656759	3.93	ppbv	0.00

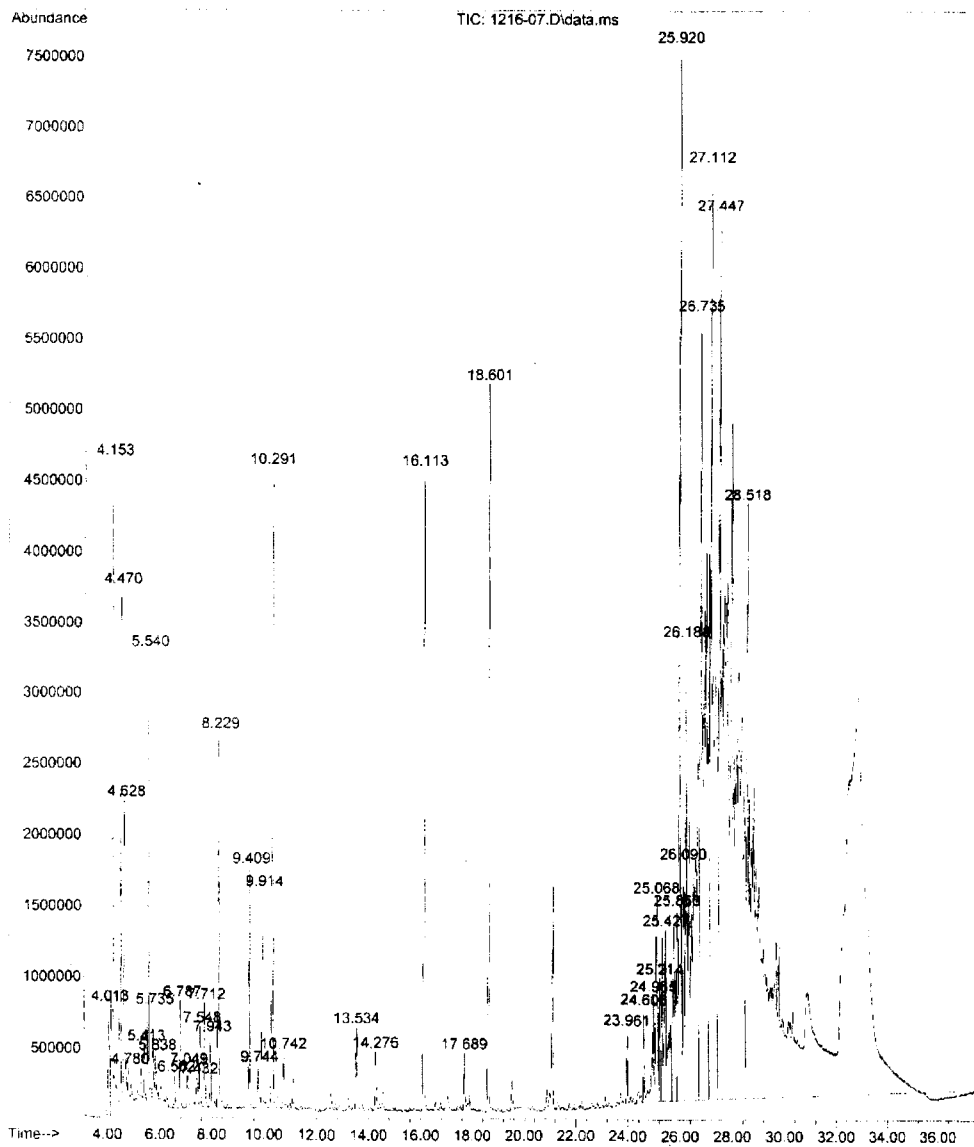
Target Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)	Qvalue
2) Freon 22 (CLF2Methane)	0.000	67	0	N.D.	d		
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.	d		
4) Chloromethane	0.000	50	0	N.D.	d		
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.			
6) Vinyl Chloride	0.000	62	0	N.D.			
7) 1,3- Butadiene	4.646	54	53185m	9.83	ppbv		
8) Bromomethane	0.000	94	0	N.D.			
9) Chloroethane	0.000	64	0	N.D.			
10) Acetone	5.565	58	388430m	89.54	ppbv		
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.			
12) Acrylonitrile	0.000	53	0	N.D.	d		
13) 1,1-Dichloroethene	0.000	96	0	N.D.			
14) Methylene Chloride	6.258	84	27736m	3.23	ppbv		
15) Methyl Acetate	0.000	43	0	N.D.			
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.			
17) Carbon Disulfide	6.562	76	43228m	1.76	ppbv		
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.			
19) 1,1-Dichloroethane	0.000	63	0	N.D.			
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.			
21) Methyl Ethyl Ketone(2-...	7.742	43	253392	15.35	ppbv		98
22) Chloroprene(2-Cl-1,3-B...	0.000	88	0	N.D.			
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.			
25) Hexane	0.000	57	0	N.D.			
26) Chloroform	0.000	83	0	N.D.	d		
27) 2,2-Dichloropropane	0.000	77	0	N.D.			
28) Dibromofluoromethane (...)	0.000	111	0	N.D.			
29) 1,2- Dichloroethane	0.000	62	0	N.D.			
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.			
31) 1,1- Dichloropropene	0.000	75	0	N.D.			
32) Benzene	9.914	78	321165	12.14	ppbv		98
33) Carbon Tetrachloride	0.000	117	0	N.D.			
34) Cyclohexane	0.000	84	0	N.D.	d		
35) Dibromomethane	0.000	174	0	N.D.			
36) 1,2-Dichloropropane	0.000	63	0	N.D.			
37) Ethyl Acrylate	0.000	55	0	N.D.			
38) Bromodichloromethane	0.000	83	0	N.D.			
39) Trichloroethene	0.000	132	0	N.D.			
40) Methyl Methacrylate	0.000	69	0	N.D.			
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.			
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.			
43) Methyl Cyclohexane	0.000	98	0	N.D.			
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.			

45)	1,1,2-Trichloroethane	0.000	97	0	N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0	N.D.	
47)	Toluene	13.534	91	85598	2.70 ppbv	99
48)	1,3-Dichloropropane	0.000	76	0	N.D.	
49)	Methyl Butyl Ketone(2-...	0.000	43	0	N.D. d	
50)	Dibromochloromethane	0.000	129	0	N.D.	
51)	1,2- Dibromoethane	0.000	107	0	N.D.	
52)	Tetrachloroethene	0.000	166	0	N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0	N.D.	
55)	Chlorobenzene	0.000	112	0	N.D. d	
56)	Ethylbenzene	0.000	91	0	N.D. d	
57)	(m and /or p) Xylene	0.000	91	0	N.D. d	
58)	Bromoform	0.000	173	0	N.D.	
59)	Butyl Acrylate	0.000	55	0	N.D. d	
60)	Styrene	0.000	104	0	N.D. d	
61)	1,1,2,2-Tetrachloroethane	0.000	83	0	N.D.	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0	N.D. d	
63)	1,2,3-Trichloropropane	0.000	110	0	N.D.	
65)	Isopropylbenzene	0.000	105	0	N.D.	
66)	Bromobenzene	0.000	156	0	N.D.	
67)	o-Chlorotoluene	0.000	126	0	N.D.	
68)	n-Propylbenzene	0.000	120	0	N.D.	
69)	p-Chlorotoluene	0.000	126	0	N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0	N.D.	
71)	tert-Butylbenzene	0.000	134	0	N.D.	
72)	1,2,4-Trimethylbenzene	0.000	105	0	N.D. d	
73)	1,3-Dichlorobenzene	0.000	146	0	N.D.	
74)	1,4-Dichlorobenzene	0.000	146	0	N.D. d	
75)	sec-Butylbenzene	0.000	105	0	N.D.	
76)	p-Isopropyltoluene	0.000	119	0	N.D. d	
77)	1,2-Dichlorobenzene	0.000	146	0	N.D.	
78)	n-Butylbenzene	0.000	91	0	N.D. d	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0	N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0	N.D.	
81)	Naphthalene	25.743	128	86520	2.24 ppbv	92
82)	1,2,3-Trichlorobenzene	0.000	180	0	N.D. d	
83)	Hexachlorobutadiene	0.000	225	0	N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

T015ppb8.M Thu Jan 07 11:00:11 2010

File : C:\msdchem\1\DATA\12162009\1216-07.D
Operator : JM
Acquired : 16 Dec 2009 2:55 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name: 100cc IS, 50cc, AS15, 2165, TO15.mpt
Misc Info : MSD, NatGas, 121509, Train #4, 35-300amu @4.64mi
Vial Number: 7



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\12162009\
 Data File : 1216-07.D
 Acq On : 16 Dec 2009 2:55 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS15,2165,T015.mpt
 Misc : MSD,NatGas.121509, Train #4,35-300amu @4.64mi
 ALS Vial : 7 Sample Multiplier: 30

Quant Time: Jan 07 10:49:10 2010
 Quant Method : C:\msdchem\1\METHODS\T015ppb8.M
 Quant Title : T014/T015 Volatile Compounds
 QLast Update : Fri Dec 11 10:00:41 2009
 Response via : Continuing Cal File: C:\msdchem\1\DATA\12162009\A1216-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.298	114	4579337	4.12	ppbv	0.01
53) Chlorobenzene-d5	16.113	82	2109400	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.235	128	963705	4.24	ppbv	0.01
64) p-Bromofluorobenzene	18.601	174	2102353	4.06	ppbv	0.00

Target Compounds	R.T.	QIon	Response	Conc	Units	Qvalue
2) Freon 22 (ClF2Methane)	0.000	67	0	N.D.	d	
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.	d	
4) Chloromethane	4.360	50	49669	7.93	ppbv	96
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.	d	
6) Vinyl Chloride	0.000	62	0	N.D.	d	
7) 1,3- Butadiene	4.658	54	278833m	45.46	ppbv	
8) Bromomethane	0.000	94	0	N.D.	d	
9) Chloroethane	0.000	64	0	N.D.	d	
10) Acetone	5.540	58	1742866m	354.26	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.	d	
12) Acrylonitrile	0.000	53	0	N.D.	d	
13) 1,1-Dichloroethene	0.000	96	0	N.D.	d	
14) Methylene Chloride	6.258	84	31089	3.19	ppbv	93
15) Methyl Acetate	0.000	43	0	N.D.	d	
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.	d	
17) Carbon Disulfide	6.562	76	190349	6.82	ppbv	98
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.	d	
19) 1,1-Dichloroethane	0.000	63	0	N.D.	d	
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.	d	
21) Methyl Ethyl Ketone(2-...)	7.712	43	1292433	69.03	ppbv	96
22) Chloroprene(2-Cl-1,3-B...	0.000	88	0	N.D.	d	
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.	d	
25) Hexane	0.000	57	0	N.D.	d	
26) Chloroform	0.000	83	0	N.D.	d	
27) 2,2-Dichloropropane	0.000	77	0	N.D.	d	
28) Dibromofluoromethane (...)	0.000	111	0	N.D.	d	
29) 1,2- Dichloroethane	0.000	62	0	N.D.	d	
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.	d	
31) 1,1- Dichloropropene	0.000	75	0	N.D.	d	
32) Benzene	9.920	78	1771934	59.07	ppbv	99
33) Carbon Tetrachloride	0.000	117	0	N.D.	d	
34) Cyclohexane	0.000	84	0	N.D.	d	
35) Dibromomethane	0.000	174	0	N.D.	d	
36) 1,2-Dichloropropane	0.000	63	0	N.D.	d	
37) Ethyl Acrylate	0.000	55	0	N.D.	d	
38) Bromodichloromethane	0.000	83	0	N.D.	d	
39) Trichloroethene	0.000	132	0	N.D.	d	
40) Methyl Methacrylate	0.000	69	0	N.D.	d	
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.	d	
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.	d	
43) Methyl Cyclohexane	0.000	98	0	N.D.	d	
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.	d	

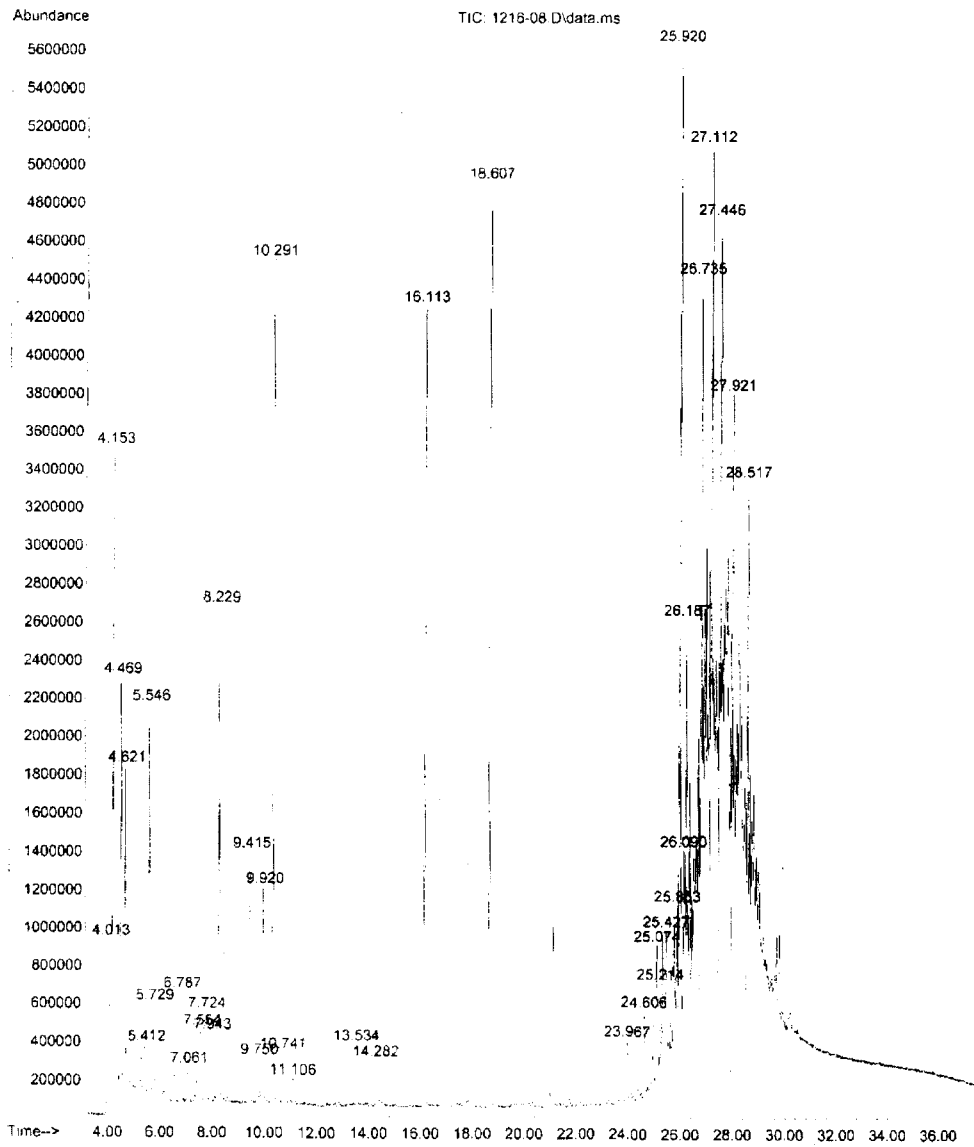
45)	1,1,2-Trichloroethane	0.000	97	0	N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0	N.D.	
47)	Toluene	13.534	91	569724	15.83 ppbv	99
48)	1,3-Dichloropropane	0.000	76	0	N.D. d	
49)	Methyl Butyl Ketone(2-...	14.033	43	36458m	1.96 ppbv	
50)	Dibromochloromethane	0.000	129	0	N.D. d	
51)	1,2- Dibromoethane	0.000	107	0	N.D. d	
52)	Tetrachloroethene	0.000	166	0	N.D. d	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0	N.D. d	
55)	Chlorobenzene	16.180	112	36260m	1.20 ppbv	
56)	Ethylbenzene	0.000	91	0	N.D. d	
57)	(m and /or p) Xylene	17.044	91	78573m	2.13 ppbv	
58)	Bromoform	0.000	173	0	N.D. d	
59)	Butyl Acrylate	0.000	55	0	N.D. d	
60)	Styrene	17.665	104	49622m	1.74 ppbv	
61)	1,1,2,2-Tetrachloroethane	0.000	83	0	N.D. d	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0	N.D. d	
63)	1,2,3-Trichloropropane	0.000	110	0	N.D.	
65)	Isopropylbenzene	0.000	105	0	N.D. d	
66)	Bromobenzene	0.000	156	0	N.D.	
67)	o-Chlorotoluene	0.000	126	0	N.D.	
68)	n-Propylbenzene	0.000	120	0	N.D.	
69)	p-Chlorotoluene	0.000	126	0	N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0	N.D. d	
71)	tert-Butylbenzene	0.000	134	0	N.D. d	
72)	1,2,4-Trimethylbenzene	0.000	105	0	N.D. d	
73)	1,3-Dichlorobenzene	0.000	146	0	N.D. d	
74)	1,4-Dichlorobenzene	0.000	146	0	N.D. d	
75)	sec-Butylbenzene	0.000	105	0	N.D. d	
76)	p-Isopropyltoluene	0.000	119	0	N.D. d	
77)	1,2-Dichlorobenzene	0.000	146	0	N.D. d	
78)	n-Butylbenzene	0.000	91	0	N.D. d	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0	N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0	N.D. d	
81)	Naphthalene	25.743	128	196811	4.15 ppbv	100
82)	1,2,3-Trichlorobenzene	0.000	180	0	N.D. d	
83)	Hexachlorobutadiene	0.000	225	0	N.D. d	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

T015ppb8.M Thu Jan 07 10:49:21 2010

3

File : C:\msdchem\1\DATA\12162009\1216-08.D
Operator : JM
Acquired : 16 Dec 2009 3:43 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name: 100cc IS, 50cc, AS16, 2166, TO15.mpt
Misc Info : MSD, Dig Gas, 121509, Train #4, 35-300amu @4.64mi
Vial Number: 8



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\12162009\
 Data File : 1216-08.D
 Acq On : 16 Dec 2009 3:43 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS16,2166,TO15.mpt
 Misc : MSD,Dig Gas,121509,Train #4,35-300amu @4.64mi
 ALS Vial : 8 Sample Multiplier: 30

Quant Time: Jan 07 10:33:31 2010
 Quant Method : C:\msdchem\1\METHODS\T015ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Mon Jan 04 13:09:57 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\12162009\A1216-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.291	114	4374419	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.113	82	1900218	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.229	128	947808	4.14	ppbv	0.00
64) p-Bromofluorobenzene	18.607	174	1923446	4.26	ppbv	0.00

Target Compounds	R.T.	QIon	Response	Conc	Units	Qvalue
2) Freon 22 (CLF2Methane)	0.000	67	0	N.D.		
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D. d		
4) Chloromethane	4.360	50	44707	6.76	ppbv	99
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.		
6) Vinyl Chloride	0.000	62	0	N.D.		
7) 1,3- Butadiene	4.652	54	229639m	36.42	ppbv	
8) Bromomethane	0.000	94	0	N.D.		
9) Chloroethane	0.000	64	0	N.D.		
10) Acetone	5.546	58	1125526m	230.30	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.		
12) Acrylonitrile	0.000	53	0	N.D. d		
13) 1,1-Dichloroethene	0.000	96	0	N.D.		
14) Methylene Chloride	6.264	84	29253	2.80	ppbv	94
15) Methyl Acetate	0.000	43	0	N.D.		
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.		
17) Carbon Disulfide	6.562	76	154094	5.28	ppbv	99
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.		
19) 1,1-Dichloroethane	0.000	63	0	N.D.		
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D. d		
21) Methyl Ethyl Ketone(2-...	7.724	43	854327	45.45	ppbv	100
22) Chloroprene(2-Cl-1,3-B...	0.000	88	0	N.D.		
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.		
25) Hexane	0.000	57	0	N.D. d		
26) Chloroform	0.000	83	0	N.D. d		
27) 2,2-Dichloropropane	0.000	77	0	N.D.		
28) Dibromofluoromethane (...)	0.000	111	0	N.D.		
29) 1,2- Dichloroethane	0.000	62	0	N.D.		
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.		
31) 1,1- Dichloropropene	0.000	75	0	N.D.		
32) Benzene	9.920	78	1307169	43.48	ppbv	100
33) Carbon Tetrachloride	0.000	117	0	N.D.		
34) Cyclohexane	0.000	84	0	N.D. d		
35) Dibromomethane	0.000	174	0	N.D.		
36) 1,2-Dichloropropane	0.000	63	0	N.D.		
37) Ethyl Acrylate	0.000	55	0	N.D.		
38) Bromodichloromethane	0.000	83	0	N.D.		
39) Trichloroethene	0.000	132	0	N.D.		
40) Methyl Methacrylate	0.000	69	0	N.D.		
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.		
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.		
43) Methyl Cyclohexane	0.000	98	0	N.D.		
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.		

45)	1,1,2-Trichloroethane	0.000	97	0		N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0		N.D.	
47)	Toluene	13.534	91	308845		8.95 ppbv	98
48)	1,3-Dichloropropane	0.000	76	0		N.D.	
49)	Methyl Butyl Ketone(2-...	14.045	43	27600		1.73 ppbv	81
50)	Dibromochloromethane	0.000	129	0		N.D.	
51)	1,2- Dibromoethane	0.000	107	0		N.D.	
52)	Tetrachloroethene	0.000	166	0		N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0		N.D.	
55)	Chlorobenzene	0.000	112	0		N.D. d	
56)	Ethylbenzene	0.000	91	0		N.D. d	
57)	(m and /or p) Xylene	0.000	91	0		N.D. d	
58)	Bromoform	0.000	173	0		N.D.	
59)	Butyl Acrylate	0.000	55	0		N.D. d	
60)	Styrene	0.000	104	0		N.D. d	
61)	1,1,2,2-Tetrachloroethane	0.000	83	0		N.D.	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0		N.D. d	
63)	1,2,3-Trichloropropane	0.000	110	0		N.D.	
65)	Isopropylbenzene	0.000	105	0		N.D. d	
66)	Bromobenzene	0.000	156	0		N.D.	
67)	o-Chlorotoluene	0.000	126	0		N.D.	
68)	n-Propylbenzene	0.000	120	0		N.D.	
69)	p-Chlorotoluene	0.000	126	0		N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0		N.D. d	
71)	tert-Butylbenzene	0.000	134	0		N.D. d	
72)	1,2,4-Trimethylbenzene	0.000	105	0		N.D. d	
73)	1,3-Dichlorobenzene	0.000	146	0		N.D.	
74)	1,4-Dichlorobenzene	0.000	146	0		N.D. d	
75)	sec-Butylbenzene	0.000	105	0		N.D.	
76)	p-Isopropyltoluene	0.000	119	0		N.D. d	
77)	1,2-Dichlorobenzene	0.000	146	0		N.D.	
78)	n-Butylbenzene	0.000	91	0		N.D. d	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0		N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0		N.D. d	
81)	Naphthalene	25.743	128	113058		4.42 ppbv	97
82)	1,2,3-Trichlorobenzene	0.000	180	0		N.D. d	
83)	Hexachlorobutadiene	0.000	225	0		N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

T015ppb8.M Thu Jan 07 10:33:41 2010

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\01042010\
 Data File : 0104-04.D
 Acq On : 4 Jan 2010 12:26 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS15,2173,TO15.mpt
 Misc : MSD,NatGas,121609, Train #4,35-300amu @4.64mi
 ALS Vial : 4 Sample Multiplier: 30

Quant Time: Jan 07 12:06:12 2010
 Quant Method : C:\msdchem\1\METHODS\TO15ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Thu Jan 07 11:31:33 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\01042010\A0104-02.D

Internal Standards	R.T.	QIOn	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.274	114	3565232	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.096	82	1606249	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIOn	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.212	128	790913	4.10	ppbv	0.00
64) p-Bromofluorobenzene	18.596	174	1481470	4.05	ppbv	0.00

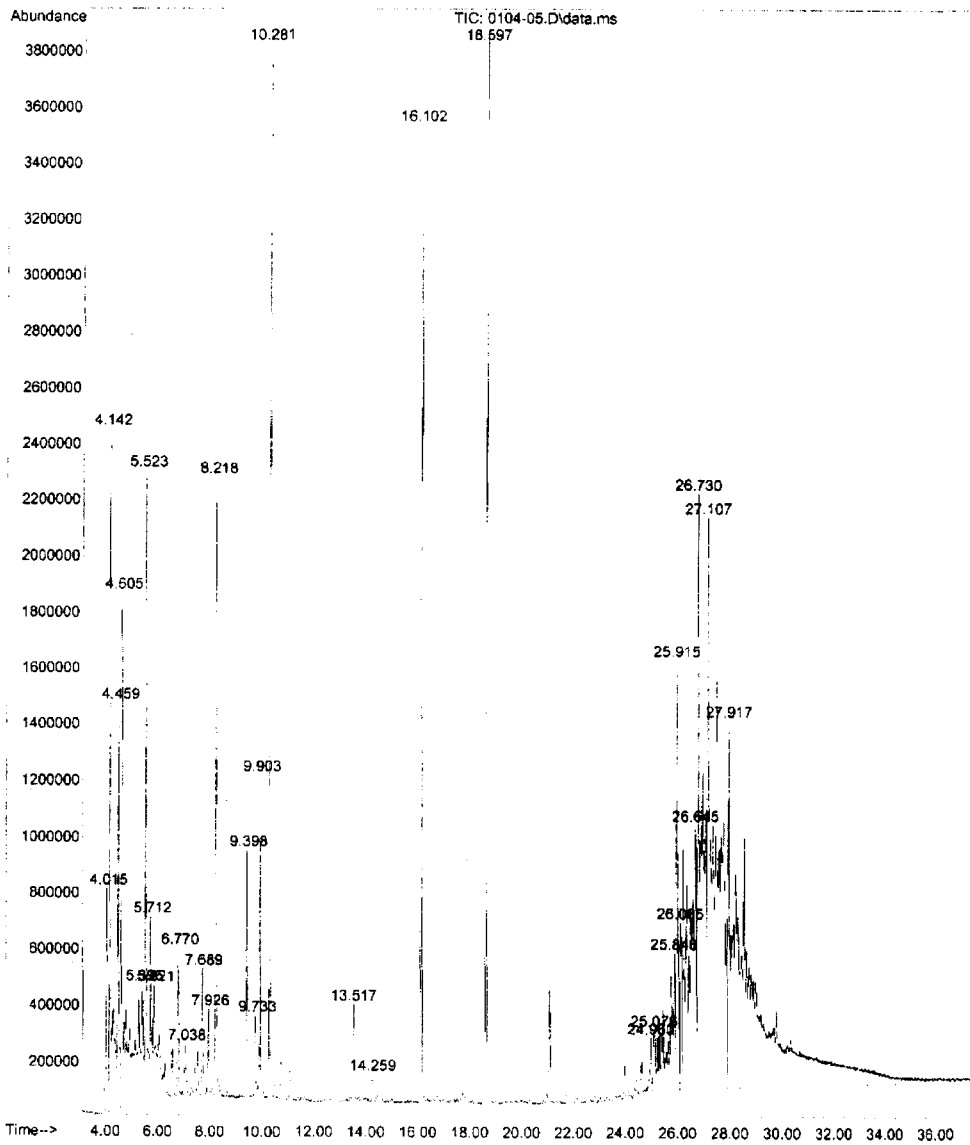
Target Compounds	R.T.	QIOn	Response	Conc	Units	Qvalue
2) Freon 22 (ClF2Methane)	0.000	67	0	N.D.		
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.		
4) Chloromethane	4.336	50	23718m	3.96	ppbv	
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.		
6) Vinyl Chloride	0.000	62	0	N.D.		
7) 1,3- Butadiene	4.598	54	34180m	5.73	ppbv	
8) Bromomethane	0.000	94	0	N.D.		
9) Chloroethane	0.000	64	0	N.D.		
10) Acetone	5.517	58	1125959m	256.11	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.		
12) Acrylonitrile	0.000	53	0	N.D.	d	
13) 1,1-Dichloroethene	0.000	96	0	N.D.		
14) Methylene Chloride	6.228	84	24278m	2.67	ppbv	
15) Methyl Acetate	0.000	43	0	N.D.	d	
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.		
17) Carbon Disulfide	6.539	76	119154m	4.57	ppbv	
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.		
19) 1,1-Dichloroethane	0.000	63	0	N.D.		
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.		
21) Methyl Ethyl Ketone(2-...)	7.682	43	767407	45.31	ppbv	99
22) Chloroprene(2-Cl-1,3-B...	0.000	88	0	N.D.		
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.		
25) Hexane	0.000	57	0	N.D.		
26) Chloroform	0.000	83	0	N.D.		
27) 2,2-Dichloropropane	0.000	77	0	N.D.		
28) Dibromofluoromethane (...)	0.000	111	0	N.D.		
29) 1,2- Dichloroethane	0.000	62	0	N.D.		
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.		
31) 1,1- Dichloropropene	0.000	75	0	N.D.		
32) Benzene	9.903	78	1141446	44.03	ppbv	99
33) Carbon Tetrachloride	0.000	117	0	N.D.		
34) Cyclohexane	0.000	84	0	N.D.	d	
35) Dibromomethane	0.000	174	0	N.D.		
36) 1,2-Dichloropropane	0.000	63	0	N.D.		
37) Ethyl Acrylate	0.000	55	0	N.D.		
38) Bromodichloromethane	0.000	83	0	N.D.		
39) Trichloroethene	0.000	132	0	N.D.		
40) Methyl Methacrylate	0.000	69	0	N.D.		
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.		
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.		
43) Methyl Cyclohexane	0.000	98	0	N.D.		
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.		

45)	1,1,2-Trichloroethane	0.000	97	0	N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0	N.D.	
47)	Toluene	13.516	91	322606	10.84 ppbv	96
48)	1,3-Dichloropropane	0.000	76	0	N.D.	
49)	Methyl Butyl Ketone(2-...	13.991	43	21714	1.56 ppbv #	28
50)	Dibromochloromethane	0.000	129	0	N.D.	
51)	1,2- Dibromoethane	0.000	107	0	N.D.	
52)	Tetrachloroethene	0.000	166	0	N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0	N.D.	
55)	Chlorobenzene	0.000	112	0	N.D. d	
56)	Ethylbenzene	0.000	91	0	N.D. d	
57)	(m and /or p) Xylene	0.000	91	0	N.D. d	
58)	Bromoform	0.000	173	0	N.D.	
59)	Butyl Acrylate	0.000	55	0	N.D. d	
60)	Styrene	0.000	104	0	N.D.	
61)	1,1,2,2-Tetrachloroethane	0.000	83	0	N.D.	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0	N.D. d	
63)	1,2,3-Trichloropropane	0.000	110	0	N.D.	
65)	Isopropylbenzene	0.000	105	0	N.D.	
66)	Bromobenzene	0.000	156	0	N.D.	
67)	o-Chlorotoluene	0.000	126	0	N.D.	
68)	n-Propylbenzene	0.000	120	0	N.D.	
69)	p-Chlorotoluene	0.000	126	0	N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0	N.D.	
71)	tert-Butylbenzene	0.000	134	0	N.D.	
72)	1,2,4-Trimethylbenzene	0.000	105	0	N.D. d	
73)	1,3-Dichlorobenzene	0.000	146	0	N.D.	
74)	1,4-Dichlorobenzene	0.000	146	0	N.D. d	
75)	sec-Butylbenzene	0.000	105	0	N.D.	
76)	p-Isopropyltoluene	0.000	119	0	N.D. d	
77)	1,2-Dichlorobenzene	0.000	146	0	N.D.	
78)	n-Butylbenzene	0.000	91	0	N.D. d	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0	N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0	N.D. d	
81)	Naphthalene	25.732	128	128123	6.63 ppbv	97
82)	1,2,3-Trichlorobenzene	0.000	180	0	N.D. d	
83)	Hexachlorobutadiene	0.000	225	0	N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

T015ppb8.M Thu Jan 07 12:06:36 2010

File : C:\msdchem\1\DATA\01042010\0104-05.D # 4
 Operator : JM
 Acquired : 4 Jan 2010 1:13 pm using AcqMethod TO15PPB8.M
 Instrument : 5973A MSD
 Sample Name: 100cc IS, 50cc, AS16, 2172, TO15.mpt
 Misc Info : MSD, Dig Gas, 121609, Train #4, 35-300amu @4.64mi
 Vial Number: 5



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\01042010\
 Data File : 0104-05.D
 Acq On : 4 Jan 2010 1:13 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS16,2172,TO15.mpt
 Misc : MSD,Dig Gas,121609,Train #4.35-300amu @4.64mi
 ALS Vial : 5 Sample Multiplier: 30

Quant Time: Jan 07 12:31:54 2010
 Quant Method : C:\msdchem\1\METHODS\T015ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Thu Jan 07 11:31:33 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\01042010\A0104-02.D

Internal Standards	R.T.	Qion	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.281	114	3690482	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.102	82	1624073	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	Qion	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.218	128	791606	3.96	ppbv	0.01
64) p-Bromofluorobenzene	18.597	174	1492476	4.04	ppbv	0.00

Target Compounds	R.T.	Qion	Response	Conc	Units	Qvalue
2) Freon 22 (ClF2Methane)	0.000	67	0	N.D.		
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.		
4) Chloromethane	4.343	50	33096m	5.34	ppbv	
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.		
6) Vinyl Chloride	0.000	62	0	N.D.		
7) 1,3- Butadiene	4.605	54	38218m	6.19	ppbv	
8) Bromomethane	0.000	94	0	N.D.		
9) Chloroethane	0.000	64	0	N.D.		
10) Acetone	5.523	58	948189m	208.36	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.		
12) Acrylonitrile	0.000	53	0	N.D.	d	
13) 1,1-Dichloroethene	0.000	96	0	N.D.		
14) Methylene Chloride	0.000	84	0	N.D.	d	
15) Methyl Acetate	0.000	43	0	N.D.	d	
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.		
17) Carbon Disulfide	6.545	76	123715m	4.58	ppbv	
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.		
19) 1,1-Dichloroethane	0.000	63	0	N.D.		
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.		
21) Methyl Ethyl Ketone(2-...	7.689	43	706539	40.30	ppbv	99
22) Chloroprene(2-Cl-1,3-B...	0.000	88	0	N.D.		
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.		
25) Hexane	0.000	57	0	N.D.		
26) Chloroform	0.000	83	0	N.D.		
27) 2,2-Dichloropropane	0.000	77	0	N.D.		
28) Dibromofluoromethane (...)	0.000	111	0	N.D.		
29) 1,2- Dichloroethane	0.000	62	0	N.D.		
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.		
31) 1,1- Dichloropropene	0.000	75	0	N.D.		
32) Benzene	9.903	78	1279848	47.70	ppbv	99
33) Carbon Tetrachloride	0.000	117	0	N.D.		
34) Cyclohexane	0.000	84	0	N.D.	d	
35) Dibromomethane	0.000	174	0	N.D.		
36) 1,2-Dichloropropane	0.000	63	0	N.D.		
37) Ethyl Acrylate	0.000	55	0	N.D.		
38) Bromodichloromethane	0.000	83	0	N.D.		
39) Trichloroethene	0.000	132	0	N.D.		
40) Methyl Methacrylate	0.000	69	0	N.D.		
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.		
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.		
43) Methyl Cyclohexane	0.000	98	0	N.D.		
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.		

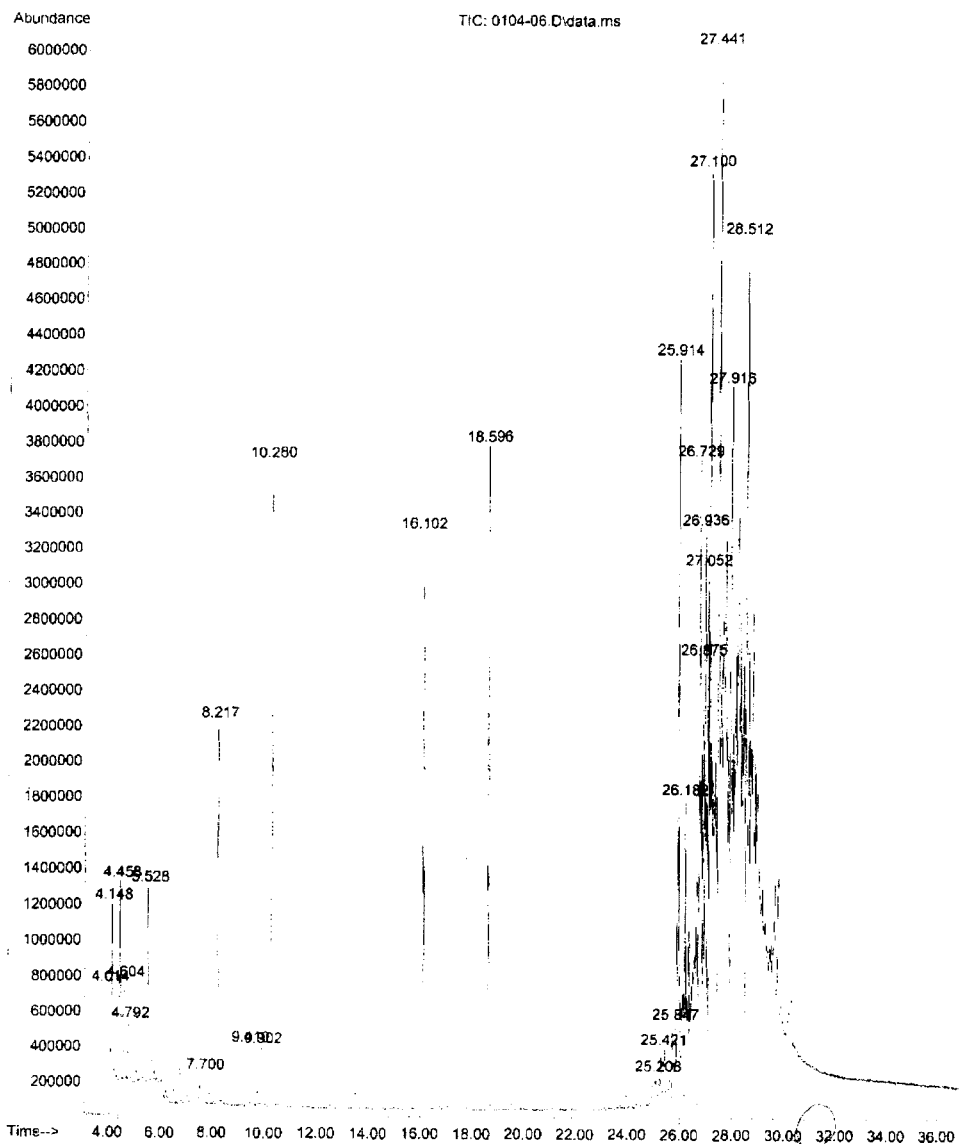
45)	1,1,2-Trichloroethane	0.000	97	0	N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0	N.D.	
47)	Toluene	13.523	91	337069	10.94 ppbv	100
48)	1,3-Dichloropropane	0.000	76	0	N.D.	
49)	Methyl Butyl Ketone(2-...	0.000	43	0	N.D.	
50)	Dibromochloromethane	0.000	129	0	N.D.	
51)	1,2- Dibromoethane	0.000	107	0	N.D.	
52)	Tetrachloroethene	0.000	166	0	N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0	N.D.	
55)	Chlorobenzene	0.000	112	0	N.D.	
56)	Ethylbenzene	0.000	91	0	N.D. d	
57)	(m and /or p) Xylene	0.000	91	0	N.D. d	
58)	Bromoform	0.000	173	0	N.D.	
59)	Butyl Acrylate	0.000	55	0	N.D.	
60)	Styrene	0.000	104	0	N.D.	
61)	1,1,2,2-Tetrachloroethane	0.000	83	0	N.D.	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0	N.D.	
63)	1,2,3-Trichloropropane	0.000	110	0	N.D.	
65)	Isopropylbenzene	0.000	105	0	N.D.	
66)	Bromobenzene	0.000	156	0	N.D.	
67)	o-Chlorotoluene	0.000	126	0	N.D.	
68)	n-Propylbenzene	0.000	120	0	N.D.	
69)	p-Chlorotoluene	0.000	126	0	N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0	N.D.	
71)	tert-Butylbenzene	0.000	134	0	N.D.	
72)	1,2,4-Trimethylbenzene	0.000	105	0	N.D.	
73)	1,3-Dichlorobenzene	0.000	146	0	N.D.	
74)	1,4-Dichlorobenzene	0.000	146	0	N.D.	
75)	sec-Butylbenzene	0.000	105	0	N.D.	
76)	p-Isopropyltoluene	0.000	119	0	N.D.	
77)	1,2-Dichlorobenzene	0.000	146	0	N.D.	
78)	n-Butylbenzene	0.000	91	0	N.D.	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0	N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0	N.D.	
81)	Naphthalene	25.733	128	59810m	3.06 ppbv	
82)	1,2,3-Trichlorobenzene	0.000	180	0	N.D.	
83)	Hexachlorobutadiene	0.000	225	0	N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

T015ppb8.M Thu Jan 07 12:32:04 2010

45

File : C:\msdchem\1\DATA\01042010\0104-06.D
Operator : JM
Acquired : 4 Jan 2010 2:01 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name: 100cc IS, 50cc, AS15, 2169, TO15.mpt
Misc Info : MSD, NatGas, 121709, Train #4, 35-300amu @4.64ml
Vial Number: 6



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\01042010\
 Data File : 0104-06.D
 Acq On : 4 Jan 2010 2:01 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS15,2169,TO15.mpt
 Misc : MSD,NatGas,121709, Train #4,35-300amu @4.64mi
 ALS Vial : 6 Sample Multiplier: 30

Quant Time: Jan 07 12:26:35 2010
 Quant Method : C:\msdchem\1\METHODS\TO15ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Thu Jan 07 11:31:33 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\01042010\A0104-02.D

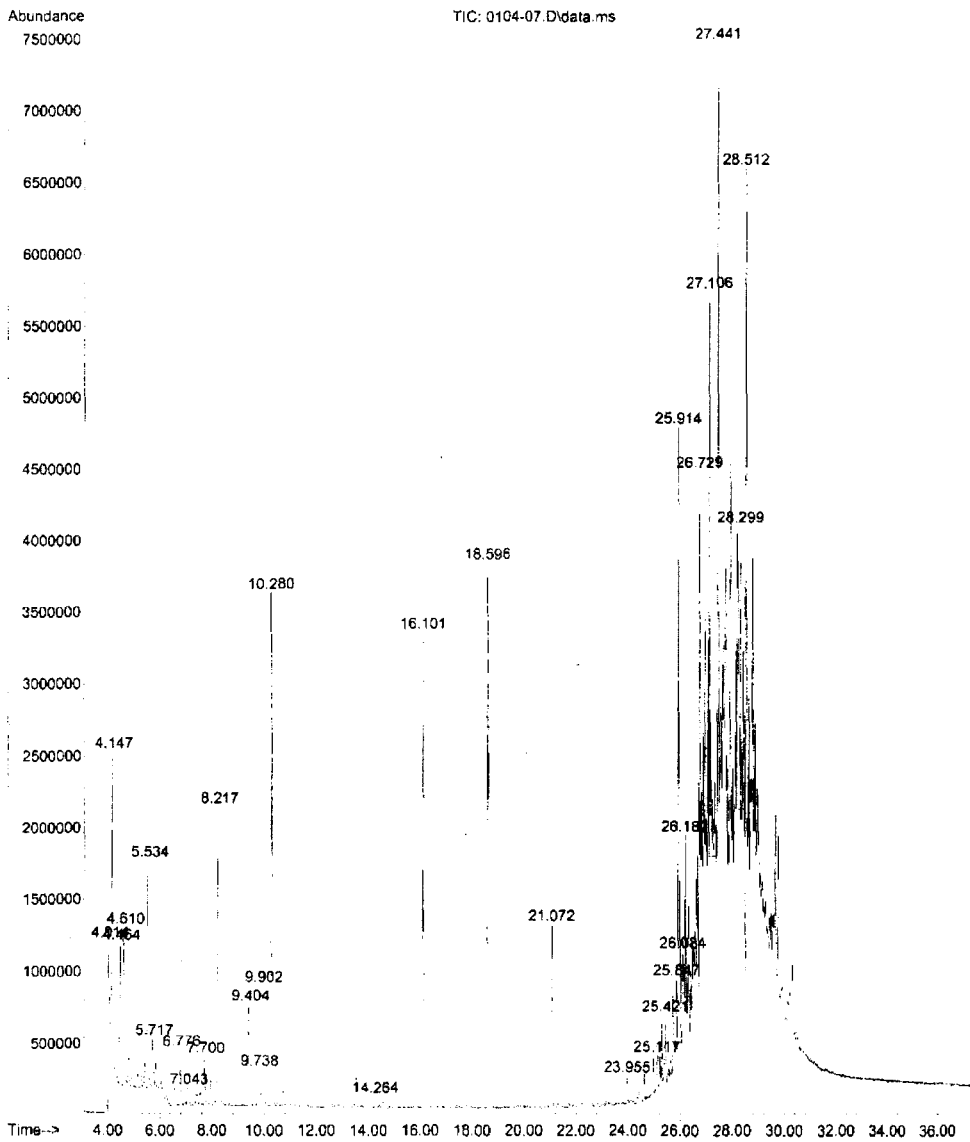
Internal Standards	R.T.	QIon	Response	Conc	Units	Dev (Min)
1) 1,4-Difluorobenzene	10.280	114	3441780	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.102	82	1494442	4.16	ppbv	0.00
System Monitoring Compounds						
24) Bromochloromethane	8.217	128	769225	4.13	ppbv	0.01
64) p-Bromofluorobenzene	18.596	174	1397469	4.11	ppbv	0.00
Target Compounds						
						Qvalue
2) Freon 22 (ClF2Methane)	0.000	67	0	N.D.		
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.		
4) Chloromethane	4.342	50	4611m	0.80	ppbv	
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.		
6) Vinyl Chloride	0.000	62	0	N.D.		
7) 1,3- Butadiene	4.640	54	28339m	4.92	ppbv	
8) Bromomethane	0.000	94	0	N.D.		
9) Chloroethane	0.000	64	0	N.D.		
10) Acetone	5.528	58	553224m	130.35	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.		
12) Acrylonitrile	0.000	53	0	N.D.		
13) 1,1-Dichloroethene	0.000	96	0	N.D.		
14) Methylene Chloride	6.234	84	22895m	2.61	ppbv	
15) Methyl Acetate	0.000	43	0	N.D.		
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.		
17) Carbon Disulfide	6.544	76	41212m	1.64	ppbv	
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.		
19) 1,1-Dichloroethane	0.000	63	0	N.D.		
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.		
21) Methyl Ethyl Ketone(2-...)	7.700	43	279236	17.08	ppbv	98
22) Chloroprene(2-Cl-1,3-B...)	0.000	88	0	N.D.		
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.		
25) Hexane	0.000	57	0	N.D.		
26) Chloroform	0.000	83	0	N.D.		
27) 2,2-Dichloropropane	0.000	77	0	N.D.		
28) Dibromofluoromethane (...)	0.000	111	0	N.D.		
29) 1,2- Dichloroethane	0.000	62	0	N.D.		
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.		
31) 1,1- Dichloropropene	0.000	75	0	N.D.		
32) Benzene	9.909	78	386198	15.43	ppbv	99
33) Carbon Tetrachloride	0.000	117	0	N.D.		
34) Cyclohexane	0.000	84	0	N.D.	d	
35) Dibromomethane	0.000	174	0	N.D.		
36) 1,2-Dichloropropane	0.000	63	0	N.D.		
37) Ethyl Acrylate	0.000	55	0	N.D.		
38) Bromodichloromethane	0.000	83	0	N.D.		
39) Trichloroethene	0.000	132	0	N.D.		
40) Methyl Methacrylate	0.000	69	0	N.D.		
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.		
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.		
43) Methyl Cyclohexane	0.000	98	0	N.D.		
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.		

45)	1,1,2-Trichloroethane	0.000	97	0	N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0	N.D.	
47)	Toluene	13.522	91	99933	3.48 ppbv	99
48)	1,3-Dichloropropane	0.000	76	0	N.D.	
49)	Methyl Butyl Ketone(2-...	0.000	43	0	N.D.	
50)	Dibromochloromethane	0.000	129	0	N.D.	
51)	1,2- Dibromoethane	0.000	107	0	N.D.	
52)	Tetrachloroethene	0.000	166	0	N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0	N.D.	
55)	Chlorobenzene	0.000	112	0	N.D.	d
56)	Ethylbenzene	0.000	91	0	N.D.	d
57)	(m and /or p) Xylene	0.000	91	0	N.D.	d
58)	Bromoform	0.000	173	0	N.D.	
59)	Butyl Acrylate	0.000	55	0	N.D.	
60)	Styrene	0.000	104	0	N.D.	
61)	1,1,2,2-Tetrachloroethane	0.000	83	0	N.D.	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0	N.D.	
63)	1,2,3-Trichloropropane	0.000	110	0	N.D.	
65)	Isopropylbenzene	0.000	105	0	N.D.	
66)	Bromobenzene	0.000	156	0	N.D.	
67)	o-Chlorotoluene	0.000	126	0	N.D.	
68)	n-Propylbenzene	0.000	120	0	N.D.	
69)	p-Chlorotoluene	0.000	126	0	N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0	N.D.	
71)	tert-Butylbenzene	0.000	134	0	N.D.	
72)	1,2,4-Trimethylbenzene	0.000	105	0	N.D.	
73)	1,3-Dichlorobenzene	0.000	146	0	N.D.	
74)	1,4-Dichlorobenzene	0.000	146	0	N.D.	
75)	sec-Butylbenzene	0.000	105	0	N.D.	
76)	p-Isopropyltoluene	0.000	119	0	N.D.	
77)	1,2-Dichlorobenzene	0.000	146	0	N.D.	
78)	n-Butylbenzene	0.000	91	0	N.D.	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0	N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0	N.D.	
81)	Naphthalene	25.732	128	121897	6.78 ppbv	98
82)	1,2,3-Trichlorobenzene	0.000	180	0	N.D.	
83)	Hexachlorobutadiene	0.000	225	0	N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

T015ppb8.M Thu Jan 07 12:26:53 2010

File : C:\msdchem\1\DATA\01042010\0104-07.D #5
Operator : JM
Acquired : 4 Jan 2010 2:49 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name: 100cc IS, 50cc, AS16, 2171, TO15.mpt
Misc Info : MSD, Dig Gas, 121709, Train #4, 35-300amu @4.64mi
Vial Number: 7



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\01042010\
 Data File : 0104-07.D
 Acq On : 4 Jan 2010 2:49 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS16,2171,TO15.mpt
 Misc : MSD,Dig Gas,121709,Train #4,35-300amu @4.64mi
 ALS Vial : 7 Sample Multiplier: 30

Quant Time: Jan 07 12:37:28 2010
 Quant Method : C:\msdchem\1\METHODS\T015ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Thu Jan 07 11:31:33 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\01042010\A0104-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.280	114	3460041	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.101	82	1523878	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.217	128	739906	3.95	ppbv	0.01
64) p-Bromofluorobenzene	18.596	174	1440938	4.15	ppbv	0.00

Target Compounds	R.T.	QIon	Response	Conc	Units	Qvalue
2) Freon 22 (ClF2Methane)	0.000	67	0	N.D.		
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.	d	
4) Chloromethane	4.348	50	20583	3.54	ppbv	96
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.		
6) Vinyl Chloride	0.000	62	0	N.D.		
7) 1,3- Butadiene	4.640	54	65584m	11.33	ppbv	
8) Bromomethane	0.000	94	0	N.D.		
9) Chloroethane	0.000	64	0	N.D.		
10) Acetone	5.534	58	756058m	177.20	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.		
12) Acrylonitrile	0.000	53	0	N.D.	d	
13) 1,1-Dichloroethene	0.000	96	0	N.D.		
14) Methylene Chloride	0.000	84	0	N.D.	d	
15) Methyl Acetate	0.000	43	0	N.D.		
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.		
17) Carbon Disulfide	6.550	76	71368m	2.82	ppbv	
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.		
19) 1,1-Dichloroethane	0.000	63	0	N.D.		
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.		
21) Methyl Ethyl Ketone(2-...)	7.700	43	520248	31.65	ppbv	99
22) Chloroprene(2-Cl-1,3-B...	0.000	88	0	N.D.		
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.		
25) Hexane	0.000	57	0	N.D.		
26) Chloroform	0.000	83	0	N.D.	d	
27) 2,2-Dichloropropane	0.000	77	0	N.D.		
28) Dibromofluoromethane (...)	0.000	111	0	N.D.		
29) 1,2- Dichloroethane	0.000	62	0	N.D.		
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.		
31) 1,1- Dichloropropene	0.000	75	0	N.D.		
32) Benzene	9.902	78	948056	37.68	ppbv	99
33) Carbon Tetrachloride	0.000	117	0	N.D.		
34) Cyclohexane	0.000	84	0	N.D.	d	
35) Dibromomethane	0.000	174	0	N.D.		
36) 1,2-Dichloropropane	0.000	63	0	N.D.		
37) Ethyl Acrylate	0.000	55	0	N.D.		
38) Bromodichloromethane	0.000	83	0	N.D.		
39) Trichloroethene	0.000	132	0	N.D.		
40) Methyl Methacrylate	0.000	69	0	N.D.		
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.		
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.		
43) Methyl Cyclohexane	0.000	98	0	N.D.		
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.		

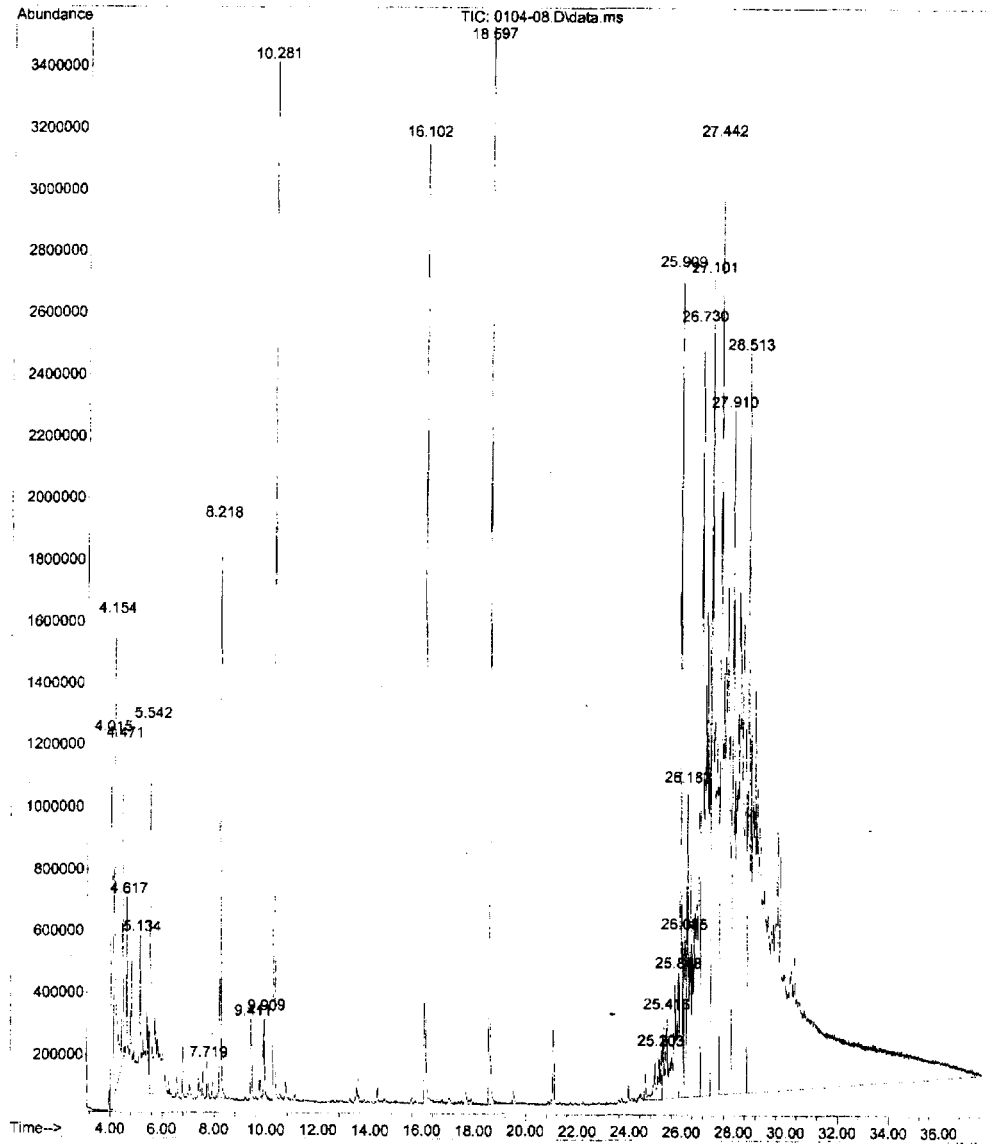
45)	1,1,2-Trichloroethane	0.000	97	0	N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0	N.D.	
47)	Toluene	13.522	91	221623	7.67 ppbv	93
48)	1,3-Dichloropropane	0.000	76	0	N.D.	
49)	Methyl Butyl Ketone(2-...	0.000	43	0	N.D. d	
50)	Dibromochloromethane	0.000	129	0	N.D.	
51)	1,2- Dibromoethane	0.000	107	0	N.D.	
52)	Tetrachloroethene	0.000	166	0	N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0	N.D.	
55)	Chlorobenzene	0.000	112	0	N.D. d	
56)	Ethylbenzene	0.000	91	0	N.D. d	
57)	(m and /or p) Xylene	0.000	91	0	N.D. d	
58)	Bromoform	0.000	173	0	N.D.	
59)	Butyl Acrylate	0.000	55	0	N.D. d	
60)	Styrene	0.000	104	0	N.D. d	
61)	1,1,2,2-Tetrachloroethane	0.000	83	0	N.D.	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0	N.D. d	
63)	1,2,3-Trichloropropane	0.000	110	0	N.D.	
65)	Isopropylbenzene	0.000	105	0	N.D.	
66)	Bromobenzene	0.000	156	0	N.D.	
67)	o-Chlorotoluene	0.000	126	0	N.D.	
68)	n-Propylbenzene	0.000	120	0	N.D.	
69)	p-Chlorotoluene	0.000	126	0	N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0	N.D.	
71)	tert-Butylbenzene	0.000	134	0	N.D. d	
72)	1,2,4-Trimethylbenzene	0.000	105	0	N.D. d	
73)	1,3-Dichlorobenzene	0.000	146	0	N.D.	
74)	1,4-Dichlorobenzene	0.000	146	0	N.D. d	
75)	sec-Butylbenzene	0.000	105	0	N.D.	
76)	p-Isopropyltoluene	0.000	119	0	N.D. d	
77)	1,2-Dichlorobenzene	0.000	146	0	N.D.	
78)	n-Butylbenzene	0.000	91	0	N.D. d	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0	N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0	N.D. d	
81)	Naphthalene	25.732	128	140775	7.67 ppbv	98
82)	1,2,3-Trichlorobenzene	0.000	180	0	N.D. d	
83)	Hexachlorobutadiene	0.000	225	0	N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

T015ppb8.M Thu Jan 07 12:37:37 2010

#6

File : C:\msdchem\1\DATA\01042010\0104-08.D
Operator : JM
Acquired : 4 Jan 2010 3:43 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name : 100cc IS, 50cc, AS15, 2174, TO15.mpt
Misc Info : MSD, NatGas, 121809, Train #4, 35-300amu @4.64mi
Vial Number: 8



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\01042010\
 Data File : 0104-08.D
 Acq On : 4 Jan 2010 3:43 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS15,2174,TO15.mpt
 Misc : MSD,NatGas,121809, Train #4,35-300amu @4.64mi
 ALS Vial : 8 Sample Multiplier: 30

Quant Time: Jan 07 12:44:11 2010
 Quant Method : C:\msdchem\1\METHODS\T015ppb8.M
 Quant Title : T014/T015 Volatile Compounds
 QLast Update : Thu Jan 07 11:31:33 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\01042010\A0104-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.281	114	3191569	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.102	82	1405323	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.218	128	672534	3.89	ppbv	0.01
64) p-Bromofluorobenzene	18.597	174	1286566	4.02	ppbv	0.00

Target Compounds	R.T.	QIon	Response	Conc	Units	Qvalue
2) Freon 22 (ClF2Methane)	0.000	67	0	N.D.	d	
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.	d	
4) Chloromethane	4.349	50	13899m	2.59	ppbv	
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.		
6) Vinyl Chloride	0.000	62	0	N.D.		
7) 1,3- Butadiene	4.647	54	21707m	4.07	ppbv	
8) Bromomethane	0.000	94	0	N.D.		
9) Chloroethane	0.000	64	0	N.D.		
10) Acetone	5.542	58	580622m	147.53	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.		
12) Acrylonitrile	0.000	53	0	N.D.	d	
13) 1,1-Dichloroethene	0.000	96	0	N.D.		
14) Methylene Chloride	0.000	84	0	N.D.	d	
15) Methyl Acetate	0.000	43	0	N.D.		
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.		
17) Carbon Disulfide	6.551	76	34999m	1.50	ppbv	
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.		
19) 1,1-Dichloroethane	0.000	63	0	N.D.		
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.		
21) Methyl Ethyl Ketone(2-...	7.719	43	221020	14.58	ppbv	99
22) Chloroprene(2-Cl-1,3-B...	0.000	88	0	N.D.		
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.		
25) Hexane	0.000	57	0	N.D.		
26) Chloroform	0.000	83	0	N.D.		
27) 2,2-Dichloropropane	0.000	77	0	N.D.		
28) Dibromofluoromethane (...)	0.000	111	0	N.D.		
29) 1,2- Dichloroethane	0.000	62	0	N.D.		
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.		
31) 1,1- Dichloropropene	0.000	75	0	N.D.		
32) Benzene	9.909	78	322095	13.88	ppbv	97
33) Carbon Tetrachloride	0.000	117	0	N.D.		
34) Cyclohexane	0.000	84	0	N.D.	d	
35) Dibromomethane	0.000	174	0	N.D.		
36) 1,2-Dichloropropane	0.000	63	0	N.D.		
37) Ethyl Acrylate	0.000	55	0	N.D.		
38) Bromodichloromethane	0.000	83	0	N.D.		
39) Trichloroethene	0.000	132	0	N.D.		
40) Methyl Methacrylate	0.000	69	0	N.D.		
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.		
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.		
43) Methyl Cyclohexane	0.000	98	0	N.D.		
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.		

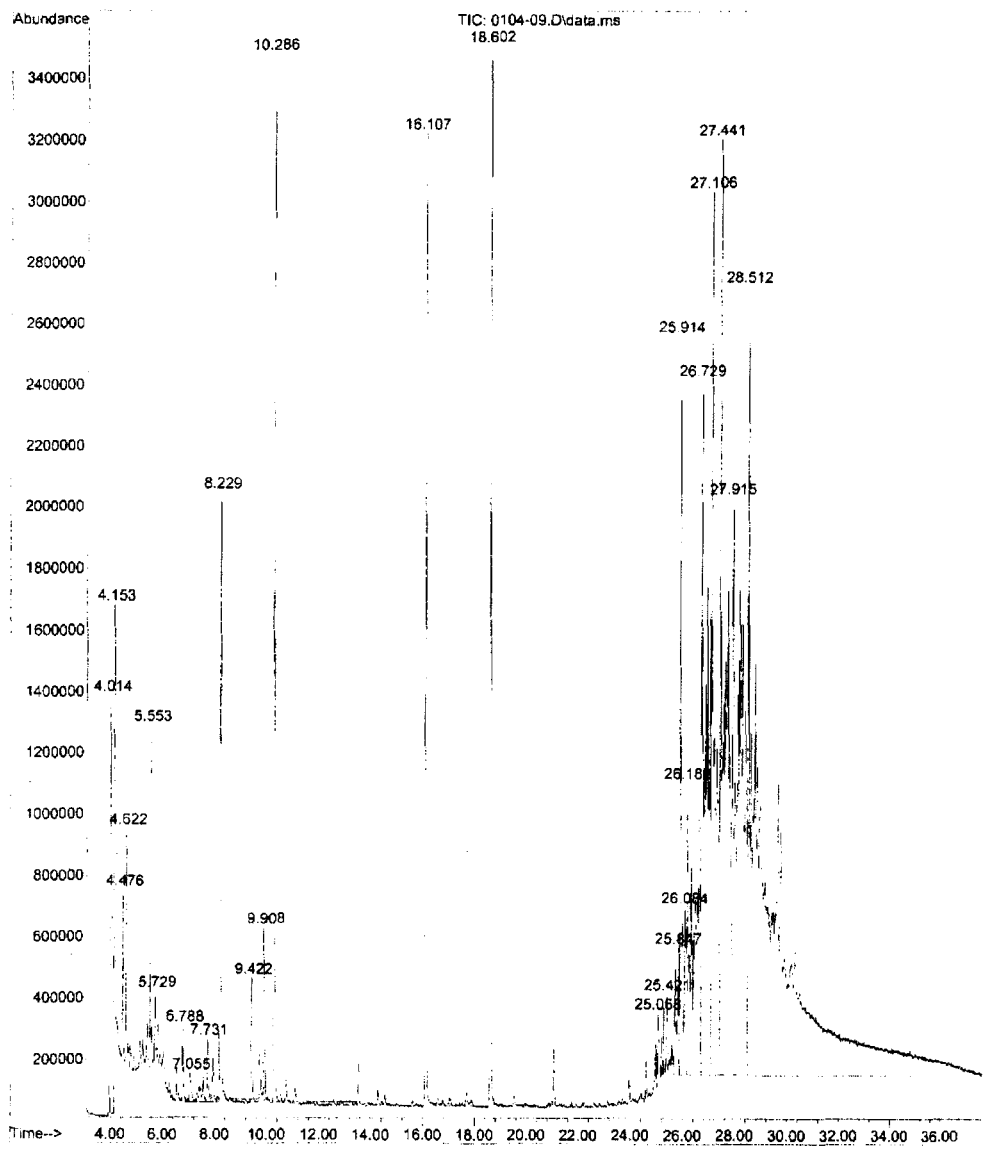
45)	1,1,2-Trichloroethane	0.000	97	0		N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0		N.D.	
47)	Toluene	13.511	91	80491	3.02 ppbv		93
48)	1,3-Dichloropropane	0.000	76	0		N.D.	
49)	Methyl Butyl Ketone(2-...	0.000	43	0		N.D. d	
50)	Dibromochloromethane	0.000	129	0		N.D.	
51)	1,2- Dibromoethane	0.000	107	0		N.D.	
52)	Tetrachloroethene	0.000	166	0		N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0		N.D.	
55)	Chlorobenzene	0.000	112	0		N.D. d	
56)	Ethylbenzene	0.000	91	0		N.D. d	
57)	(m and /or p) Xylene	0.000	91	0		N.D. d	
58)	Bromoform	0.000	173	0		N.D.	
59)	Butyl Acrylate	0.000	55	0		N.D. d	
60)	Styrene	0.000	104	0		N.D. d	
61)	1,1,2,2-Tetrachloroethane	0.000	83	0		N.D.	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0		N.D. d	
63)	1,2,3-Trichloropropane	0.000	110	0		N.D.	
65)	Isopropylbenzene	0.000	105	0		N.D.	
66)	Bromobenzene	0.000	156	0		N.D.	
67)	o-Chlorotoluene	0.000	126	0		N.D.	
68)	n-Propylbenzene	0.000	120	0		N.D.	
69)	p-Chlorotoluene	0.000	126	0		N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0		N.D.	
71)	tert-Butylbenzene	0.000	134	0		N.D.	
72)	1,2,4-Trimethylbenzene	0.000	105	0		N.D. d	
73)	1,3-Dichlorobenzene	0.000	146	0		N.D.	
74)	1,4-Dichlorobenzene	0.000	146	0		N.D.	
75)	sec-Butylbenzene	0.000	105	0		N.D.	
76)	p-Isopropyltoluene	0.000	119	0		N.D.	
77)	1,2-Dichlorobenzene	0.000	146	0		N.D.	
78)	n-Butylbenzene	0.000	91	0		N.D.	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0		N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0		N.D.	
81)	Naphthalene	25.739	128	72647	4.29 ppbv		95
82)	1,2,3-Trichlorobenzene	0.000	180	0		N.D. d	
83)	Hexachlorobutadiene	0.000	225	0		N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

T015ppb8.M Thu Jan 07 12:44:18 2010

46

File : C:\msdchem\1\DATA\01042010\0104-09.D
Operator : JM
Acquired : 4 Jan 2010 4:31 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name : 100cc IS, 50cc, AS16, 6445, TO15.mpt
Misc Info : MSD, Dig Gas, 121809, Train #4, 35-300amu @4.64mi
Vial Number: 9



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\01042010\
 Data File : 0104-09.D
 Acq On : 4 Jan 2010 4:31 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS16,6445,TO15.mpt
 Misc : MSD,Dig Gas,121809,Train #4,35-300amu @4.64mi
 ALS Vial : 9 Sample Multiplier: 30

Quant Time: Jan 07 11:43:29 2010
 Quant Method : C:\msdchem\1\METHODS\T015ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Fri Dec 11 10:00:41 2009
 Response via : Continuing Cal File: C:\msdchem\1\DATA\12162009\A1216-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.286	114	3353582	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.107	82	1469472	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.229	128	719588	4.32	ppbv	0.00
64) p-Bromofluorobenzene	18.602	174	1355804	3.76	ppbv	0.00

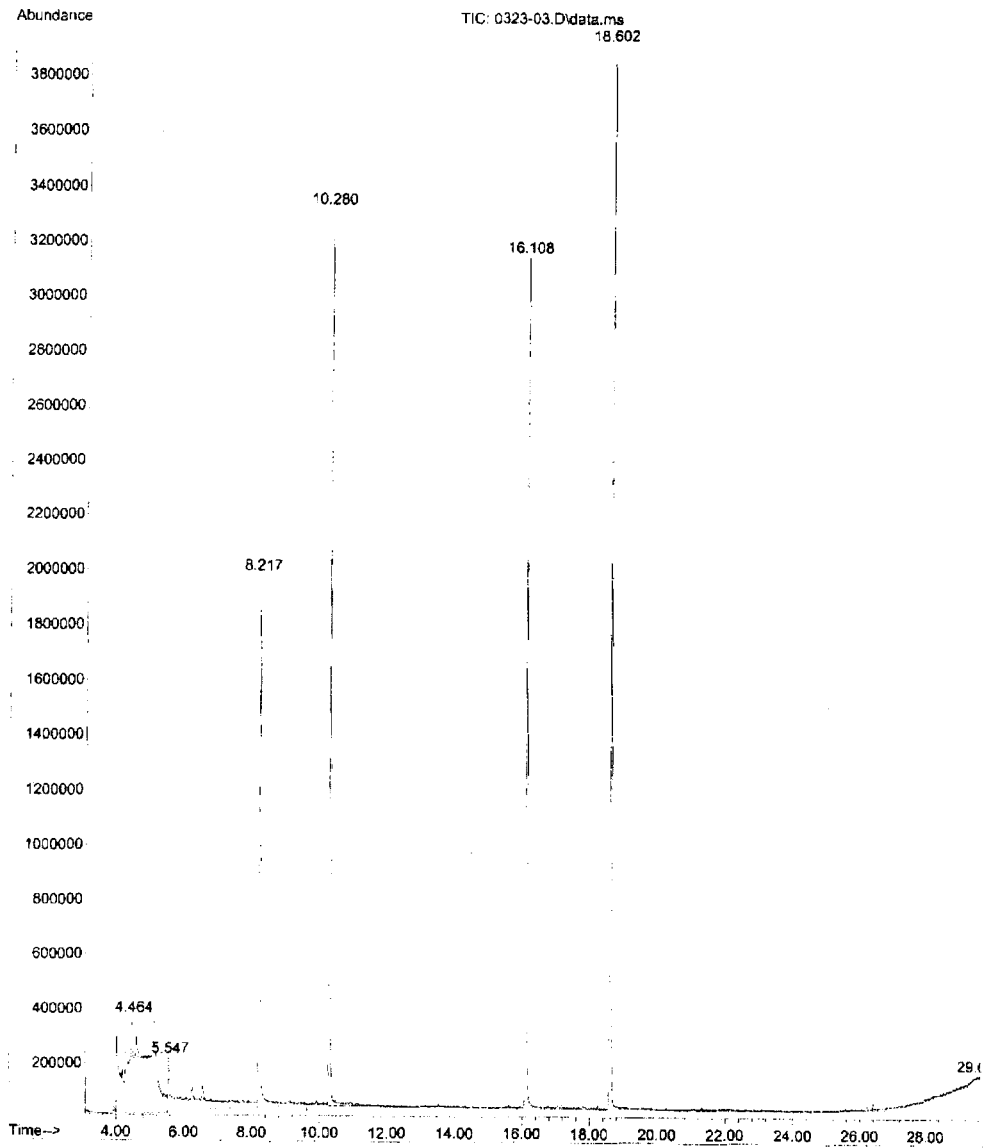
Target Compounds	R.T.	QIon	Response	Conc	Units	Qvalue
2) Freon 22 (ClF2Methane)	0.000	67	0	N.D.		
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.	d	
4) Chloromethane	4.354	50	16783m	3.66	ppbv	
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.		
6) Vinyl Chloride	0.000	62	0	N.D.		
7) 1,3- Butadiene	4.652	54	41619m	9.27	ppbv	
8) Bromomethane	0.000	94	0	N.D.		
9) Chloroethane	0.000	64	0	N.D.		
10) Acetone	5.553	58	522566m	145.04	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.		
12) Acrylonitrile	0.000	53	0	N.D.	d	
13) 1,1-Dichloroethene	0.000	96	0	N.D.		
14) Methylene Chloride	6.252	84	21451m	3.01	ppbv	
15) Methyl Acetate	0.000	43	0	N.D.		
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.		
17) Carbon Disulfide	6.556	76	46337m	2.27	ppbv	
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.		
19) 1,1-Dichloroethane	0.000	63	0	N.D.		
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.		
21) Methyl Ethyl Ketone(2-...)	7.724	43	352732	25.72	ppbv	98
22) Chloroprene(2-Cl-1,3-B...)	0.000	88	0	N.D.		
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.		
25) Hexane	0.000	57	0	N.D.		
26) Chloroform	0.000	93	0	N.D.	d	
27) 2,2-Dichloropropane	0.000	77	0	N.D.		
28) Dibromofluoromethane (...)	0.000	111	0	N.D.		
29) 1,2- Dichloroethane	0.000	62	0	N.D.		
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.		
31) 1,1- Dichloropropene	0.000	75	0	N.D.		
32) Benzene	9.908	78	670291	30.51	ppbv	99
33) Carbon Tetrachloride	0.000	117	0	N.D.		
34) Cyclohexane	0.000	84	0	N.D.	d	
35) Dibromomethane	0.000	174	0	N.D.		
36) 1,2-Dichloropropane	0.000	63	0	N.D.		
37) Ethyl Acrylate	0.000	55	0	N.D.		
38) Bromodichloromethane	0.000	93	0	N.D.		
39) Trichloroethene	0.000	132	0	N.D.		
40) Methyl Methacrylate	0.000	69	0	N.D.		
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.		
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.		
43) Methyl Cyclohexane	0.000	98	0	N.D.		
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.		

45)	1,1,2-Trichloroethane	0.000	97	0	N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0	N.D.	
47)	Toluene	13.522	91	143254	5.43 ppbv	98
48)	1,3-Dichloropropane	0.000	76	0	N.D.	
49)	Methyl Butyl Ketone(2-...	0.000	43	0	N.D. d	
50)	Dibromochloromethane	0.000	129	0	N.D.	
51)	1,2- Dibromoethane	0.000	107	0	N.D.	
52)	Tetrachloroethene	0.000	166	0	N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0	N.D.	
55)	Chlorobenzene	0.000	112	0	N.D. d	
56)	Ethylbenzene	0.000	91	0	N.D. d	
57)	(m and /or p) Xylene	0.000	91	0	N.D. d	
58)	Bromoform	0.000	173	0	N.D.	
59)	Butyl Acrylate	0.000	55	0	N.D. d	
60)	Styrene	0.000	104	0	N.D. d	
61)	1,1,2,2-Tetrachloroethane	0.000	83	0	N.D.	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0	N.D. d	
63)	1,2,3-Trichloropropane	0.000	110	0	N.D.	
65)	Isopropylbenzene	0.000	105	0	N.D.	
66)	Bromobenzene	0.000	156	0	N.D.	
67)	o-Chlorotoluene	0.000	126	0	N.D.	
68)	n-Propylbenzene	0.000	120	0	N.D.	
69)	p-Chlorotoluene	0.000	126	0	N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0	N.D.	
71)	tert-Butylbenzene	0.000	134	0	N.D.	
72)	1,2,4-Trimethylbenzene	0.000	105	0	N.D. d	
73)	1,3-Dichlorobenzene	0.000	146	0	N.D.	
74)	1,4-Dichlorobenzene	0.000	146	0	N.D.	
75)	sec-Butylbenzene	0.000	105	0	N.D.	
76)	p-Isopropyltoluene	0.000	119	0	N.D. d	
77)	1,2-Dichlorobenzene	0.000	146	0	N.D.	
78)	n-Butylbenzene	0.000	91	0	N.D. d	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0	N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0	N.D.	
81)	Naphthalene	25.738	128	64417	1.95 ppbv	97
82)	1,2,3-Trichlorobenzene	0.000	180	0	N.D.	
83)	Hexachlorobutadiene	0.000	225	0	N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

T015ppb8.M Thu Jan 07 11:45:03 2010

File : C:\msdchem\1\DATA\03232010\0323-03.D
Operator : JM
Acquired : 23 Mar 2010 11:05 am using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name : 100cc IS, 500cc, AS15, 6458, TO15.mpt
Misc Info : Sample Date: 022610, FB MSD.
Vial Number: 3



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\03232010\
 Data File : 0323-03.D
 Acq On : 23 Mar 2010 11:05 am
 Operator : JM
 Sample : 100cc IS,500cc,AS15,6458,TO15.mpt
 Misc : Sample Date: 022610, FB MSD.
 ALS Vial : 3 Sample Multiplier: 1

Quant Time: Mar 23 11:58:08 2010
 Quant Method : C:\msdchem\1\METHODS\TO15ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Tue Mar 23 11:48:01 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\03232010\A0323-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.280	114	2922750	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.108	82	1365410	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.217	128	678685	4.49	ppbv	0.00
64) p-Bromofluorobenzene	18.602	174	1367961	3.89	ppbv	0.00

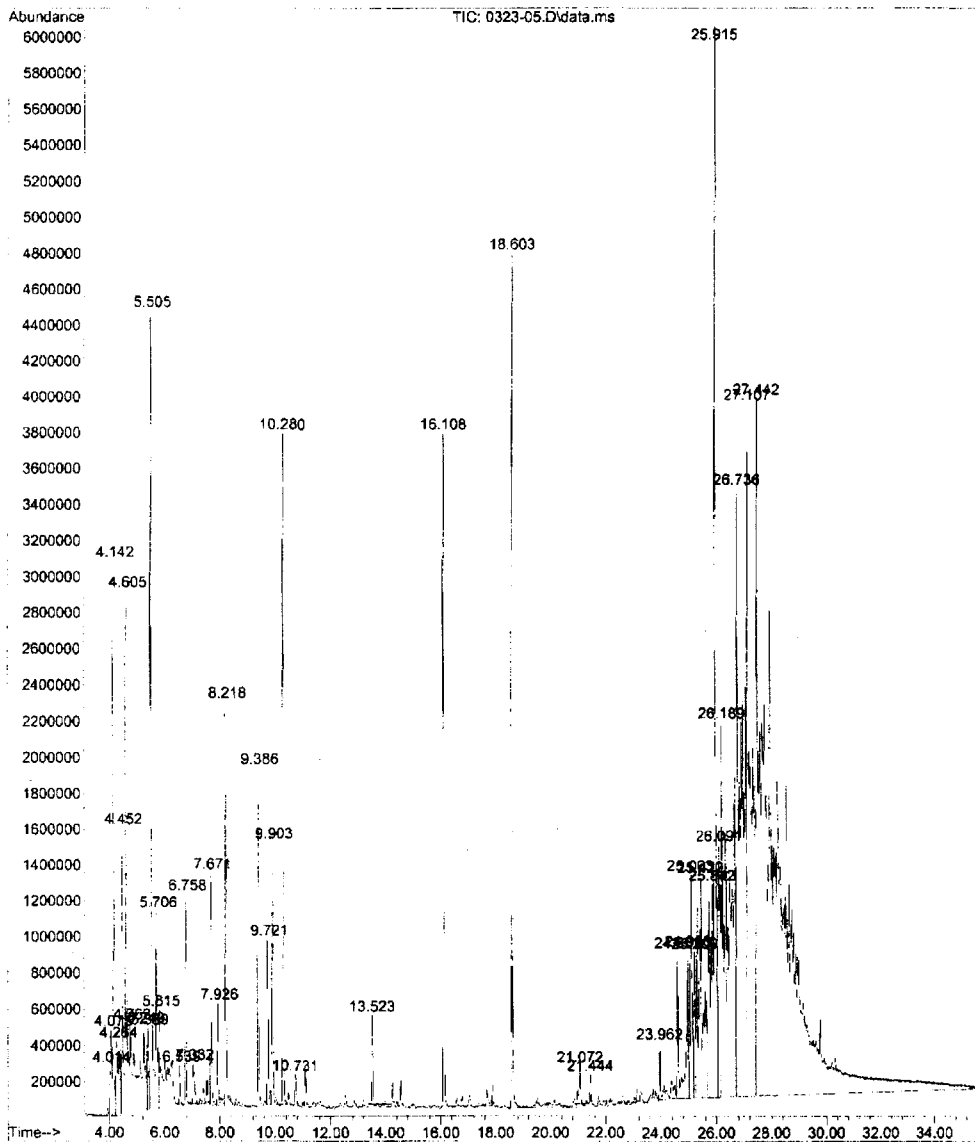
Target Compounds	R.T.	QIon	Response	Conc	Units	Qvalue
2) Freon 22 (ClF2Methane)	4.111	67	1881	N.D.		
3) Freon 12 (Cl2F2Methane)	4.208	85	10908	N.D.		
4) Chloromethane	4.348	50	1644	N.D.		
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.		
6) Vinyl Chloride	0.000	62	0	N.D.		
7) 1,3- Butadiene	0.000	54	0	N.D.		
8) Bromomethane	0.000	94	0	N.D.		
9) Chloroethane	0.000	64	0	N.D.		
10) Acetone	5.547	58	64593m	0.54	ppbv	
11) Freon 11 (Cl3Fmethane)	5.614	101	6043	N.D.		
12) Acrylonitrile	0.000	53	0	N.D.		
13) 1,1-Dichloroethene	0.000	96	0	N.D.		
14) Methylene Chloride	6.240	84	23739	0.11	ppbv	94
15) Methyl Acetate	0.000	43	0	N.D.		
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.		
17) Carbon Disulfide	6.544	76	10925	N.D.		
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.		
19) 1,1-Dichloroethane	0.000	63	0	N.D.		
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.		
21) Methyl Ethyl Ketone(2-...)	7.743	43	15157	N.D.		
22) Chloroprene(2-Cl-1,3-B...	0.000	88	0	N.D.		
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.		
25) Hexane	0.000	57	0	N.D.		
26) Chloroform	0.000	83	0	N.D.		
27) 2,2-Dichloropropane	0.000	77	0	N.D.		
28) Dibromofluoromethane (...)	0.000	111	0	N.D.		
29) 1,2- Dichloroethane	0.000	62	0	N.D.		
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.		
31) 1,1- Dichloropropene	0.000	75	0	N.D.		
32) Benzene	9.903	78	11764	N.D.		
33) Carbon Tetrachloride	0.000	117	0	N.D.		
34) Cyclohexane	0.000	84	0	N.D.	d	
35) Dibromomethane	0.000	174	0	N.D.		
36) 1,2-Dichloropropane	0.000	63	0	N.D.		
37) Ethyl Acrylate	0.000	55	0	N.D.		
38) Bromodichloromethane	0.000	83	0	N.D.		
39) Trichloroethene	0.000	132	0	N.D.		
40) Methyl Methacrylate	0.000	69	0	N.D.		
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.		
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.		
43) Methyl Cyclohexane	0.000	98	0	N.D.		
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.		

45)	1,1,2-Trichloroethane	0.000	97	0	N.D.
46)	Toluene-d8 (SMC)	0.000	98	0	N.D.
47)	Toluene	13.516	91	5439	N.D.
48)	1,3-Dichloropropane	0.000	76	0	N.D.
49)	Methyl Butyl Ketone(2-...	0.000	43	0	N.D.
50)	Dibromochloromethane	0.000	129	0	N.D.
51)	1,2- Dibromoethane	0.000	107	0	N.D.
52)	Tetrachloroethene	0.000	166	0	N.D.
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0	N.D.
55)	Chlorobenzene	16.181	112	5194	N.D.
56)	Ethylbenzene	0.000	91	0	N.D.
57)	(m and /or p) Xylene	17.057	91	8879	N.D.
58)	Bromoform	17.160	173	6777	N.D.
59)	Butyl Acrylate	0.000	55	0	N.D.
60)	Styrene	0.000	104	0	N.D.
61)	1,1,2,2-Tetrachloroethane	0.000	83	0	N.D.
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0	N.D.
63)	1,2,3-Trichloropropane	0.000	110	0	N.D.
65)	Isopropylbenzene	0.000	105	0	N.D.
66)	Bromobenzene	0.000	156	0	N.D.
67)	o-Chlorotoluene	0.000	126	0	N.D.
68)	n-Propylbenzene	0.000	120	0	N.D.
69)	p-Chlorotoluene	0.000	126	0	N.D.
70)	1,3,5-Trimethylbenzene	0.000	105	0	N.D.
71)	tert-Butylbenzene	0.000	134	0	N.D.
72)	1,2,4-Trimethylbenzene	0.000	105	0	N.D.
73)	1,3-Dichlorobenzene	0.000	146	0	N.D.
74)	1,4-Dichlorobenzene	0.000	146	0	N.D.
75)	sec-Butylbenzene	0.000	105	0	N.D.
76)	p-Isopropyltoluene	0.000	119	0	N.D.
77)	1,2-Dichlorobenzene	0.000	146	0	N.D.
78)	n-Butylbenzene	0.000	91	0	N.D.
79)	1,2-Dibromo-3-chloropr...	0.000	157	0	N.D.
80)	1,2,4-Trichlorobenzene	0.000	180	0	N.D.
81)	Naphthalene	0.000	128	0	N.D.
82)	1,2,3-Trichlorobenzene	0.000	180	0	N.D.
83)	Hexachlorobutadiene	0.000	225	0	N.D.

(#) = qualifier out of range (m) = manual integration (+) = signals summed

TO15ppb8.M Tue Mar 23 11:58:22 2010

File :C:\msdchem\1\DATA\03232010\0323-05.D
Operator : JM
Acquired : 23 Mar 2010 12:39 pm using AcqMethod TO15FPB8.M
Instrument : 5973A MSD
Sample Name: 100cc IS, 50cc, AS15, 6437, TO15.mpt
Misc Info : Sample Date: 022610, Site: DigesterTRN #1, MSD
Vial Number: 5



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\03232010\
 Data File : 0323-05.D
 Acq On : 23 Mar 2010 12:39 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS15,6437,TO15.mpt
 Misc : Sample Date: 022610,Site: DigesterTRN #1, MSD
 ALS Vial : 5 Sample Multiplier: 30

Quant Time: Mar 24 16:39:36 2010
 Quant Method : C:\msdchem\1\METHODS\TO15ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Tue Mar 23 11:48:01 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\03232010\A0323-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.280	114	3495555	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.108	82	1725641	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.218	128	764966	4.23	ppbv	0.00
64) p-Bromofluorobenzene	18.603	174	1824425	4.10	ppbv	0.00

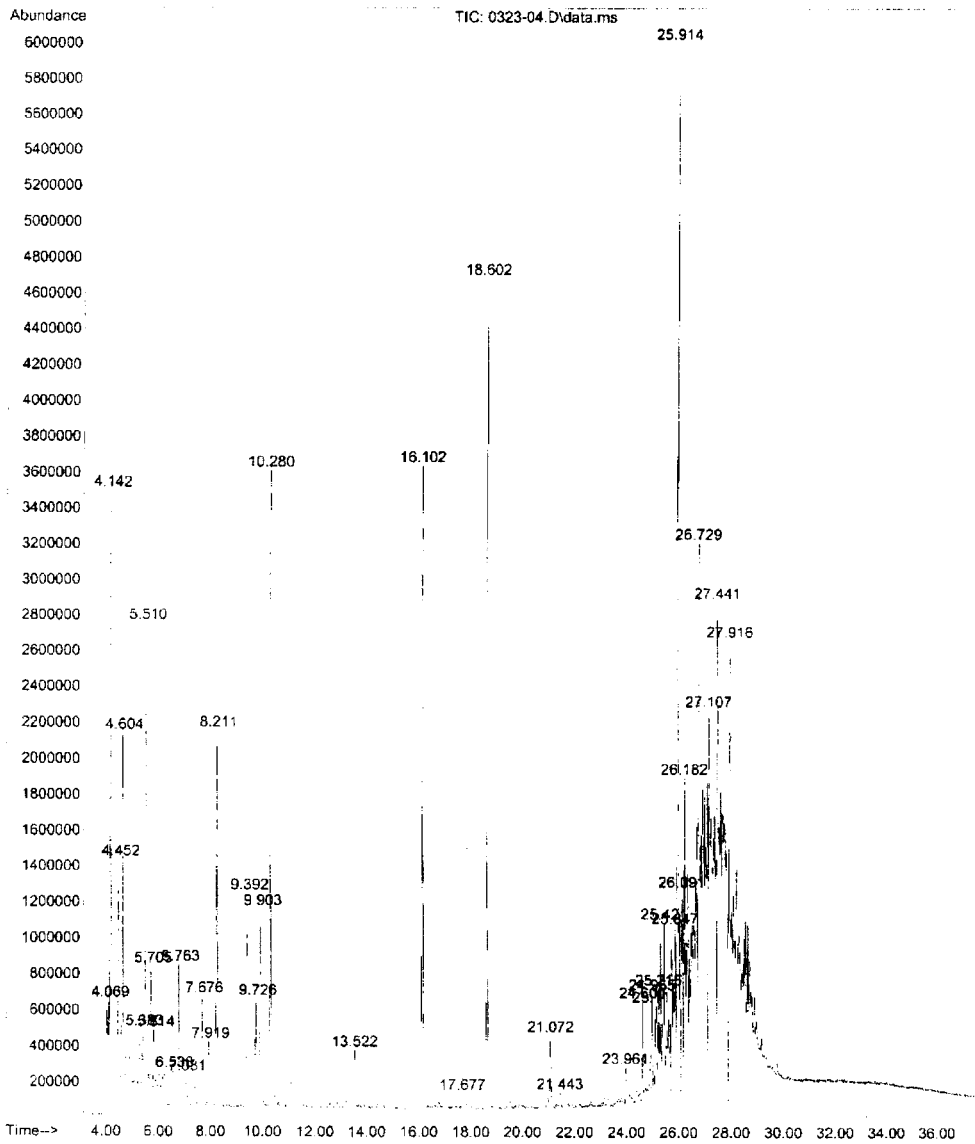
Target Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)	Qvalue
2) Freon 22 (ClF2Methane)	0.000	67	0	N.D.			
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.	d		
4) Chloromethane	4.343	50	138137	21.87	ppbv		99
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.			
6) Vinyl Chloride	0.000	62	0	N.D.			
7) 1,3- Butadiene	4.635	54	214336m	34.93	ppbv		
8) Bromomethane	0.000	94	0	N.D.			
9) Chloroethane	0.000	64	0	N.D.	d		
10) Acetone	5.511	58	1896013m	400.63	ppbv		
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.	d		
12) Acrylonitrile	0.000	53	0	N.D.	d		
13) 1,1-Dichloroethene	0.000	96	0	N.D.			
14) Methylene Chloride	6.235	84	35323	4.26	ppbv		89
15) Methyl Acetate	0.000	43	0	N.D.	d		
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.			
17) Carbon Disulfide	6.539	76	132460	5.73	ppbv		99
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.			
19) 1,1-Dichloroethane	0.000	63	0	N.D.			
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.			
21) Methyl Ethyl Ketone(2-...)	7.671	43	1965414	128.58	ppbv		98
22) Chloroprene(2-Cl-1,3-B...)	0.000	88	0	N.D.			
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.			
25) Hexane	0.000	57	0	N.D.	d		
26) Chloroform	0.000	83	0	N.D.	d		
27) 2,2-Dichloropropane	0.000	77	0	N.D.			
28) Dibromofluoromethane (...)	0.000	111	0	N.D.			
29) 1,2- Dichloroethane	0.000	62	0	N.D.			
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.			
31) 1,1- Dichloropropene	0.000	75	0	N.D.			
32) Benzene	9.903	78	1614361	68.27	ppbv		99
33) Carbon Tetrachloride	0.000	117	0	N.D.			
34) Cyclohexane	0.000	84	0	N.D.	d		
35) Dibromomethane	0.000	174	0	N.D.			
36) 1,2-Dichloropropane	0.000	63	0	N.D.			
37) Ethyl Acrylate	0.000	55	0	N.D.			
38) Bromodichloromethane	0.000	83	0	N.D.	d		
39) Trichloroethene	0.000	132	0	N.D.			
40) Methyl Methacrylate	11.388	69	11057m	1.54	ppbv		
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.			
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.			
43) Methyl Cyclohexane	0.000	98	0	N.D.			
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.			

45)	1,1,2-Trichloroethane	0.000	97	0	N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0	N.D.	
47)	Toluene	13.523	91	492711	17.91 ppbv	99
48)	1,3-Dichloropropane	0.000	76	0	N.D.	
49)	Methyl Butyl Ketone(2-...	13.985	43	31986	2.24 ppbv	90
50)	Dibromochloromethane	0.000	129	0	N.D.	
51)	1,2- Dibromoethane	0.000	107	0	N.D.	
52)	Tetrachloroethene	0.000	166	0	N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0	N.D.	
55)	Chlorobenzene	0.000	112	0	N.D. d	
56)	Ethylbenzene	16.778	91	39269	1.11 ppbv	95
57)	(m and /or p) Xylene	17.045	91	64630	2.31 ppbv	96
58)	Bromoform	0.000	173	0	N.D.	
59)	Butyl Acrylate	0.000	55	0	N.D. d	
60)	Styrene	0.000	104	0	N.D. d	
61)	1,1,2,2-Tetrachloroethane	0.000	83	0	N.D. d	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0	N.D. d	
63)	1,2,3-Trichloropropane	0.000	110	0	N.D.	
65)	Isopropylbenzene	0.000	105	0	N.D. d	
66)	Bromobenzene	0.000	156	0	N.D.	
67)	o-Chlorotoluene	0.000	126	0	N.D.	
68)	n-Propylbenzene	0.000	120	0	N.D.	
69)	p-Chlorotoluene	0.000	126	0	N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0	N.D. d	
71)	tert-Butylbenzene	0.000	134	0	N.D.	
72)	1,2,4-Trimethylbenzene	0.000	105	0	N.D. d	
73)	1,3-Dichlorobenzene	0.000	146	0	N.D.	
74)	1,4-Dichlorobenzene	21.444	146	118048	5.05 ppbv	97
75)	sec-Butylbenzene	0.000	105	0	N.D.	
76)	p-Isopropyltoluene	0.000	119	0	N.D. d	
77)	1,2-Dichlorobenzene	0.000	146	0	N.D.	
78)	n-Butylbenzene	0.000	91	0	N.D. d	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0	N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0	N.D. d	
81)	Naphthalene	25.745	128	35735m	1.08 ppbv	
82)	1,2,3-Trichlorobenzene	0.000	180	0	N.D. d	
83)	Hexachlorobutadiene	0.000	225	0	N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

TO15ppb8.M Wed Mar 24 16:39:41 2010

File :C:\msdchem\1\DATA\03232010\0323-04.D
Operator : JM
Acquired : 23 Mar 2010 11:50 am using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name : 100cc IS,50cc,AS15,6445,TO15.mpt
Misc Info : Sample Date: 022610,Site:NatGasTRN #4, MSD
Vial Number: 4



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\03232010\
 Data File : 0323-04.D
 Acq On : 23 Mar 2010 11:50 am
 Operator : JM
 Sample : 100cc IS,50cc,AS15,6445,TO15.mpt
 Misc : Sample Date: 022610,Site:NatGasTRN #4, MSD
 ALS Vial : 4 Sample Multiplier: 30

Quant Time: Mar 24 16:32:36 2010
 Quant Method : C:\msdchem\1\METHODS\TO15ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Tue Mar 23 11:48:01 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\03232010\A0323-02.D

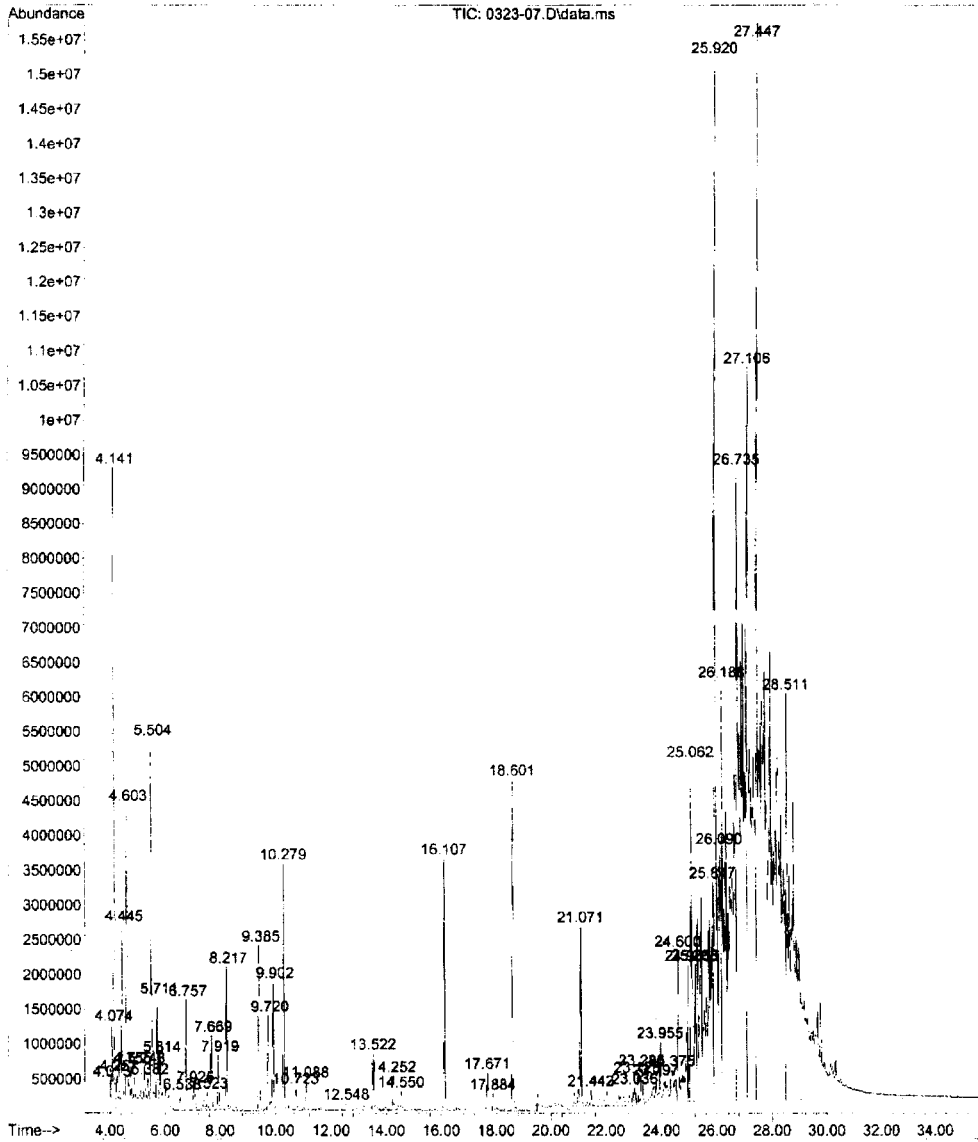
Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.280	114	3262956	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.102	82	1629256	4.16	ppbv	0.00
System Monitoring Compounds						
24) Bromochloromethane	8.211	128	706003	4.18	ppbv	0.00
64) p-Bromofluorobenzene	18.602	174	1744972	4.15	ppbv	0.00
Target Compounds						
2) Freon 22 (CLF2Methane)	4.111	67	23579	10.40	ppbv	94
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.	d	
4) Chloromethane	4.342	50	32485	5.51	ppbv	99
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.		
6) Vinyl Chloride	0.000	62	0	N.D.		
7) 1,3- Butadiene	0.000	54	0	N.D.	d	
8) Bromomethane	0.000	94	0	N.D.		
9) Chloroethane	0.000	64	0	N.D.		
10) Acetone	5.510	58	1176626m	266.35	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.	d	
12) Acrylonitrile	0.000	53	0	N.D.	d	
13) 1,1-Dichloroethene	0.000	96	0	N.D.		
14) Methylene Chloride	6.234	84	31760	4.11	ppbv	92
15) Methyl Acetate	0.000	43	0	N.D.	d	
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.		
17) Carbon Disulfide	6.538	76	102584	4.75	ppbv	99
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.		
19) 1,1-Dichloroethane	0.000	63	0	N.D.		
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.		
21) Methyl Ethyl Ketone(2-...)	7.676	43	899851	63.06	ppbv	99
22) Chloroprene(2-Cl-1,3-B...)	0.000	88	0	N.D.		
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.		
25) Hexane	0.000	57	0	N.D.		
26) Chloroform	0.000	83	0	N.D.	d	
27) 2,2-Dichloropropane	0.000	77	0	N.D.		
28) Dibromofluoromethane (...)	0.000	111	0	N.D.		
29) 1,2- Dichloroethane	0.000	62	0	N.D.		
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.		
31) 1,1- Dichloropropene	0.000	75	0	N.D.		
32) Benzene	9.903	78	1203140	54.50	ppbv	100
33) Carbon Tetrachloride	0.000	117	0	N.D.		
34) Cyclohexane	0.000	84	0	N.D.	d	
35) Dibromomethane	0.000	174	0	N.D.		
36) 1,2-Dichloropropane	0.000	63	0	N.D.		
37) Ethyl Acrylate	0.000	55	0	N.D.		
38) Bromodichloromethane	0.000	83	0	N.D.		
39) Trichloroethene	0.000	132	0	N.D.		
40) Methyl Methacrylate	0.000	69	0	N.D.		
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.		
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.		
43) Methyl Cyclohexane	0.000	98	0	N.D.		
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.		

45)	1,1,2-Trichloroethane	0.000	97	0	N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0	N.D.	
47)	Toluene	13.522	91	306653	11.94 ppbv	100
48)	1,3-Dichloropropane	0.000	76	0	N.D.	
49)	Methyl Butyl Ketone(2-...	0.000	43	0	N.D. d	
50)	Dibromochloromethane	0.000	129	0	N.D.	
51)	1,2- Dibromoethane	0.000	107	0	N.D.	
52)	Tetrachloroethene	0.000	166	0	N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0	N.D.	
55)	Chlorobenzene	0.000	112	0	N.D. d	
56)	Ethylbenzene	0.000	91	0	N.D. d	
57)	(m and /or p) Xylene	17.038	91	45946	1.74 ppbv	90
58)	Bromoform	0.000	173	0	N.D.	
59)	Butyl Acrylate	0.000	55	0	N.D. d	
60)	Styrene	0.000	104	0	N.D. d	
61)	1,1,1,2-Tetrachloroethane	0.000	83	0	N.D.	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0	N.D. d	
63)	1,2,3-Trichloropropane	0.000	110	0	N.D.	
65)	Isopropylbenzene	0.000	105	0	N.D.	
66)	Bromobenzene	0.000	156	0	N.D.	
67)	o-Chlorotoluene	0.000	126	0	N.D.	
68)	n-Propylbenzene	0.000	120	0	N.D.	
69)	p-Chlorotoluene	0.000	126	0	N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0	N.D.	
71)	tert-Butylbenzene	0.000	134	0	N.D.	
72)	1,2,4-Trimethylbenzene	0.000	105	0	N.D. d	
73)	1,3-Dichlorobenzene	0.000	146	0	N.D.	
74)	1,4-Dichlorobenzene	21.443	146	60631	2.75 ppbv	93
75)	sec-Butylbenzene	0.000	105	0	N.D.	
76)	p-Isopropyltoluene	0.000	119	0	N.D. d	
77)	1,2-Dichlorobenzene	0.000	146	0	N.D.	
78)	n-Butylbenzene	0.000	91	0	N.D. d	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0	N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0	N.D. d	
81)	Naphthalene	25.738	128	69812	2.23 ppbv	90
82)	1,2,3-Trichlorobenzene	0.000	180	0	N.D. d	
83)	Hexachlorobutadiene	0.000	225	0	N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

TO15ppb8.M Wed Mar 24 16:32:45 2010

File :C:\msdchem\1\DATA\03232010\0323-07.D
Operator : JM
Acquired : 23 Mar 2010 2:14 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name: 100cc IS,50cc,AS15,6443,TO15.mpt
Misc Info : Sample Date: 030510,DigesterTRN #1, MSD
Vial Number: 7



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\03232010\
 Data File : 0323-07.D
 Acq On : 23 Mar 2010 2:14 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS15,6443,TO15.mpt
 Misc : Sample Date: 030510,DigesterTRN #1, MSD
 ALS Vial : 7 Sample Multiplier: 30

Quant Time: Mar 25 09:25:12 2010
 Quant Method : C:\msdchem\1\METHODS\TO15ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Tue Mar 23 11:48:01 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\03232010\A0323-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.279	114	3370921	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.107	82	1692367	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.217	128	718929	4.12	ppbv	0.00
64) p-Bromofluorobenzene	18.601	174	1918648	4.40	ppbv	0.00

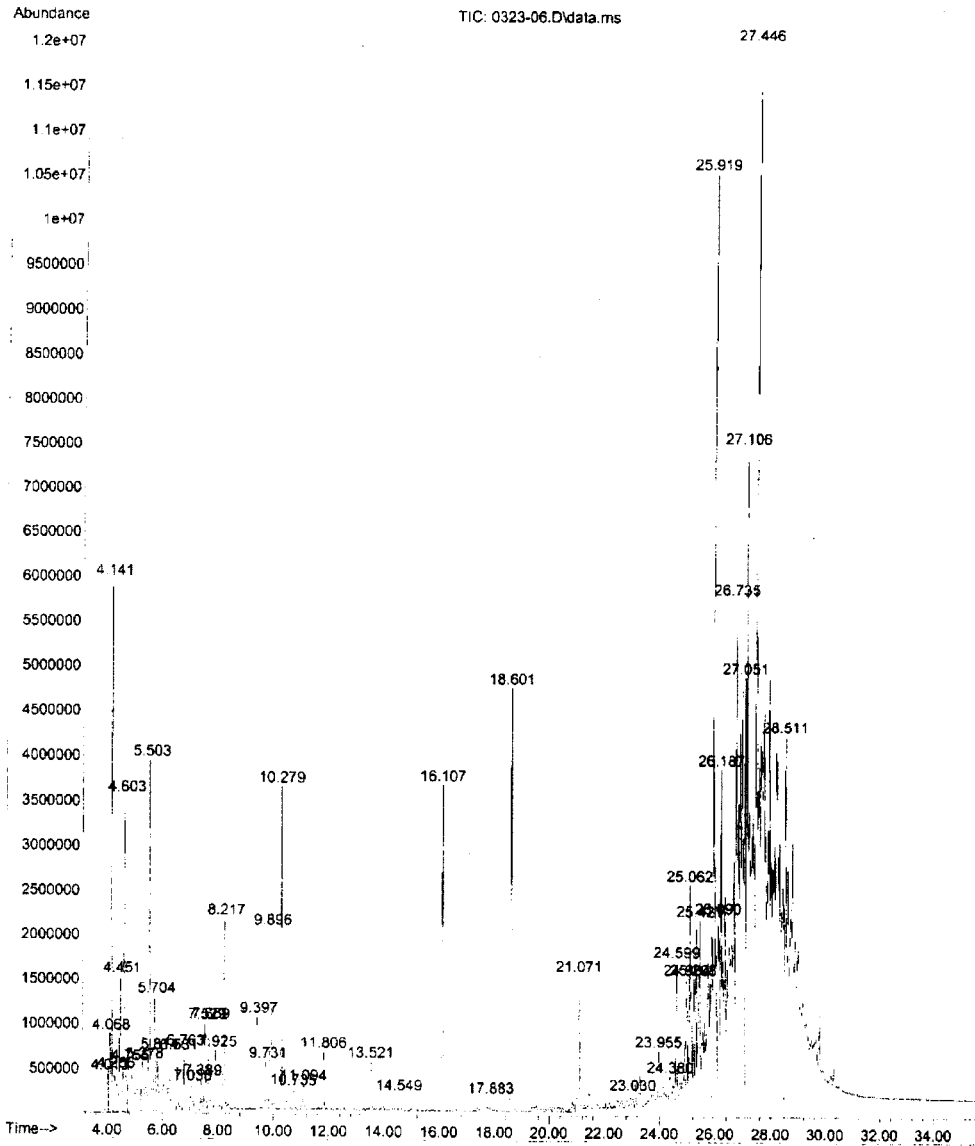
Target Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)	Qvalue
2) Freon 22 (ClF2Methane)	0.000	67	0	N.D.	d		
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.	d		
4) Chloromethane	4.342	50	170258	27.95	ppbv		100
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.			
6) Vinyl Chloride	0.000	62	0	N.D.			
7) 1,3- Butadiene	4.634	54	414514m	70.06	ppbv		
8) Bromomethane	0.000	94	0	N.D.			
9) Chloroethane	0.000	64	0	N.D.	d		
10) Acetone	5.504	58	2508645m	549.68	ppbv		
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.	d		
12) Acrylonitrile	0.000	53	0	N.D.	d		
13) 1,1-Dichloroethene	0.000	96	0	N.D.			
14) Methylene Chloride	6.228	84	27515	3.44	ppbv		92
15) Methyl Acetate	0.000	43	0	N.D.	d		
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.			
17) Carbon Disulfide	6.538	76	179679	8.06	ppbv		100
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.			
19) 1,1-Dichloroethane	0.000	63	0	N.D.			
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.			
21) Methyl Ethyl Ketone(2-...)	7.669	43	1727025	117.16	ppbv		95
22) Chloroprene(2-Cl-1,3-B...	0.000	88	0	N.D.			
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.			
25) Hexane	8.235	57	13562m	1.15	ppbv		
26) Chloroform	0.000	83	0	N.D.	d		
27) 2,2-Dichloropropane	0.000	77	0	N.D.			
28) Dibromofluoromethane (...)	0.000	111	0	N.D.			
29) 1,2- Dichloroethane	0.000	62	0	N.D.			
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.			
31) 1,1- Dichloropropene	0.000	75	0	N.D.			
32) Benzene	9.902	78	2091564	91.72	ppbv		99
33) Carbon Tetrachloride	0.000	117	0	N.D.			
34) Cyclohexane	0.000	84	0	N.D.	d		
35) Dibromomethane	0.000	174	0	N.D.			
36) 1,2-Dichloropropane	0.000	63	0	N.D.			
37) Ethyl Acrylate	0.000	55	0	N.D.			
38) Bromodichloromethane	0.000	83	0	N.D.	d		
39) Trichloroethene	0.000	132	0	N.D.			
40) Methyl Methacrylate	11.393	69	17363m	2.51	ppbv		
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.			
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.			
43) Methyl Cyclohexane	0.000	98	0	N.D.			
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.			

45)	1,1,2-Trichloroethane	0.000	97	0		N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0		N.D.	
47)	Toluene	13.522	91	783367	29.54	ppbv	99
48)	1,3-Dichloropropane	0.000	76	0		N.D. d	
49)	Methyl Butyl Ketone(2-...	13.978	43	49701	3.61	ppbv	90
50)	Dibromochloromethane	0.000	129	0		N.D.	
51)	1,2- Dibromoethane	0.000	107	0		N.D.	
52)	Tetrachloroethene	0.000	166	0		N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0		N.D.	
55)	Chlorobenzene	0.000	112	0		N.D. d	
56)	Ethylbenzene	16.770	91	64742	1.86	ppbv	96
57)	(m and /or p) Xylene	17.044	91	116394	4.25	ppbv	97
58)	Bromoform	0.000	173	0		N.D.	
59)	Butyl Acrylate	0.000	55	0		N.D. d	
60)	Styrene	17.665	104	55787	2.81	ppbv	70
61)	1,1,2,2-Tetrachloroethane	0.000	83	0		N.D. d	
62)	o-Xylene (1,2-Dimethyl...	17.823	91	54781	1.77	ppbv	92
63)	1,2,3-Trichloropropane	0.000	110	0		N.D.	
65)	Isopropylbenzene	0.000	105	0		N.D. d	
66)	Bromobenzene	0.000	156	0		N.D.	
67)	o-Chlorotoluene	0.000	126	0		N.D.	
68)	n-Propylbenzene	0.000	120	0		N.D. d	
69)	p-Chlorotoluene	0.000	126	0		N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0		N.D. d	
71)	tert-Butylbenzene	0.000	134	0		N.D. d	
72)	1,2,4-Trimethylbenzene	0.000	105	0		N.D. d	
73)	1,3-Dichlorobenzene	0.000	146	0		N.D.	
74)	1,4-Dichlorobenzene	21.442	146	156426	6.83	ppbv	94
75)	sec-Butylbenzene	0.000	105	0		N.D. d	
76)	p-Isopropyltoluene	0.000	119	0		N.D. d	
77)	1,2-Dichlorobenzene	0.000	146	0		N.D.	
78)	n-Butylbenzene	0.000	91	0		N.D. d	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0		N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0		N.D. d	
81)	Naphthalene	0.000	128	0		N.D. d	
82)	1,2,3-Trichlorobenzene	0.000	180	0		N.D. d	
83)	Hexachlorobutadiene	0.000	225	0		N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

TO15ppb8.M Thu Mar 25 09:25:20 2010

File :C:\msdchem\1\DATA\03232010\0323-06.D
Operator : JM
Acquired : 23 Mar 2010 1:27 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name: 100cc IS, 50cc, AS15, 6455, TO15.mpt
Misc Info : Sample Date: 030510, Site: Site:NatGasTRN #4,
Vial Number: 6



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\03232010\
 Data File : 0323-06.D
 Acq On : 23 Mar 2010 1:27 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS15,6455,TO15.mpt
 Misc : Sample Date: 030510,Site: Site:NatGasTRN #4,
 ALS Vial : 6 Sample Multiplier: 30

Quant Time: Mar 25 09:12:33 2010
 Quant Method : C:\msdchem\1\METHODS\TO15ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Tue Mar 23 11:48:01 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\03232010\A0323-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.279	114	3355498	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.101	82	1702387	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.217	128	706818	4.07	ppbv	0.00
64) p-Bromofluorobenzene	18.601	174	1842933	4.20	ppbv	0.00

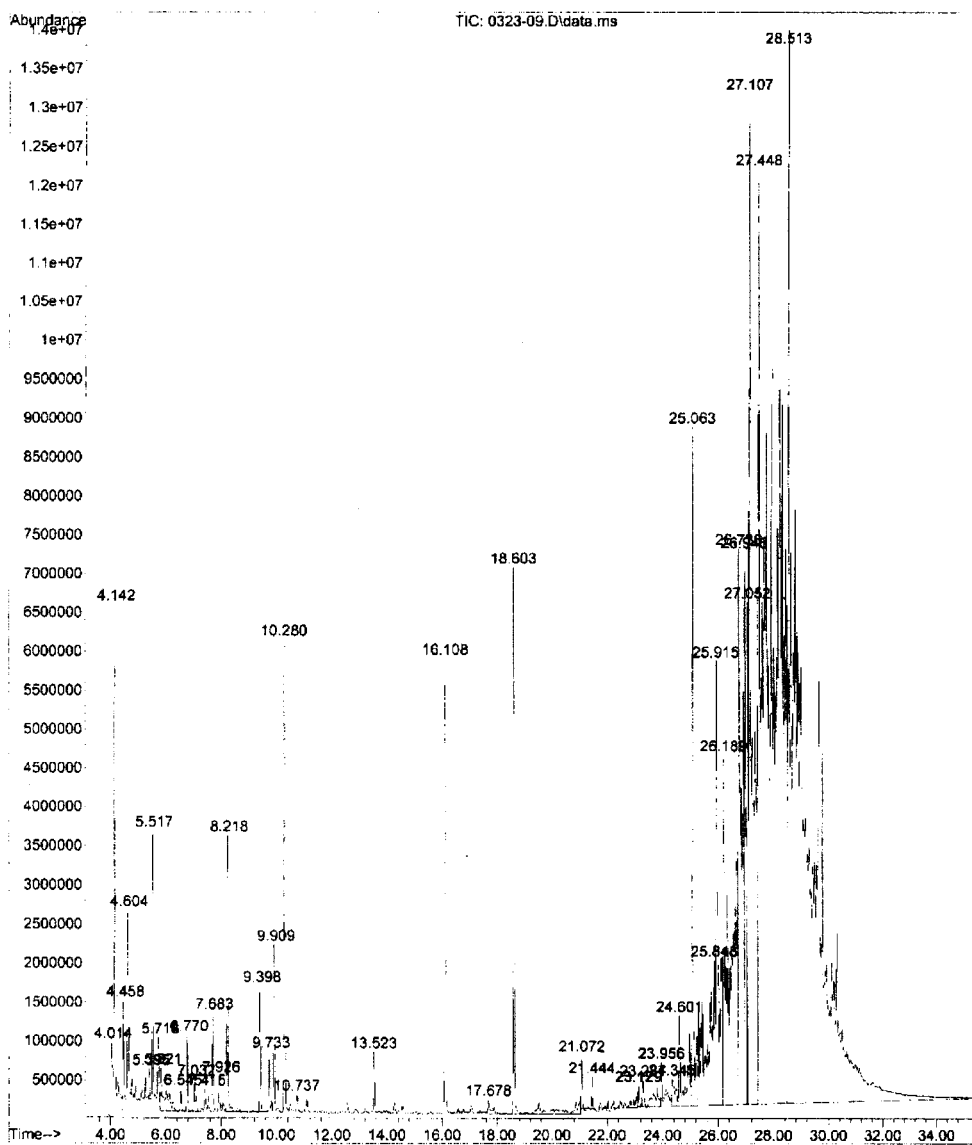
Target Compounds	R.T.	QIon	Response	Conc	Units	Qvalue
2) Freon 22 (ClF2Methane)	0.000	67	0	N.D.	d	
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.	d	
4) Chloromethane	4.341	50	137133	22.62	ppbv	98
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.		
6) Vinyl Chloride	0.000	62	0	N.D.		
7) 1,3- Butadiene	4.633	54	431939m	73.34	ppbv	
8) Bromomethane	0.000	94	0	N.D.	d	
9) Chloroethane	0.000	64	0	N.D.	d	
10) Acetone	5.509	58	1754771m	386.26	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.		
12) Acrylonitrile	0.000	53	0	N.D.	d	
13) 1,1-Dichloroethene	0.000	96	0	N.D.		
14) Methylene Chloride	6.233	84	36454	4.58	ppbv	89
15) Methyl Acetate	0.000	43	0	N.D.	d	
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.		
17) Carbon Disulfide	6.544	76	142561	6.42	ppbv	97
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.		
19) 1,1-Dichloroethane	0.000	63	0	N.D.		
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.	d	
21) Methyl Ethyl Ketone(2-...)	7.669	43	1441615	98.25	ppbv	97
22) Chloroprene(2-Cl-1,3-B...)	0.000	88	0	N.D.		
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.		
25) Hexane	0.000	57	0	N.D.	d	
26) Chloroform	0.000	83	0	N.D.	d	
27) 2,2-Dichloropropane	0.000	77	0	N.D.		
28) Dibromofluoromethane (...)	0.000	111	0	N.D.		
29) 1,2-Dichloroethane	0.000	62	0	N.D.		
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.		
31) 1,1-Dichloropropene	0.000	75	0	N.D.		
32) Benzene	9.902	78	1900565	83.72	ppbv	98
33) Carbon Tetrachloride	0.000	117	0	N.D.		
34) Cyclohexane	0.000	84	0	N.D.	d	
35) Dibromomethane	0.000	174	0	N.D.		
36) 1,2-Dichloropropane	0.000	63	0	N.D.		
37) Ethyl Acrylate	0.000	55	0	N.D.		
38) Bromodichloromethane	0.000	83	0	N.D.	d	
39) Trichloroethene	0.000	132	0	N.D.		
40) Methyl Methacrylate	0.000	69	0	N.D.		
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.		
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.		
43) Methyl Cyclohexane	0.000	98	0	N.D.		
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.		

45)	1,1,2-Trichloroethane	0.000	97	0		N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0		N.D.	
47)	Toluene	13.527	91	531451		20.13 ppbv	99
48)	1,3-Dichloropropane	0.000	76	0		N.D.	
49)	Methyl Butyl Ketone(2-...	13.984	43	39743		2.90 ppbv	79
50)	Dibromochloromethane	0.000	129	0		N.D.	
51)	1,2- Dibromoethane	0.000	107	0		N.D.	
52)	Tetrachloroethene	0.000	166	0		N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0		N.D.	
55)	Chlorobenzene	0.000	112	0		N.D. d	
56)	Ethylbenzene	16.764	91	38499m		1.10 ppbv	
57)	(m and /or p) Xylene	17.044	91	70963		2.57 ppbv	95
58)	Bromoform	0.000	173	0		N.D.	
59)	Butyl Acrylate	0.000	55	0		N.D. d	
60)	Styrene	17.658	104	36865m		1.85 ppbv	
61)	1,1,1,2-Tetrachloroethane	0.000	83	0		N.D. d	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0		N.D. d	
63)	1,2,3-Trichloropropane	0.000	110	0		N.D.	
65)	Isopropylbenzene	0.000	105	0		N.D. d	
66)	Bromobenzene	0.000	156	0		N.D.	
67)	o-Chlorotoluene	0.000	126	0		N.D.	
68)	n-Propylbenzene	0.000	120	0		N.D.	
69)	p-Chlorotoluene	0.000	126	0		N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0		N.D. d	
71)	tert-Butylbenzene	0.000	134	0		N.D. d	
72)	1,2,4-Trimethylbenzene	0.000	105	0		N.D. d	
73)	1,3-Dichlorobenzene	0.000	146	0		N.D.	
74)	1,4-Dichlorobenzene	21.442	146	141225		6.13 ppbv	98
75)	sec-Butylbenzene	0.000	105	0		N.D.	
76)	p-Isopropyltoluene	0.000	119	0		N.D. d	
77)	1,2-Dichlorobenzene	0.000	146	0		N.D.	
78)	n-Butylbenzene	0.000	91	0		N.D. d	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0		N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0		N.D. d	
81)	Naphthalene	25.737	128	90324		2.76 ppbv	90
82)	1,2,3-Trichlorobenzene	0.000	180	0		N.D. d	
83)	Hexachlorobutadiene	0.000	225	0		N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

TO15ppb8.M Thu Mar 25 09:13:02 2010

File : C:\msdchem\1\DATA\03232010\0323-09.D
Operator : JM
Acquired : 23 Mar 2010 3:49 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name: 100cc IS, 500cc, AS15, 6449, TO15.mpt
Misc Info : Sample Date: 031210, Site: DigesterTRN #4, MSD
Vial Number: 9



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\03232010\
 Data File : 0323-09.D
 Acq On : 23 Mar 2010 3:49 pm
 Operator : JM
 Sample : 100cc IS,500cc,AS15,6449,TO15.mpt
 Misc : Sample Date: 031210,Site: DigesterTRN #4, MSD
 ALS Vial : 9 Sample Multiplier: 30

Quant Time: Mar 25 09:37:33 2010
 Quant Method : C:\msdchem\1\METHODS\TO15ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Tue Mar 23 11:48:01 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\03232010\A0323-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.286	114	6329976	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.108	82	2700843	4.16	ppbv	0.00
System Monitoring Compounds						
24) Bromochloromethane	8.218	128	1357245	4.14	ppbv	0.00
64) p-Bromofluorobenzene	18.603	174	3058046	4.39	ppbv	0.00
Target Compounds						
2) Freon 22 (ClF2Methane)	0.000	67	0	N.D.	d	
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.	d	
4) Chloromethane	4.343	50	42901	3.75	ppbv	98
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.		
6) Vinyl Chloride	0.000	62	0	N.D.		
7) 1,3- Butadiene	4.635	54	370828m	33.38	ppbv	
8) Bromomethane	0.000	94	0	N.D.		
9) Chloroethane	0.000	64	0	N.D.		
10) Acetone	5.517	58	1596709m	186.31	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.		
12) Acrylonitrile	0.000	53	0	N.D.	d	
13) 1,1-Dichloroethene	0.000	96	0	N.D.		
14) Methylene Chloride	6.247	84	45675	3.04	ppbv	90
15) Methyl Acetate	0.000	43	0	N.D.	d	
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.		
17) Carbon Disulfide	6.539	76	196782	4.70	ppbv	98
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.		
19) 1,1-Dichloroethane	0.000	63	0	N.D.		
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.		
21) Methyl Ethyl Ketone(2-...)	7.683	43	1974637	71.34	ppbv	94
22) Chloroprene(2-Cl-1,3-B...	0.000	88	0	N.D.		
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.		
25) Hexane	0.000	57	0	N.D.	d	
26) Chloroform	0.000	83	0	N.D.	d	
27) 2,2-Dichloropropane	0.000	77	0	N.D.		
28) Dibromofluoromethane (...)	0.000	111	0	N.D.		
29) 1,2- Dichloroethane	0.000	62	0	N.D.		
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.		
31) 1,1- Dichloropropene	0.000	75	0	N.D.		
32) Benzene	9.909	78	2538857	59.29	ppbv	98
33) Carbon Tetrachloride	0.000	117	0	N.D.		
34) Cyclohexane	0.000	84	0	N.D.	d	
35) Dibromomethane	0.000	174	0	N.D.		
36) 1,2-Dichloropropane	0.000	63	0	N.D.		
37) Ethyl Acrylate	0.000	55	0	N.D.		
38) Bromodichloromethane	0.000	83	0	N.D.	d	
39) Trichloroethene	0.000	132	0	N.D.		
40) Methyl Methacrylate	0.000	69	0	N.D.	d	
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.		
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.		
43) Methyl Cyclohexane	0.000	98	0	N.D.		
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.		

45)	1,1,2-Trichloroethane	0.000	97	0		N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0		N.D.	
47)	Toluene	13.523	91	802894		16.12 ppbv	98
48)	1,3-Dichloropropane	0.000	76	0		N.D. d	
49)	Methyl Butyl Ketone(2-...	0.000	43	0		N.D. d	
50)	Dibromochloromethane	0.000	129	0		N.D.	
51)	1,2- Dibromoethane	0.000	107	0		N.D.	
52)	Tetrachloroethene	0.000	166	0		N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0		N.D.	
55)	Chlorobenzene	0.000	112	0		N.D. d	
56)	Ethylbenzene	0.000	91	0		N.D. d	
57)	(m and /or p) Xylene	17.045	91	108083		2.47 ppbv	95
58)	Bromoform	0.000	173	0		N.D.	
59)	Butyl Acrylate	0.000	55	0		N.D. d	
60)	Styrene	17.647	104	63498		2.01 ppbv	94
61)	1,1,2,2-Tetrachloroethane	0.000	83	0		N.D. d	
62)	o-Xylene (1,2-Dimethyl...	0.000	91	0		N.D. d	
63)	1,2,3-Trichloropropane	0.000	110	0		N.D.	
65)	Isopropylbenzene	0.000	105	0		N.D. d	
66)	Bromobenzene	0.000	156	0		N.D.	
67)	o-Chlorotoluene	0.000	126	0		N.D.	
68)	n-Propylbenzene	0.000	120	0		N.D. d	
69)	p-Chlorotoluene	0.000	126	0		N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0		N.D. d	
71)	tert-Butylbenzene	0.000	134	0		N.D. d	
72)	1,2,4-Trimethylbenzene	0.000	105	0		N.D. d	
73)	1,3-Dichlorobenzene	0.000	146	0		N.D.	
74)	1,4-Dichlorobenzene	21.450	146	304224		8.32 ppbv	99
75)	sec-Butylbenzene	0.000	105	0		N.D.	
76)	p-Isopropyltoluene	0.000	119	0		N.D. d	
77)	1,2-Dichlorobenzene	0.000	146	0		N.D.	
78)	n-Butylbenzene	0.000	91	0		N.D. d	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0		N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0		N.D. d	
81)	Naphthalene	25.738	128	213759		4.11 ppbv	97
82)	1,2,3-Trichlorobenzene	0.000	180	0		N.D. d	
83)	Hexachlorobutadiene	0.000	225	0		N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

TO15ppb8.M Thu Mar 25 09:37:38 2010

Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\03232010\
 Data File : 0323-08.D
 Acq On : 23 Mar 2010 3:02 pm
 Operator : JM
 Sample : 100cc IS,50cc,AS15,6447,TO15.mpt
 Misc : Sample Date: 031210,Site: NatGasTRN #4
 ALS Vial : 8 Sample Multiplier: 30

Quant Time: Mar 25 09:32:29 2010
 Quant Method : C:\msdchem\1\METHODS\TO15ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 Qlast Update : Tue Mar 23 11:48:01 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\03232010\A0323-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.280	114	4564908	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.102	82	2055654	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.218	128	1028208	4.35	ppbv	0.00
64) p-Bromofluorobenzene	18.602	174	2321539	4.38	ppbv	0.00

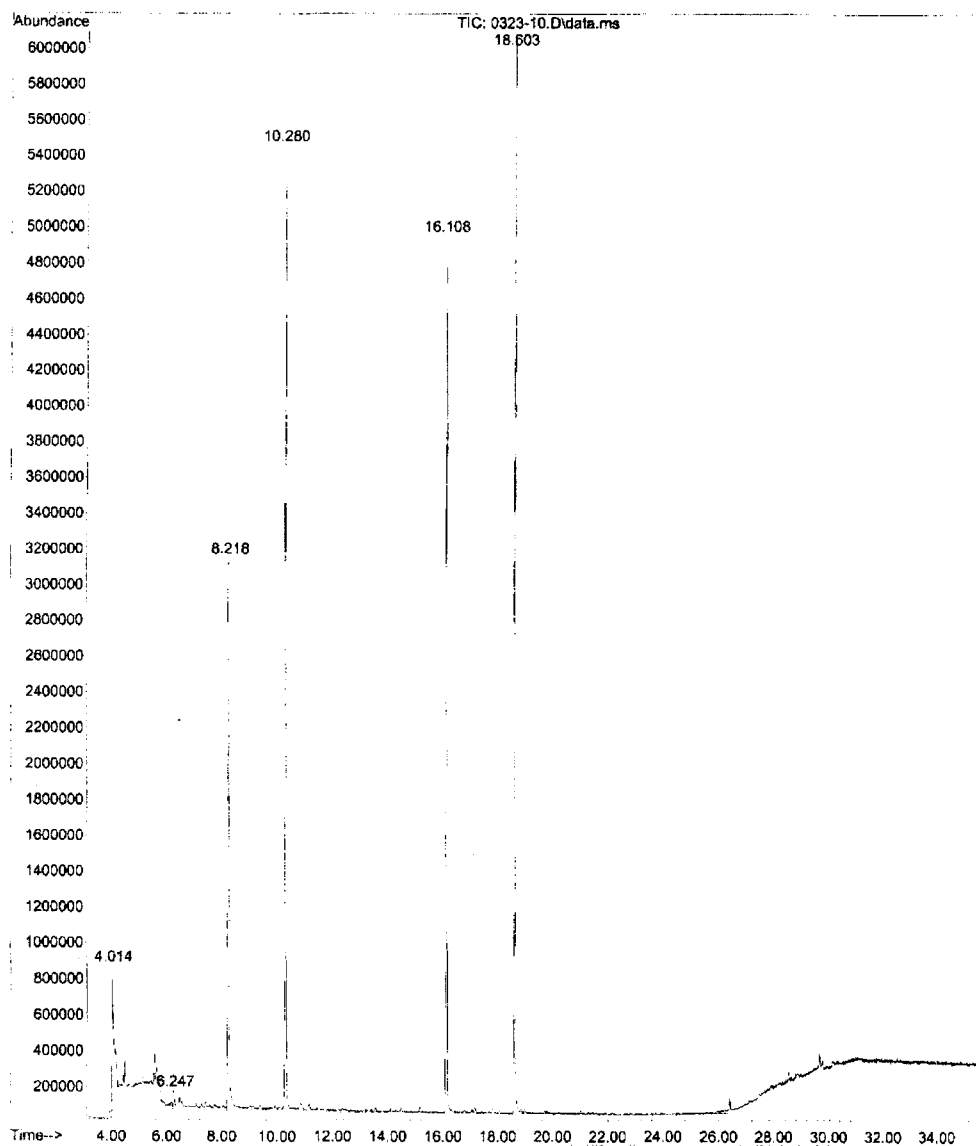
Target Compounds	R.T.	QIon	Response	Conc	Units	Qvalue
2) Freon 22 (ClF2Methane)	0.000	67	0	N.D.	d	
3) Freon 12 (Cl2F2Methane)	0.000	85	0	N.D.	d	
4) Chloromethane	4.343	50	124434	15.09	ppbv	99
5) Freon 114 (Cl2F4Ethane)	0.000	85	0	N.D.		
6) Vinyl Chloride	0.000	62	0	N.D.		
7) 1,3- Butadiene	4.635	54	416239m	51.95	ppbv	
8) Bromomethane	0.000	94	0	N.D.		
9) Chloroethane	0.000	64	0	N.D.		
10) Acetone	5.505	58	2422316m	391.94	ppbv	
11) Freon 11 (Cl3Fmethane)	0.000	101	0	N.D.		
12) Acrylonitrile	0.000	53	0	N.D.	d	
13) 1,1-Dichloroethene	0.000	96	0	N.D.	d	
14) Methylene Chloride	6.235	84	38951	3.60	ppbv	85
15) Methyl Acetate	0.000	43	0	N.D.	d	
16) Freon 113 (Cl3F3Ethane)	0.000	101	0	N.D.		
17) Carbon Disulfide	6.539	76	344657	11.41	ppbv	99
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.		
19) 1,1-Dichloroethane	0.000	63	0	N.D.		
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.	d	
21) Methyl Ethyl Ketone(2-...	7.670	43	2397933	120.12	ppbv	94
22) Chloroprene(2-Cl-1,3-B...	0.000	88	0	N.D.		
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.		
25) Hexane	0.000	57	0	N.D.	d	
26) Chloroform	0.000	83	0	N.D.	d	
27) 2,2-Dichloropropane	0.000	77	0	N.D.		
28) Dibromofluoromethane (...)	0.000	111	0	N.D.		
29) 1,2- Dichloroethane	0.000	62	0	N.D.		
30) 1,1,1-Trichloroethane	0.000	97	0	N.D.		
31) 1,1- Dichloropropene	0.000	75	0	N.D.		
32) Benzene	9.903	78	3415745	110.60	ppbv	98
33) Carbon Tetrachloride	0.000	117	0	N.D.		
34) Cyclohexane	0.000	84	0	N.D.	d	
35) Dibromomethane	0.000	174	0	N.D.		
36) 1,2-Dichloropropane	0.000	63	0	N.D.		
37) Ethyl Acrylate	0.000	55	0	N.D.		
38) Bromodichloromethane	0.000	83	0	N.D.	d	
39) Trichloroethene	0.000	132	0	N.D.		
40) Methyl Methacrylate	0.000	69	0	N.D.	d	
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.		
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.	d	
43) Methyl Cyclohexane	0.000	98	0	N.D.		
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.		

45)	1,1,2-Trichloroethane	0.000	97	0		N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0		N.D.	
47)	Toluene	13.523	91	1270997		35.39 ppbv	99
48)	1,3-Dichloropropane	0.000	76	0		N.D. d	
49)	Methyl Butyl Ketone(2-...	13.991	43	62294		3.34 ppbv	92
50)	Dibromochloromethane	0.000	129	0		N.D.	
51)	1,2- Dibromoethane	0.000	107	0		N.D.	
52)	Tetrachloroethene	0.000	166	0		N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0		N.D.	
55)	Chlorobenzene	0.000	112	0		N.D. d	
56)	Ethylbenzene	16.771	91	94588		2.24 ppbv	97
57)	(m and /or p) Xylene	17.039	91	190297		5.72 ppbv	96
58)	Bromoform	0.000	173	0		N.D.	
59)	Butyl Acrylate	0.000	55	0		N.D. d	
60)	Styrene	17.659	104	77635		3.22 ppbv	93
61)	1,1,2,2-Tetrachloroethane	0.000	83	0		N.D. d	
62)	o-Xylene (1,2-Dimethyl...	17.824	91	65858		1.75 ppbv	93
63)	1,2,3-Trichloropropane	0.000	110	0		N.D.	
65)	Isopropylbenzene	0.000	105	0		N.D. d	
66)	Bromobenzene	0.000	156	0		N.D.	
67)	o-Chlorotoluene	0.000	126	0		N.D.	
68)	n-Propylbenzene	0.000	120	0		N.D. d	
69)	p-Chlorotoluene	0.000	126	0		N.D.	
70)	1,3,5-Trimethylbenzene	0.000	105	0		N.D. d	
71)	tert-Butylbenzene	0.000	134	0		N.D. d	
72)	1,2,4-Trimethylbenzene	21.017	105	58417		1.30 ppbv	93
73)	1,3-Dichlorobenzene	0.000	146	0		N.D.	
74)	1,4-Dichlorobenzene	21.443	146	244155		8.77 ppbv	98
75)	sec-Butylbenzene	0.000	105	0		N.D. d	
76)	p-Isopropyltoluene	0.000	119	0		N.D. d	
77)	1,2-Dichlorobenzene	0.000	146	0		N.D.	
78)	n-Butylbenzene	0.000	91	0		N.D. d	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0		N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0		N.D. d	
81)	Naphthalene	25.738	128	253515		6.40 ppbv	97
82)	1,2,3-Trichlorobenzene	0.000	180	0		N.D. d	
83)	Hexachlorobutadiene	0.000	225	0		N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

TO15ppb8.M Thu Mar 25 09:32:36 2010

File : C:\msdchem\1\DATA\03232010\0323-10.D
Operator : JM
Acquired : 23 Mar 2010 4:40 pm using AcqMethod TO15PPB8.M
Instrument : 5973A MSD
Sample Name: 100cc IS, 500cc, AS11, 6440, TO15.mpt
Misc Info : Sample Date: 031610, Site: MethBlink
Vial Number: 10



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\03232010\
 Data File : 0323-10.D
 Acq On : 23 Mar 2010 4:40 pm
 Operator : JM
 Sample : 100cc IS,500cc,AS11,6440,TO15.mpt
 Misc : Sample Date: 031610,Site:MethBlnk
 ALS Vial : 10 Sample Multiplier: 1.25

Quant Time: Mar 25 10:12:43 2010
 Quant Method : C:\msdchem\1\METHODS\TO15ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Tue Mar 23 11:48:01 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\03232010\A0323-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) 1,4-Difluorobenzene	10.286	114	5491350	4.12	ppbv	0.00
53) Chlorobenzene-d5	16.108	82	2166452	4.16	ppbv	0.00

System Monitoring Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)
24) Bromochloromethane	8.224	128	1217659	4.29	ppbv	0.00
64) p-Bromofluorobenzene	18.603	174	2397093	4.29	ppbv	0.00

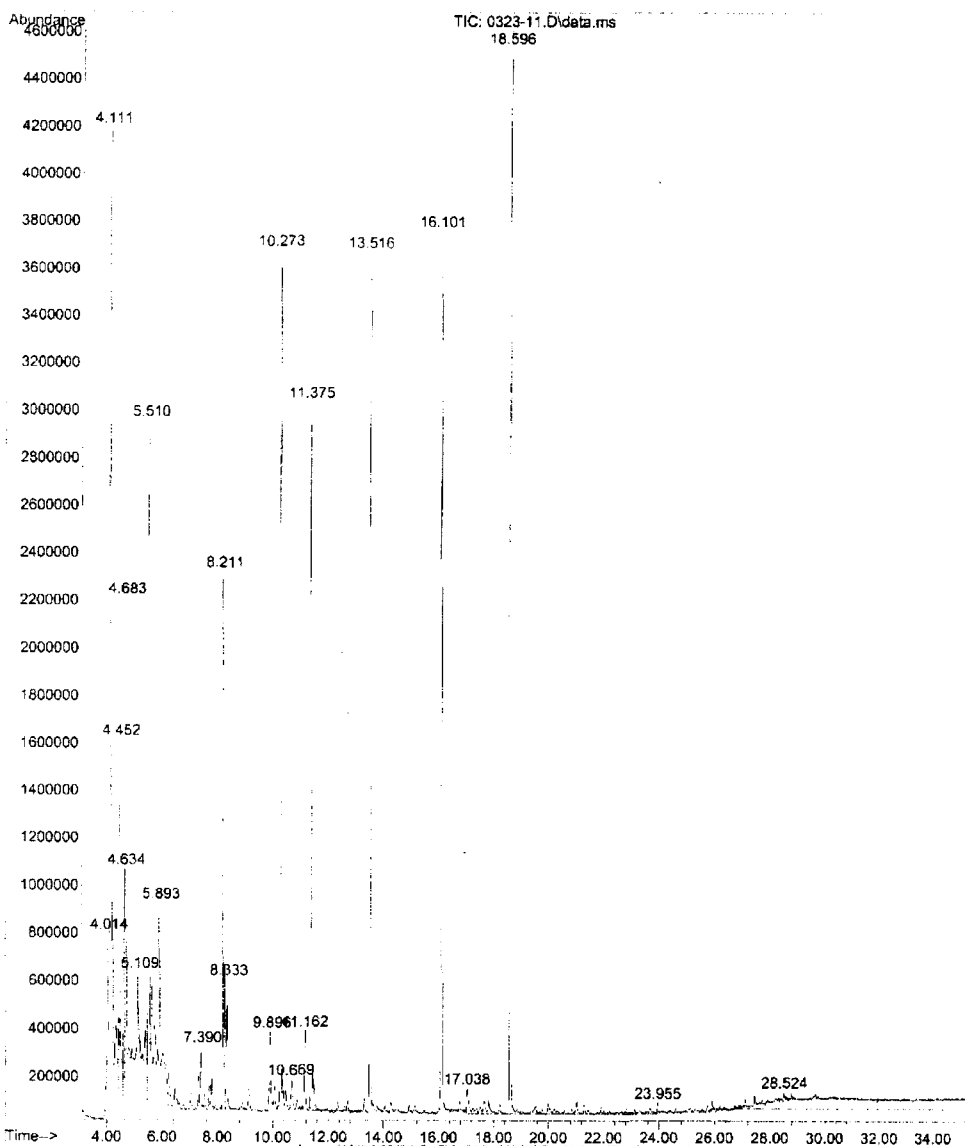
Target Compounds	R.T.	QIon	Response	Conc	Units	Dev(Min)	Qvalue
2) Freon 22 (CLF2Methane)	4.118	67	6033	N.D.			
3) Freon 12 (Cl2F2Methane)	4.215	85	44252	0.04	ppbv		95
4) Chloromethane	0.000	50	0	N.D.	d		
5) Freon 114 (Cl2F4Ethane)	4.422	85	34561	N.D.			
6) Vinyl Chloride	4.531	62	11750	N.D.			
7) 1,3- Butadiene	4.647	54	9038	N.D.			
8) Bromomethane	0.000	94	0	N.D.	d		
9) Chloroethane	4.994	64	5995	N.D.			
10) Acetone	5.553	58	76816m	0.43	ppbv		
11) Freon 11 (Cl3Fmethane)	5.620	101	44881	N.D.			
12) Acrylonitrile	5.888	53	8023	N.D.			
13) 1,1-Dichloroethene	6.156	96	9165	N.D.			
14) Methylene Chloride	6.241	84	49057	0.16	ppbv		93
15) Methyl Acetate	6.259	43	25658	0.05	ppbv		89
16) Freon 113 (Cl3F3Ethane)	6.460	101	29288	N.D.			
17) Carbon Disulfide	6.551	76	53737m	0.06	ppbv		
18) Trans-1,2-Dichloroethene	7.074	96	9260	N.D.			
19) 1,1-Dichloroethane	7.257	63	19497	N.D.			
20) Methyl T-Butyl Ether (...)	7.409	73	11360	N.D.			
21) Methyl Ethyl Ketone(2-...	7.731	43	30017	0.05	ppbv		95
22) Chloroprene(2-Cl-1,3-B...	0.000	88	0	N.D.			
23) cis-1,2-Dichloroethene	8.054	96	8160	N.D.			
25) Hexane	8.255	57	9561	N.D.			
26) Chloroform	8.340	83	30343	0.03	ppbv		94
27) 2,2-Dichloropropane	8.376	77	21296	N.D.			
28) Dibromofluoromethane (...)	0.000	111	0	N.D.			
29) 1,2- Dichloroethane	9.118	62	15227	N.D.			
30) 1,1,1-Trichloroethane	9.398	97	30676	N.D.			
31) 1,1- Dichloropropene	9.739	75	7435	N.D.			
32) Benzene	9.903	78	35338	N.D.			
33) Carbon Tetrachloride	10.073	117	17843	N.D.			
34) Cyclohexane	0.000	84	0	N.D.	d		
35) Dibromomethane	10.822	174	15009	N.D.			
36) 1,2-Dichloropropane	10.852	63	9916	N.D.			
37) Ethyl Acrylate	10.895	55	6551	N.D.			
38) Bromodichloromethane	11.083	83	25062	N.D.			
39) Trichloroethene	11.132	132	10934	N.D.			
40) Methyl Methacrylate	0.000	69	0	N.D.			
41) cis-1,3-Dichloropropene	12.215	75	7769	N.D.			
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.			
43) Methyl Cyclohexane	0.000	98	0	N.D.			
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.			

45)	1,1,2-Trichloroethane	13.127	97	12003	N.D.
46)	Toluene-d8 (SMC)	0.000	98	0	N.D. d
47)	Toluene	13.529	91	16595	N.D.
48)	1,3-Dichloropropane	13.553	76	8887m	0.01 ppbv
49)	Methyl Butyl Ketone(2-...	0.000	43	0	N.D.
50)	Dibromochloromethane	14.119	129	14751	N.D.
51)	1,2-Dibromoethane	14.478	107	14346	N.D.
52)	Tetrachloroethene	15.159	166	12573	N.D.
54)	1,1,1,2-Tetrachloroe...	0.000	131	0	N.D. d
55)	Chlorobenzene	16.175	112	25949	N.D.
56)	Ethylbenzene	16.771	91	13266	N.D.
57)	(m and /or p) Xylene	17.045	91	17197	N.D.
58)	Bromoform	17.155	173	21815	N.D.
59)	Butyl Acrylate	0.000	55	0	N.D.
60)	Styrene	0.000	104	0	N.D.
61)	1,1,2,2-Tetrachloroethane	17.812	83	21850	N.D.
62)	o-Xylene (1,2-Dimethyl...	17.830	91	10513	N.D.
63)	1,2,3-Trichloropropane	18.043	110	6394	N.D.
65)	Isopropylbenzene	18.840	105	16756	N.D.
66)	Bromobenzene	18.974	156	8541	N.D.
67)	o-Chlorotoluene	0.000	126	0	N.D.
68)	n-Propylbenzene	0.000	120	0	N.D.
69)	p-Chlorotoluene	0.000	126	0	N.D.
70)	1,3,5-Trimethylbenzene	20.221	105	7448	N.D.
71)	tert-Butylbenzene	0.000	134	0	N.D.
72)	1,2,4-Trimethylbenzene	21.018	105	7976	N.D.
73)	1,3-Dichlorobenzene	21.310	146	11336	N.D.
74)	1,4-Dichlorobenzene	21.444	146	10785	N.D.
75)	sec-Butylbenzene	21.577	105	11619	N.D.
76)	p-Isopropyltoluene	21.930	119	9864	N.D.
77)	1,2-Dichlorobenzene	22.155	146	9028	N.D.
78)	n-Butylbenzene	22.831	91	9932	N.D.
79)	1,2-Dibromo-3-chloropr...	0.000	157	0	N.D.
80)	1,2,4-Trichlorobenzene	0.000	180	0	N.D.
81)	Naphthalene	25.745	128	5469	N.D.
82)	1,2,3-Trichlorobenzene	0.000	180	0	N.D.
83)	Hexachlorobutadiene	26.402	225	17236	N.D.

(#) = qualifier out of range (m) = manual integration (+) = signals summed

TO15ppb8.M Thu Mar 25 10:13:11 2010

File : C:\msdchem\1\DATA\03232010\0323-11.D
Operator : JM
Acquired : 24 Mar 2010 1:04 pm using AcqMethod T015PPB8.M
Instrument : 5973A MSD
Sample Name: 100cc IS, 500cc, AS4, 6435, T015.mpt
Misc Info : Sample Date: 032410, 10:05AM, MSD Background
Vial Number: 11



Quantitation Report (QT Reviewed)

Data Path : C:\msdchem\1\DATA\03232010\
 Data File : 0323-11.D
 Acq On : 24 Mar 2010 1:04 pm
 Operator : JM
 Sample : 100cc IS,500cc,AS4,6435,TO15.mpt
 Misc : Sample Date: 032410,10:05AM,MSD Background
 ALS Vial : 11 Sample Multiplier: 1.25

Quant Time: Mar 24 16:21:57 2010
 Quant Method : C:\msdchem\1\METHODS\TO15ppb8.M
 Quant Title : TO14/TO15 Volatile Compounds
 QLast Update : Tue Mar 23 11:48:01 2010
 Response via : Continuing Cal File: C:\msdchem\1\DATA\03232010\A0323-02.D

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)	
1) 1,4-Difluorobenzene	10.273	114	3483330	4.12	ppbv	0.00	
53) Chlorobenzene-d5	16.101	82	1688943	4.16	ppbv	0.00	
System Monitoring Compounds							
24) Bromochloromethane	8.211	128	766533	4.25	ppbv	0.00	
64) p-Bromofluorobenzene	18.596	174	1741903	4.00	ppbv	0.00	
Target Compounds							
							Qvalue
2) Freon 22 (ClF2Methane)	4.117	67	1055463	18.17	ppbv		95
3) Freon 12 (Cl2F2Methane)	4.208	85	720839	1.04	ppbv		98
4) Chloromethane	4.342	50	187063	1.24	ppbv		98
5) Freon 114 (Cl2F4Ethane)	4.421	85	21755	N.D.			
6) Vinyl Chloride	0.000	62	0	N.D.			
7) 1,3- Butadiene	4.640	54	385261m	2.63	ppbv		
8) Bromomethane	4.853	94	5615	N.D.			
9) Chloroethane	0.000	64	0	N.D.			
10) Acetone	5.516	58	918925m	8.12	ppbv		
11) Freon 11 (Cl3Fmethane)	5.614	101	329902	0.34	ppbv		99
12) Acrylonitrile	5.869	53	74238	0.57	ppbv		92
13) 1,1-Dichloroethene	0.000	96	0	N.D.			
14) Methylene Chloride	6.228	84	52075	0.26	ppbv		99
15) Methyl Acetate	6.240	43	38967	0.11	ppbv		100
16) Freon 113 (Cl3F3Ethane)	6.447	101	48457	0.10	ppbv		94
17) Carbon Disulfide	6.544	76	76746	0.14	ppbv		97
18) Trans-1,2-Dichloroethene	0.000	96	0	N.D.			
19) 1,1-Dichloroethane	0.000	63	0	N.D.			
20) Methyl T-Butyl Ether (...)	0.000	73	0	N.D.			
21) Methyl Ethyl Ketone(2-...)	7.694	43	190471	0.52	ppbv		95
22) Chloroprene(2-Cl-1,3-B...)	0.000	88	0	N.D.			
23) cis-1,2-Dichloroethene	0.000	96	0	N.D.			
25) Hexane	8.236	57	77001	0.26	ppbv		99
26) Chloroform	8.333	83	519921	0.92	ppbv		100
27) 2,2-Dichloropropane	0.000	77	0	N.D.			
28) Dibromofluoromethane (...)	0.000	111	0	N.D.			
29) 1,2- Dichloroethane	9.112	62	9869	N.D.			
30) 1,1,1-Trichloroethane	9.379	97	7311	N.D.			
31) 1,1- Dichloropropene	0.000	75	0	N.D.			
32) Benzene	9.896	78	341001	0.60	ppbv		100
33) Carbon Tetrachloride	10.073	117	71373	0.12	ppbv		99
34) Cyclohexane	10.219	84	9114	N.D.			
35) Dibromomethane	0.000	174	0	N.D.			
36) 1,2-Dichloropropane	0.000	63	0	N.D.			
37) Ethyl Acrylate	10.864	55	52117m	0.14	ppbv		
38) Bromodichloromethane	11.162	83	11149	N.D.			
39) Trichloroethene	0.000	132	0	N.D.			
40) Methyl Methacrylate	11.375	69	1404229	8.18	ppbv		98
41) cis-1,3-Dichloropropene	0.000	75	0	N.D.			
42) Methyl Isobutyl Ketone	0.000	58	0	N.D.			
43) Methyl Cyclohexane	12.348	98	6404	N.D.			
44) trans-1,3-Dichloropropene	0.000	75	0	N.D.			

45)	1,1,2-Trichloroethane	0.000	97	0		N.D.	
46)	Toluene-d8 (SMC)	0.000	98	0		N.D.	
47)	Toluene	13.516	91	3353567		5.10 ppbv	99
48)	1,3-Dichloropropane	0.000	76	0		N.D. d	
49)	Methyl Butyl Ketone(2-...	13.844	43	6517		N.D.	
50)	Dibromochloromethane	0.000	129	0		N.D.	
51)	1,2- Dibromoethane	0.000	107	0		N.D.	
52)	Tetrachloroethene	15.140	166	12016		N.D.	
54)	1,1,1,2 - Tetrachloroe...	0.000	131	0		N.D.	
55)	Chlorobenzene	0.000	112	0		N.D.	
56)	Ethylbenzene	16.765	91	43481		0.05 ppbv	94
57)	(m and /or p) Xylene	17.050	91	116604		0.18 ppbv	94
58)	Bromoform	0.000	173	0		N.D.	
59)	Butyl Acrylate	17.519	55	12731m		0.04 ppbv	
60)	Styrene	17.653	104	24920m		0.05 ppbv	
61)	1,1,2,2-Tetrachloroethane	0.000	83	0		N.D.	
62)	o-Xylene (1,2-Dimethyl...	17.823	91	46405		0.06 ppbv	94
63)	1,2,3-Trichloropropane	0.000	110	0		N.D.	
65)	Isopropylbenzene	18.845	105	10853		N.D.	
66)	Bromobenzene	0.000	156	0		N.D.	
67)	o-Chlorotoluene	0.000	126	0		N.D.	
68)	n-Propylbenzene	0.000	120	0		N.D.	
69)	p-Chlorotoluene	0.000	126	0		N.D.	
70)	1,3,5-Trimethylbenzene	20.214	105	12249		N.D.	
71)	tert-Butylbenzene	0.000	134	0		N.D.	
72)	1,2,4-Trimethylbenzene	21.017	105	38990		0.04 ppbv	88
73)	1,3-Dichlorobenzene	0.000	146	0		N.D.	
74)	1,4-Dichlorobenzene	21.437	146	10682		N.D.	
75)	sec-Butylbenzene	0.000	105	0		N.D.	
76)	p-Isopropyltoluene	21.917	119	15566		N.D.	
77)	1,2-Dichlorobenzene	0.000	146	0		N.D.	
78)	n-Butylbenzene	22.811	91	7474		N.D.	
79)	1,2-Dibromo-3-chloropr...	0.000	157	0		N.D.	
80)	1,2,4-Trichlorobenzene	0.000	180	0		N.D.	
81)	Naphthalene	25.744	128	23181		N.D.	
82)	1,2,3-Trichlorobenzene	0.000	180	0		N.D.	
83)	Hexachlorobutadiene	0.000	225	0		N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

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APPENDIX C – NOMENCLATURE

Clean Air Act (CAA)

Maximum contaminant levels (MCLs)

National Ambient Air Quality Standards (NAAQS)

New Source Performance Standards (NSPS)

Hazardous Air Pollutants (HAPs)

U.S. Environmental Protection Agency (USEPA)

World Health Organization (WHO)

Louisville Metropolitan Sewer District (MSD)

Volatile Organic Compounds (VOCs)

Greenhouse Gases (GHGs)

Chlorofluorocarbons (CFC)

Hydrofluorocarbons (HFC)

Perfluorocarbons (PFC)

Regenerative Thermal Oxidizers (RTO)

Inhalation Reference Concentration (RfC)

Oral Reference Dose (RfD)

Energy Information Administration (EIA)

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