

NC Department of Environment and Natural Resources
Division of Air Quality, Toxics Protection Branch

Raleigh, North Carolina

**Toxic Air Pollutants Survey Report in Matthews, NC
in Support of the Mecklenburg County Department of
Environmental Protection (MCDEP)**

ATAST # 99007

Final Report

by

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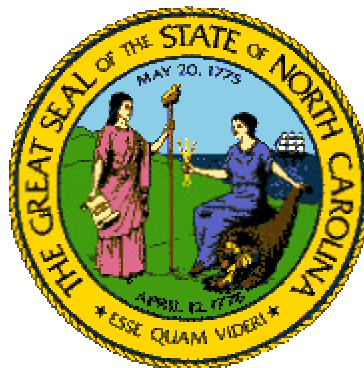


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ATAST Investigation #99007

1.0 Introduction: In 1998, stack tests and air dispersion computer modeling was conducted for the MCDEP at two facilities in the Matthews area of Mecklenburg County, NC, a medical waste incinerator (BMWNC) and steel drum recycler (ECC). The test data and modeling demonstrated that the emissions from BMWNC and ECC do not increase the health risk of adjacent neighbors from exposure to toxic air pollutants. However, because of the continued growth in the area and the concerns expressed over medical waste incinerators in general, MCDEP wished to provide the public additional assurances about the air they breathe. In an effort to do this, an ambient monitoring survey was conducted to provide additional information on toxic air pollution levels in the community. Additionally, production data for the amount of material burned at BMWNC and the number of drums processed at ECC was collected from the two facilities during unannounced MCDEP inspections. These data and discussion of the data are included in Appendix D. The purpose of this survey was not intended to target any specific facility or site in the area.

To this end, the Mecklenburg County Department of Environmental Protection (MCDEP) requested the assistance of the North Carolina Department of Environment and Natural Resources, Division of Air Quality, Toxics Protection Branch (NC DENR, DAQ, TPB) in surveying for specific toxic air pollutants in an area near Matthews, NC in Mecklenburg County. Sampling began in April 1999 and continued until the end of May 1999. A cost estimate is provided in Appendix E.

This report is divided into various sections corresponding to the various toxic air pollutants of interest listed in Table 1. Table 1 also summarizes the sampling plan as to the pollutant, number of sites, monitoring duration, agency responsible for that particular monitoring, the method to be employed, and any pertinent comments.

Monitoring results for each pollutant group are discussed in its corresponding report section. The discussions include comparisons of the monitoring results to given values from a variety of sources. Those sources include information from the Agency for Toxic Substance and Disease Registry (ATSDR), U.S. Environmental Protection Agency (EPA), reference articles, state and federal documents, and official agency web pages. The values that are used for comparison were chosen based on their availability, comparability, and utility. Several of the most commonly used references in this report are ATSDR's Minimal Risk Levels (MRLs)⁽¹⁾, EPA's inhalation Reference Concentrations (RfC)⁽²⁾, EPA's Technology Transfer Network site for hazardous air pollutant information website at <http://www.epa.gov/ttn/uatw/hapindex.html>⁽³⁾, Journal article from Environmental Science and Technology^(4,5), and various federal and state documents⁽⁶⁻⁸⁾. The MRLs⁽¹⁾ and RfCs⁽²⁾ are defined by the respective agency as follows.

The ATSDR defines their MRL as:

an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure. These substance-specific estimates, which are intended to serve as screening levels, are used by ATSDR health assessors and other responders to identify contaminants and potential health effects that may be of concern at hazardous waste sites. It is important to note that MRLs are not intended to define clean up or action levels for ATSDR or other Agencies.

During the development of toxicological profiles, MRLs are derived when ATSDR determines that reliable and sufficient data exist to identify the target organ(s) of effect or the most sensitive health effect(s) for a specific duration for a given route of exposure to the substance. MRLs are based on non-cancer health effects only and are not based on a consideration of cancer effects. Inhalation MRLs are exposure concentrations expressed in units of parts per million (ppm) for gases and volatiles, or milligrams per cubic meter (mg/m³) for particles.

*ATSDR uses the no-observed-adverse-effect-level/uncertainty factor approach to derive MRLs for hazardous substances. They are set below levels that, based on current information, might cause adverse health effects in the people most sensitive to such substance-induced effects. MRLs are derived for acute (1-14 days), intermediate (15-364 days), and chronic (365 days and longer) exposure duration, and for the oral and inhalation routes of exposure. Currently, MRLs for the dermal route of exposure are not derived because ATSDR has not yet identified a method suitable for this route of exposure. MRLs are generally based on the most sensitive substance-induced end point considered to be of relevance to humans. ATSDR does not use serious health effects (such as irreparable damage to the liver or kidneys, or birth defects) as a basis for establishing MRLs. **Exposure to a level above the MRL does not mean that adverse health effects will occur.** [emphasis added]*

MRLs are intended to serve as a screening tool to help public health professionals decide where to look more closely. They may also be viewed as a mechanism to identify those hazardous waste sites that are not expected to cause adverse health effects. Most MRLs contain some degree of uncertainty because of the lack of precise toxicological information on the people who might be most sensitive (e.g., infants, elderly, and nutritionally or immunologically compromised) to the effects of hazardous substances. ATSDR uses a conservative (i.e., protective) approach to address these uncertainties consistent with the public health principle of prevention. Although human data are preferred, MRLs often must be based on animal studies because relevant human studies are lacking. In the absence of evidence to the contrary, ATSDR assumes that humans are more sensitive than animals to the effects of hazardous substances and that certain persons may be particularly sensitive. Thus, the resulting

MRL may be as much as a hundred-fold below levels shown to be nontoxic in laboratory animals.

Proposed MRLs undergo a rigorous review process. They are reviewed by the Health Effects/MRL Workgroup within the Division of Toxicology; an expert panel of external peer reviewers; the agency wide MRL Workgroup, with participation from other federal agencies, including EPA; and are submitted for public comment through the toxicological profile public comment period.

The EPA's inhalation Reference Concentration (RfC) is defined as follows:

...an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily inhalation exposure of the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Inhalation RfCs were derived according to the Interim Methods for Development of Inhalation Reference Doses (EPA/600/8-88/066F August 1989) and subsequently, according to Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry (EPA/600/8-90/066F October 1994). RfCs can also be derived for the noncarcinogenic health effects of substances that are carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance.

In addition to the ATSDR MRLs, this report utilizes the results of an extensive study of volatile organic compounds in ambient air conducted in the Charlotte, Mecklenburg area from 1996-1997⁽⁸⁾ for comparison purposes in the volatile organic compounds monitoring section for BTEX (benzene, toluene, ethylbenzene, and xylenes). These comparisons were pertinent because of the similarity of several of the sampling sites in that study to the ones in Matthews and ATSDR had made an assessment of the BTEX concentrations observed in the study area of Charlotte, Mecklenburg County, NC.⁽⁹⁾ ATSDR's assessment of the data was that BTEX concentrations were typical of urban areas. Since Matthews, NC is encompassed in the Charlotte Metropolitan Statistical Area, it is felt that the ATAST (Air Toxics Analytical Support Team) Study results and subsequent ATSDR analysis of those results are pertinent to the results obtained in the Matthews Survey.

Another source of comparison values is the survey of ambient air concentration in the Environmental Science and Technology (ES&T) article entitled "Concentrations and Transformations of Hazardous Air Pollutants". This review was compiled from computerized and manual searches of a variety of databases and sources such as Chemical Abstracts (1967-1992), review articles, Chemical Abstracts Previews, National Technical Information Service (NTIS) files (1964-1992), resource reference books, technical journals, proceedings of air conferences, and the National VOC Data Base. The references for these sources can be found in the original ES&T article. As stated in the article, "...the focus of this survey was on ambient data in populated areas of the United States. Data from remote sites and data indicating direct source impacts were excluded" which makes this article pertinent to the Matthews Survey results.

**TABLE 1.1 TOXIC AIR POLLUTANTS SURVEY
 AMBIENT AIR MONITORING PROTOCOL FOR MATTHEWS, NC
 SUMMARY**

Pollutants	# Sites	# Samples (total)	Monitoring Duration	Sampling Agency	Analysis Agency	Method	Comments
Mercury (Hg)	1	Multiple	11 days, continuous	NCDAQ	NCDAQ	Tekran Hg vapor analyzer Model 2537A	Sampling frequency will be determined by ambient levels. 5 minute composite sample
Metals - As, Be, Cd, Cr, Mn, Ni, Pb	3	39	13 sampling days, 24 hr samples	MCDEP	MCDEP	Hi-vol particulate samplers, TSP EPA Inorganic Compendium Method IO-3	Sample every 6th day to include weekdays and weekend days.
Volatile Organics (TO-14 compds)	3	108	24 hr samples, 36 days, continuously	NCDAQ	NCDAQ	Xontech 911/912 samplers, w/ 6L SUMMA canisters	EPA Method TO-14 for VOCs w/ attention to benzene, toluene, ethylbenzene, and xylenes (BTEX)
Formaldehyde	3	18	3 days, Two 8-hr composite samples/day	NCDAQ	Contract Lab	DNPH tubes, 8 hr time avg. sample per tube	Two 8-hr samples each day. Samples taken on 2 weekdays and 1 weekend day, consecutively.
Hydrogen Chloride	Multiple	13	Initial set up day, April 14	NCDAQ	NCDAQ	Dräger tubes and Dräger chips	Review the results to determine if more sampling needed.
Meteorological Station	3	Multiple	Duration of Sampling	NCDAQ	NCDAQ	Meteorological Data	Collection of wind speed & direction, temperature, and solar flux for the duration of sampling.

2.0 Site Selection: With assistance from MCDEP personnel, three sites were selected in the community following, as closely as possible, siting criteria for ambient air monitoring and meteorological measurements.⁽¹⁰⁾ Primary importance was given to having "open areas" for unobstructed and/or minimally turbulent air movement and away from such things as buildings and large trees. These sites are plotted on a topographical map of the area (see Figure 2.0.1). and are labeled on the map as Site MC1 (S1 - commercial lot) at the crossroads of Matthews-Indian Trail Rd and Campus Ridge Dr., Site MC2 (S2 - Geneva Johnson property) at 2224 Matthews-Indian Trail Rd at the same crossroad, and Site MC3 (S3 - Thomas Drake property) at 3318 Campus Ridge Dr. All of the sites are within one mile of each other.

3.0 Meteorological Station: A 6-meter meteorological station was set up at *each* site and a data logger automatically recorded meteorological conditions over the sampling period. The conditions monitored were ambient temperature, wind speed, and wind direction. At one of the sites, two additional conditions were monitored. Those were solar flux and solar radiation. All measurements were logged at a rate of one measurement every 10 seconds and averaged to give a 15-minute value for each of the conditions. These measurements were also averaged to give 1-hour and 24-hour values. The 15-minute wind speed and direction data were plotted to give wind rose graphs for each site (see figures 3.0.1, 3.0.2, and 3.0.3). All of the meteorological station clocks were synchronized. It should be noted that the NC DAQ set instrumentation clocks to Eastern Daylight Savings Time (EDT) and MCDEP set instrument clocks (namely particulate samplers) to Eastern Standard Time (EST). Therefore the meteorological data used for comparison purposes in the Metal section were time-shifted to match the sampling period of the particulate samplers.

3.1.0 Meteorological Data Results:

The meteorological data for wind speed and direction are plotted in Figures 3.1.1, 3.1.2, and 3.1.3. The plots are "windrose" formats that indicate the percentage of the time that the wind direction was from a particular direction range within given wind speeds. The center number indicates the percentage of wind speeds that were below the lowest wind speed range. While these plots represent the composite view of the wind direction/speed, this data was also used for assessing the wind direction and speed during each of the monitoring sequences at each site. Individual sections use the pertinent meteorological data needed for comparison in that section. Wind direction and speed are represented in some sections as "wind rays" to depict an average during a particular sampling time period.

The plot of the wind data at site MC1 (Figure 3.1.1) shows that the winds over the period of April 9 to May 19, 1999 were calm (<1 mph) for 1.5% of the recorded data points and the predominant wind direction was from the northeast but almost evenly divided around the site. Winds varied between 1-20 mph with the majority of the data points below 10 mph.

The plot of the wind data at site MC2 (Figure 3.1.2) shows that the winds over the period of April 15 to May 19, 1999 were calm (<1 mph) for 6.0% of the recorded data points and the predominant wind direction was from the north-northeast and the south. Winds also varied between 1-15 mph with the majority of the data points below 10 mph. Data

Figure 2.0.1 - Topographical Map of the Survey Area

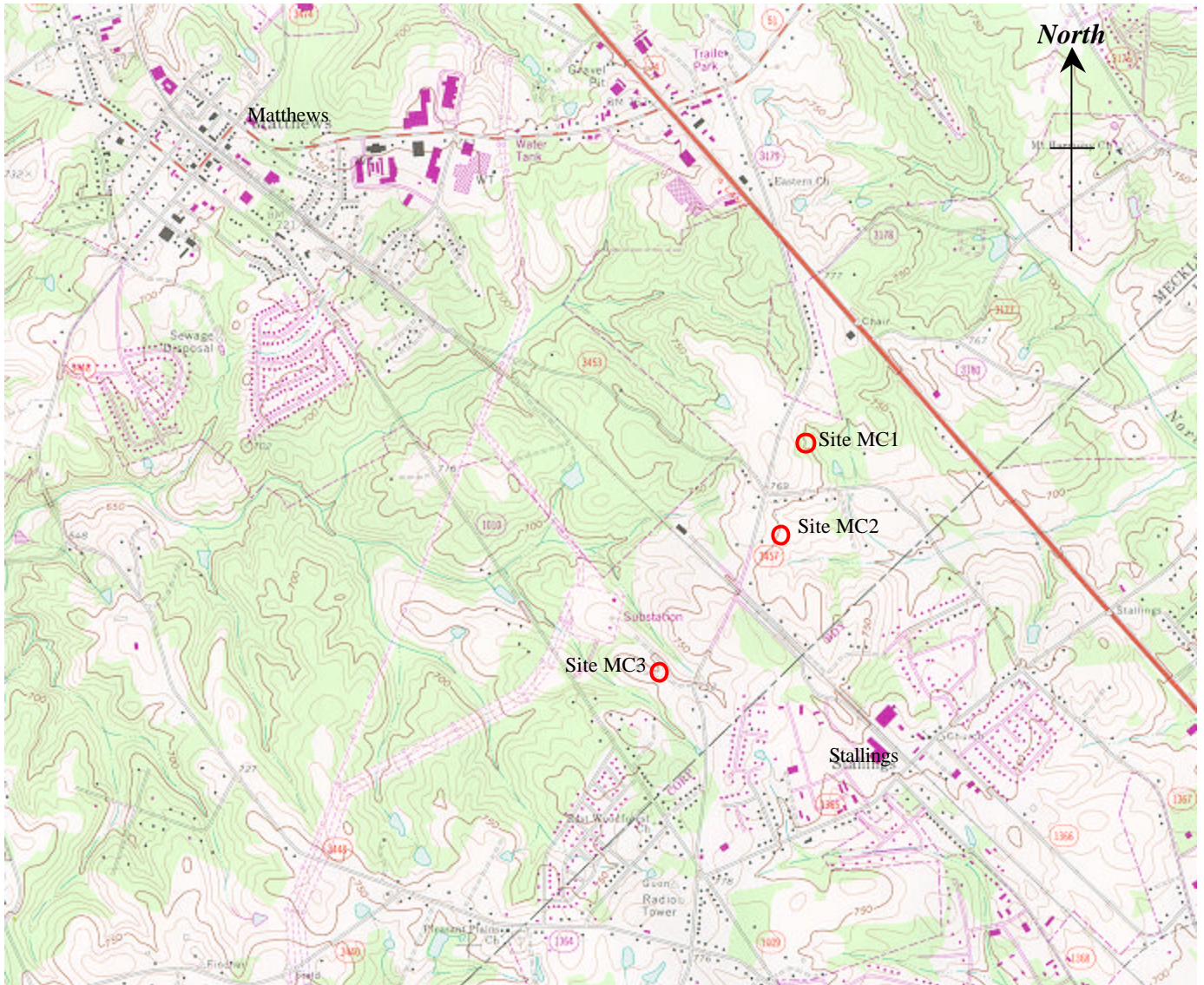
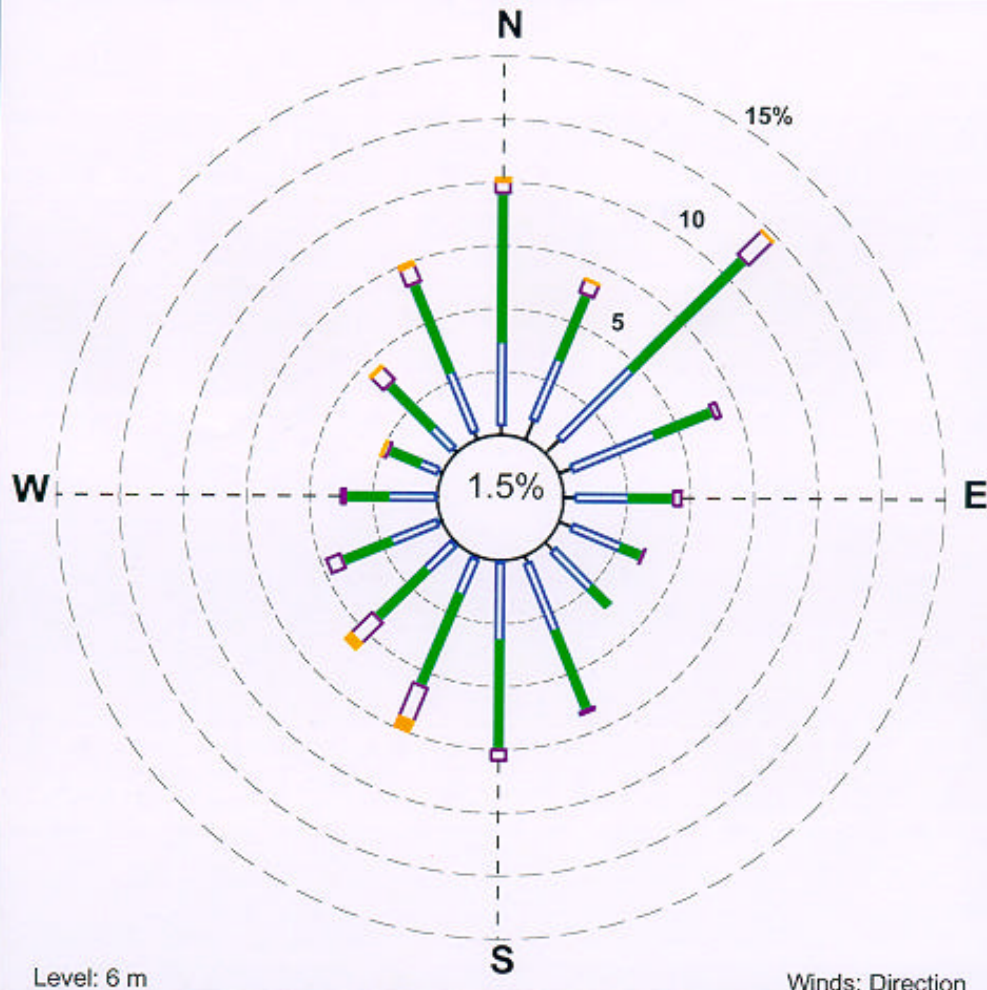
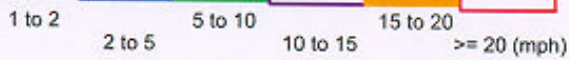


Figure 3.1.1 - Matthews Survey Meteorological Data
 Site MC1 - April 9 through May 19, 1999



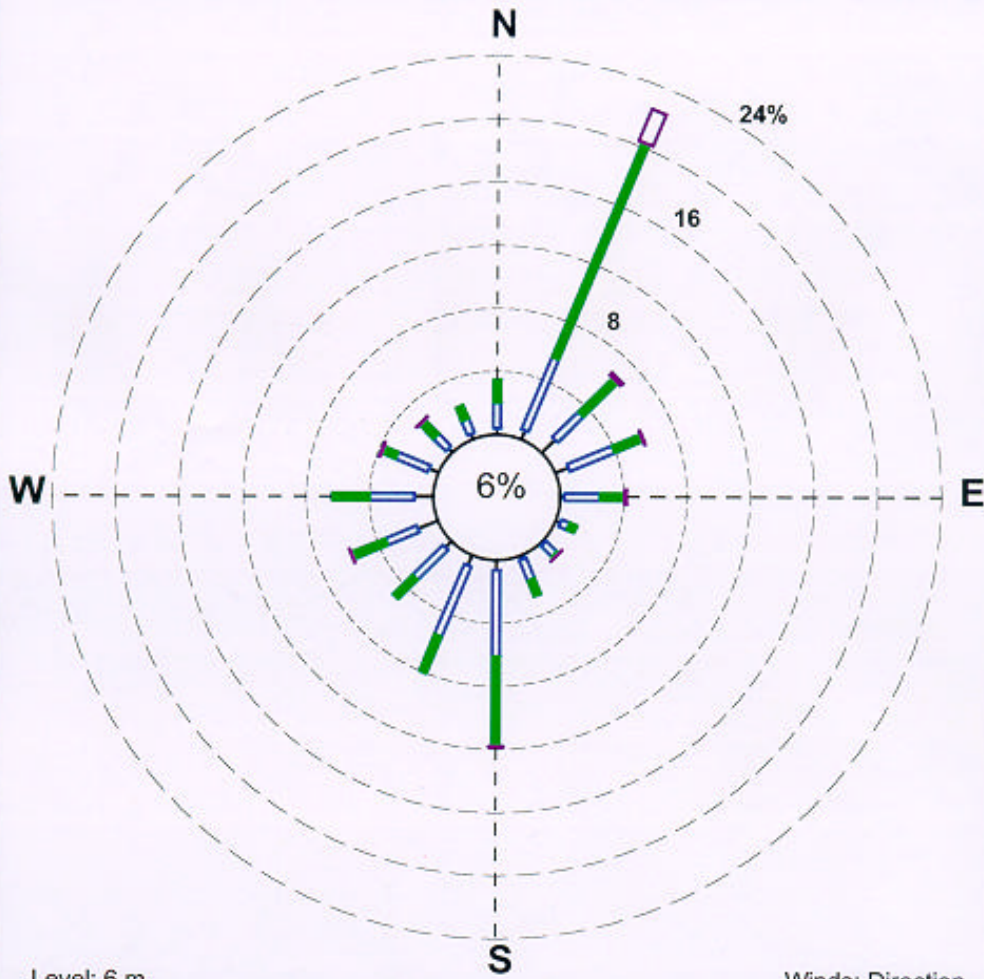
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Winds: Direction



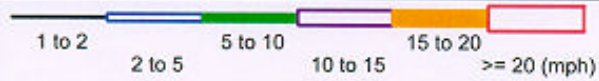
Number of Records Used: 3851

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Level: 6 m

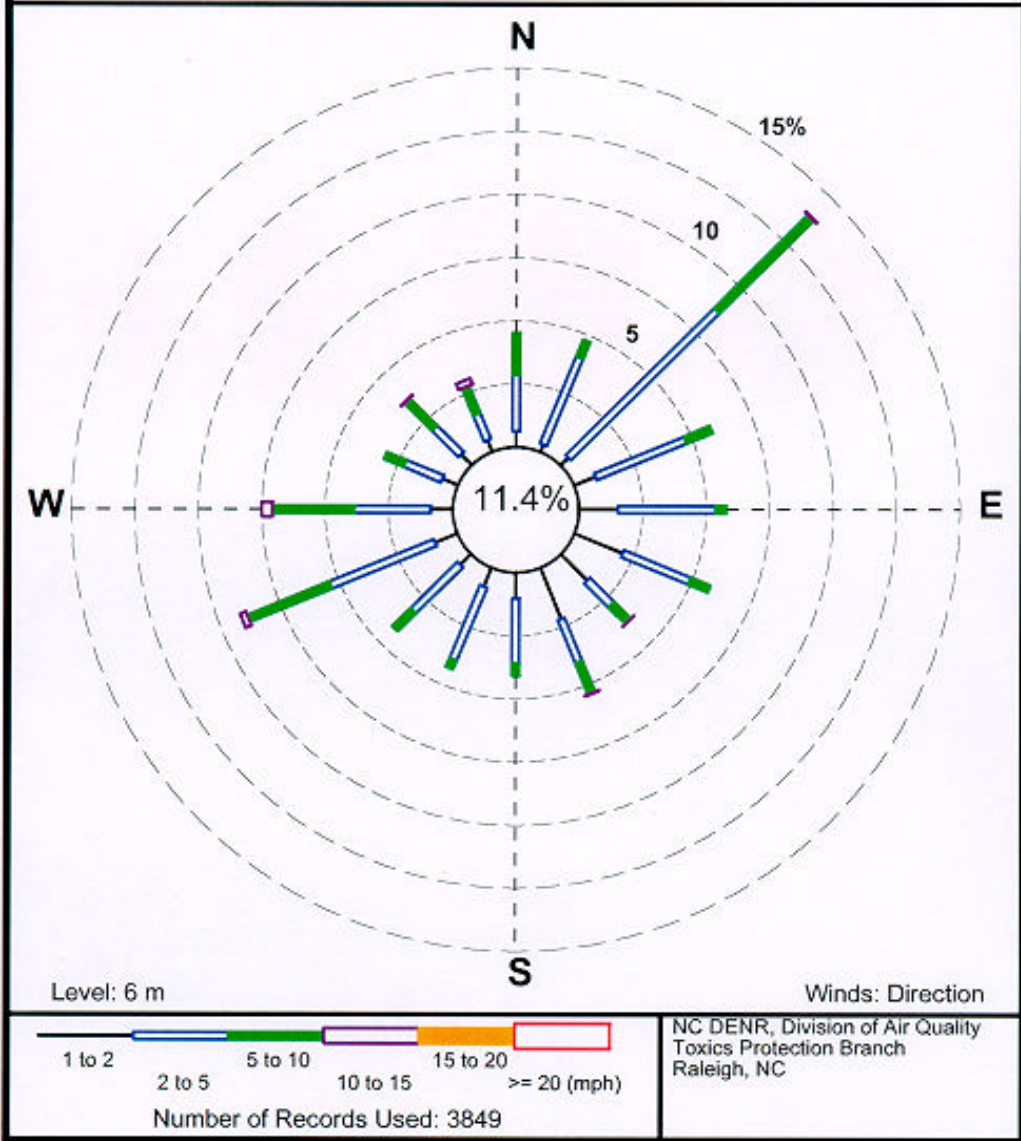
Winds: Direction



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Toxics Protection Branch
Raleigh, NC

Number of Records Used: 2797

Figure 3.1.3 - Matthews Survey Meteorological Data
Site MC3 - April 9, through May 19, 1999



was incomplete from April 9 to April 14 at 20:00 hrs and May 9 at 15:30 hrs to May 14 at 16:45 hrs due to a data logger malfunction. When needed, the meteorological data from site MC1 was substituted for these missing data because of the proximity of the two sites. The data plotted here did not include data from Site MC1.

Plots of the wind data at site MC3 (Figure 3.1.3) shows that the winds over the period of April 9 to May 19, 1999 were calm (<1mph) for 11.2% of the recorded data points and the predominant wind direction was from the northeast with a secondary contribution from the west-southwest and west. Winds also varied between 1-15 mph with the majority of the wind speeds below 10 mph.

These wind data were correlated to the concentration data obtained from the various analyses. The exception was the use of meteorological data at the mercury trailer. This data was collected independently of the 15-minute meteorological data collected at MC2. This mercury meteorological data was collected on a 5-minute time base and correlated to the 5-minute data collected on the Tekran Mercury Vapor Analyzer (See section 4.1.6 for further details).

4.0 Individual Pollutant Reports: This section is divided into subsections that correspond to the individual pollutants listed in Table 1. Each subsection is a self-contained sampling report for each pollutant. The following subheadings numbered 4.0.X pertain to all of the sites in general.

4.0.1 Photographs: Photographs of sites were taken as necessary and are listed in Appendix A. These photographs document the sites, the equipment orientation at the site, facilities, structures, and sample collection.

4.0.2 Sample Chain of Custody: In general, sample and data file collection followed established chain of custody procedures.

4.0.3 Site Security: Each site was enclosed with fencing and secured with lock and key with access only by authorized personnel, i.e. MCDEP and NC DAQ personnel. All monitoring platforms, i.e. buildings, enclosures, or trailers were locked or sealed with tamper-indicating tags. When any of these tags are broken for sample retrieval or sampler maintenance, the number of the broken tag, the date/time, the replacement tag number, and the person was recorded in an appropriate log. All electrical connections that were not enclosed had lockable covers or tamper-indicating bands.

Each site had a logbook that was divided into individual sections corresponding to the monitoring activities at that site. Each logbook also had a brief description of the data entry format to be used. Staff members were instructed to document all site entries in the logbooks.