

STATEMENT OF QUALIFICATIONS

Ambient Air Quality and Meteorological Monitoring Services

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SECTION 1: OVERVIEW

Enviroplan Consulting is one of the nation's leading air pollution consulting companies. Since 1972 our staff of 30 professionals has conducted over 3,500 studies and monitoring programs for over 350 industrial and governmental clients.

As shown in Figure 1-1, our staff is located in 15 offices throughout the U.S. and Canada. We have conducted air quality and meteorological monitoring in 26 states as indicated in Figure 1-2.

Our air quality and meteorological monitoring services include:

- Monitoring network design
- Preparation of the Quality Assurance Project Plan
- Monitoring equipment supply
- Installation and startup
- Operation and maintenance
- Data acquisition, analysis and reporting including daily polling
- Quality Assurance Performance and Systems Audits and other QA functions

Table 1-1 provides a summary of selected experience in air quality and meteorological monitoring. We have conducted operation and maintenance, quality assurance, data analysis and/or reporting and auditing of over 1,900 air quality and meteorological parameters for over 6,200 parameter-years.

We provide these services from our Operations Center and Quality Assurance Laboratory in Fairfield NJ and with our on-site monitoring personnel located at each monitoring network.

Highly trained monitoring technicians carry out sensor component and electronic instrumentation repair. Our field engineering resources, diagnostic instrumentation, and large spare parts and monitor inventory help assure reliable network operations.

A fully equipped quality assurance laboratory is maintained at our Fairfield, N.J. headquarters. This laboratory provides the NIST-traceable calibration/certification of gaseous standards, flow-measuring devices, and includes other support equipment used for field quality control and performance audits. Enviroplan Consulting's Quality Assurance Section has had extensive experience working with U.S. EPA, regional, state and local agencies to ensure that all routine

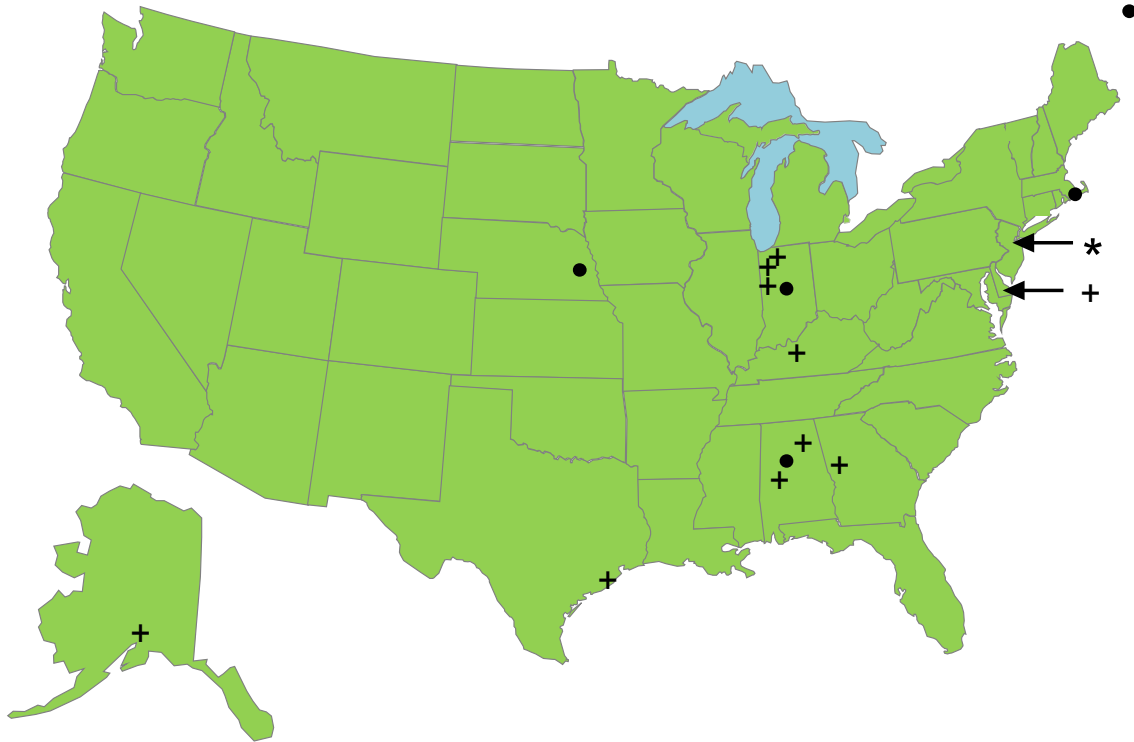
and special quality assurance requirements are fully met. Our networks have been subject to independent audits by seven state air pollution agencies. Enviroplan Consulting also participates in the EPA National Performance Audit Program.

The parameters monitored include PM_{2.5}, PM₁₀, TSP, SO₂, O₃, NO_x, NO_y, CO, H₂S, VOC, SVOC, total HC, NMHC, carbonyl, other speciated HC compounds, sulfates, nitrates, dioxins, furans, lead, mercury, metals, and various meteorological parameters.

Our over 6,200 parameter-years of experience includes instrumentation from every major manufacturer as well as a wide range of state-of-the-art equipment.

Of the over 100 air quality and meteorological monitoring networks Enviroplan has or is operating involving over 6,200 parameter-years of monitoring, less than 3% of these networks have ever replaced Enviroplan once we assumed network operations and never for reasons of quality.

FIGURE 1: ENVIROPLAN CONSULTING HEADQUARTERS OFFICE, REGIONAL OFFICES, AND PROJECT OFFICES



Office	Location	Symbol
Headquarters Office	Fairfield, NJ	*
Midwest Regional Office	Indianapolis, IN	●
Southeast Regional Office	Birmingham, AL	●
Canadian Regional Office	Gander, Newfoundland	●
Project Offices	Anchorage, AK; Atlanta, GA; Fowler, IN; Dune Acres, IN; Wheatfield, IN; Delaware City, DE; Louisville, KY; Michigan City, IN; Tarrant, AL; Hueytown, AL; Brazoria, TX.	+
Wind Energy Client Management Services	Omaha, NE	●
Greenhouse Gas Verification Services	Hingham, MA	●

Table 1-1: Number of Air Quality and Meteorological Parameters Monitored and Period of Monitoring								
Revision: 8/10/09								
			Total Number	Total Number	Total Number	Total	Number of	Number of
	Period of		Air Quality	Meteorological	Air Toxics	Number	Parameter	Meteorological
Network Name	Operation	Years	Parameters	Parameters	Parameters	Parameters	Years	Parameter-Years
Currently Operated								
CLIENT NAMES AVAILABLE UPON REQUEST	1998-Present	11	1	7	0	8	88	77
	2007-Present	2	0	4	0	4	8	4
	N/A	N/A	Develop and operate a portable power supply for a LIDAR	Develop and operate a portable power supply for a LIDAR	Develop and operate a portable power supply for a LIDAR	0	0	N/A
	2008-Present	1	Develop and operate a portable power supply for a LIDAR	Develop and operate a portable power supply for a LIDAR	Develop and operate a portable power supply for a LIDAR	0	0	N/A
	1997-Present	12	9	11	0	20	240	132
	1991-Present	18	3	26	0	29	522	468
	N/A	N/A	2	10	0	12	12	10
	2007-Present	2	2	6	0	8	16	12
	2003-Present	6	13	4	0	17	102	24
	2001-Present	8	3	4	0	7	56	32
	2008-Present	1	6	6	0	12	12	6
	2002-Present	7	11	0	0	11	77	0
	2000-Present	9	21	6	0	27	243	54
SubTotal			71	84	0	155	1376	819

Other Networks Operated Since 1998								
Ohio Wind Energy Project	2008-2009	1	0	4	0	4	4	4
Warren County NJ Air Monitoring Project	2002-2006	4	4	10	60	74	296	40
University of Texas at Austin: TexAQS II Monitoring Project	2005-2007	2	22	41	0	63	126	82
Conectiv Energy	2002-2005	3	3	0	0	3	9	0
Caribbean Petroleum Refining	1999-2000	1	2	7	0	9	9	7
City of Toledo, Ohio	2001	1	4	0	0	4	4	0
Plantation Pipeline	2005-2007	2	4	4	86	94	188	8
Lions Copolymer	2005-2006	2	2	2	43	47	94	4
Steel Dynamics -Butler	1998-2001	3	3	4	0	7	21	12
SubTotal			44	72	189	305	751	157
Other Networks Operated Since 1992								
American Electric Power	1992-1995	3	4	8	0	12	36	24
BHP Minerals - Hartley	1992-1994	2	0	7	0	7	14	14
BHP Minerals - Mali	1992-1996	4	1	7	0	8	32	28
Caribbean Petroleum Corporation	1991-1996	5	3	7	0	10	50	35
Central Hudson Gas and Electric	1987-1998	11	10	17	0	27	297	187
Chambers Works Cogeneration Project	1993-1994	1	5	3	0	8	8	3
DuPont Chambers Works-Post Construction	1992-1993	1	8	4	98	110	110	4
Georgia Department of Natural Resources	1998-1999	1	124	0	72	196	196	0
Indianapolis Power and Light Company-Marion	1995-1996	1	3	3	0	6	6	3
Indianapolis Power and Light Company-Partriot	1991-1993	2	11	0	0	11	22	0
Indiantown Cogeneration Project	1994-1996	2	6	3	0	9	18	6
Keystone Cogeneration- Post Construction	1993-1994	1	4	0	0	4	4	0
Long Island Lighting Co. - Keyspan	1992	1	4	16	0	20	20	16
NARSTO Northeast	1995-1996	1	56	63	7	126	126	63
Pittsburgh Plate Glass-Circleville	1986-1994	8	6	7	30	43	344	56
Washington University Medical School	1993	1			4	4	4	0
Texas Air Control Board	1993	1	0	60	0	60	60	60
SubTotal			245	205	211	661	1,347	499

			Total Number	Total Number	Total Number	Total	Number of	Number of
Network Name	Period of	Years	Air Quality	Meteorological	Air Toxics	Number	Parameter	Meteorological
	Operation		Parameters	Parameters	Parameters	Parameters	Years	Parameter-Years
Other Networks Operated Prior to 1992								
Allegheny Power Systems	1988	1	1	4	0	5	5	4
Allied Chemical	1980-1981	1	5	3	0	8	8	3
Arkansas Power and Light	1983-1984	1	0	5	0	5	5	5
Ashkelon Regional Assoc. of Towns for Env. Quality - Israel	1990	1	42	0	0	42	42	0
Baltimore Gas and Electric	1980-1981	1	2	0	0	2	2	0
Bath Iron Works	1990-1991	1	5	3	0	8	8	3
Breed Corporation	1985	1	0	0	1	1	1	0
Champion International	1987	1	14	7	0	21	21	7
Cincinnati Gas and Electric-Eastbend	1978-1985	7	9	0	0	9	63	0
Cincinnati Gas and Electric-Miami Ft/Beckjord	1975-1983	8	10	0	0	10	80	0
Cincinnati Gas and Electric-Zimmer	1984-1985	1	14	11	0	25	25	11
City Public Service Board of San Antonio	1981-1983	2	0	12	0	12	24	24
Cleveland Electric Illuminating-Avon Lake	1976-1989	13	13	21	0	34	442	273
Cleveland Electric Illuminating-Eastlake	1977-1982	5	15	24	0	39	195	120
Cleveland Electric Illuminating-Ashtabula	1976-1984	8	3	6	0	9	72	48
Cleveland Electric Illuminating-Lakeshore	1976-1984	8	3	0	0	3	24	0
Cleveland Electric Illuminating-Monitoring/Modeling Validation Study	1980-1981	1	13	18	0	31	31	18
Consolidated Edison	1979-1982	3	4	12	0	16	48	36
Consumers Power Company	1984	1	7	10	0	17	17	10
Cooperative Power	1981-1982	1	10	9	0	19	19	9
County of Westchester	1986	1	0	4	0	4	4	4
Dallas Independent School District	1981-1982	1	0	0	2	2	2	0
Dayton Power and Light	1982	1	3	4	0	7	7	4
DuPont Chambers Works-Pre Construction	1989-1990	1	9	4	0	13	13	4
Duquesne Light Company	1980-1984	4	22	8	24	54	216	32
Ferro Corporation	1987-1988	1	3	0	2	5	5	0
Ford Motor Company	1986	1	6	0	0	6	6	0
Foster Wheeler Power Systems, Inc.	1985-1986	1	2	0	0	2	2	0
SubTotal			215	165	29	409	1387	615

			Total Number	Total Number	Total Number	Total	Number of	Number of
	Period of		Air Quality	Meteorological	Air Toxics	Number	Parameter	Meteorological
Network Name	Operation	Years	Parameters	Parameters	Parameters	Parameters	Years	Parameter-Years
Other Networks Operated Prior to 1992								
Freeport Sulfur Co./Duval Corp.	1985	1	2	4	0	6	6	4
Keystone Cogeneration- Pre Construction	1990-1991	1	4	0	0	4	4	0
Manner Textile Processing	1985	1	0	0	2	2	2	0
Marathon Oil	1980-1981	1	0	5	0	5	5	5
Massachusetts Port Authority	1985-1990	5	1	3	0	4	20	15
New England Power Company	1980-1983	3	12	12	0	24	72	36
New York State DOT	1974	1	3	4	1	8	8	4
Ohio Edison- Edgewater	1979-1982	3	23	20	16	59	177	60
Ohio Edison-Gorge	1979-1982	3	14	6	8	28	84	18
Ohio Edison-Niles	1982-1983	1	10	3	0	13	13	3
Ohio Edison Company-Burger/Sammis	1989-1991	2	0	10	0	10	20	20
Ohio Edison Company-Burger/Sammis	1978-1980	2	7	22	0	29	58	44
Ohio Edison/Penn Power Company-Mansfield/New Castle	1989-1991	2	11	22	0	33	66	44
Orange and Rockland Utilities - Bowline	1978-1983	5	7	20	0	27	135	100
Orange and Rockland Utilities - Lovett	1986-1991	5	12	0	0	12	60	0
Pennsylvania Power Company-Mansfield/New Castle	1982-1983	1	11	14	5	30	30	14
Pittsburgh Plate Glass-Barberton	1980-1982	2	8	2	0	10	20	4
Plaza Humaco Mall	1990	1	1	4	0	5	5	4
Public Service of New Hampshire	1980-1983	3	0	8	0	8	24	24
Public Service of New Mexico	1984	1	0	16	0	16	16	16
Public Service of Indiana	1983-1985	2	5	20	0	25	50	40
Public Service of Indiana	1981-1982	1	4	0	0	4	4	0
Taiwan Power Company	1988	1	8	0	0	8	8	0
Union Electric Company	1986	1	0	8	0	8	8	8
United Engineers and Constructors	1989-1990	1	5	11	0	16	16	11
Wisconsin Power and Light Company-Edgewater/Lakeshore	1976-1991	15	14	16	0	30	450	240
SubTotal			162	230	32	424	1361	714
TOTALS			522	756	461	1,954	6,222	2,804

SECTION 2: EXPERIENCE

2.1 SELECTED AIR QUALITY AND METEOROLOGICAL MONITORING PROGRAMS

Following are descriptions of selected air quality and meteorological monitoring network programs designed, installed and operated by Enviroplan are given below. Annual budgets for these programs ranged from approximately \$30,000 to over \$1,000,000.

NARSTO For **NARSTO Northeast**, we audited 15 sites including two airplanes equipped with air quality monitoring equipment in the northeastern U.S. Parameters included O₃, SO₂, CO, NO-NO_x, NO-NO_y for low detection limit analyzers. We also provided audit test results and audit reports.

Georgia For the **State of Georgia**, we operated the majority of the state's air quality monitoring program including 19 continuous monitors for ozone, NO_x, SO₂, and CO; 19 PM₁₀ monitors; 29 PM_{2.5} monitors; and about 60 air toxics samplers for metals, SVOC, VOC, lead and carbonyl. Work involved full operation and maintenance, data analysis and reporting as well as quality control activities of all monitoring equipment except for the PM_{2.5} samplers for which filter analyses were conducted by the state.

Delaware For **Valero**, (previously **Premcor Refining Group** and prior to that Motiva Enterprises) a major oil refiner, we refurbished, audited and currently operate 16 continuous monitors for ozone, NO_x, SO₂ and CO, six TSP and two PM₁₀ samplers and one meteorological tower. Work involves full operation and maintenance, data analysis and reporting as well as quality control activities and performance audits of all monitoring equipment

For a **coke company**, we operate and maintain and conduct full data analysis and reporting for nine TSP samplers.

Alabama For **Drummond Company, Inc.'s ABC Coke Production Facility**, we designed, supplied, installed and provide on-going complete support services for a single-station air quality and meteorological monitoring program consistent with regulatory guidelines. Air quality parameters include continuously-measured PM₁₀ and analysis of time-integrated PM₁₀ samples for organic and inorganic elements and compounds using bulk analyses methods and microscopy. Meteorological parameters include continuously-measured wind speed, wind direction, sigma theta, air temperature, relative humidity and precipitation.

- Florida** For **Indiantown Cogeneration Limited Partnership**, we installed, operated and maintained a two station ambient air quality and meteorological monitoring network in support of the construction of a pulverized coal-fired cogeneration plant. Parameters monitored include SO₂, NO_x, PM₁₀ (primary and collocated), wind speed, and wind direction. All phases of data reduction, data processing, data validation, data reporting, and quality assurance including an independent audit program are included in this program.
- Indiana** For **Steel Dynamics, Inc.**, we supplied, installed, and currently provide on-going support services for a two-station ambient air quality and meteorological monitoring network to meet Indiana Department of Environmental Management (IDEM) PSD requirements for this specialty steel manufacturing facility. Monitored parameters include three PM₁₀ samplers and continuous measurement of wind speed, wind direction, sigma theta and ambient air temperature.
- Indiana** For **Indianapolis Power & Light (AESIPALCO)**, we conducted three PSD preconstruction ambient air quality monitoring programs in support of three generating stations. We designed, supplied and installed all three networks, which monitored O₃, SO₂, CO, NO_x and particulate matter. Data for continuous air quality parameters of O₃, SO₂, CO, NO_x were collected with TECO instrumentation. We conducted all operation, maintenance, data reduction, data reporting, quality assurance (including quarterly quality assurance audits) on all parameters. These projects began operation in 1990; final decommissioning of the third network was in April 1996.
- Indiana** For **Northern Indiana Public Service Company (NiSource)**, we currently operate and maintain air quality and meteorological monitoring networks for the Bailly, Michigan City and R.M. Schahfer generating stations. These networks originally consisted of seven SO₂ monitors, 39 meteorological parameters, and 3 PM₁₀ samplers. Recently, the number of parameters measured at each plant has been reduced.
- For **American Electric Power Service Corp.**, we conducted a monitoring program in the vicinity of a fossil fuel generating station in southern Indiana. The program's objective was to collect the highest quality data possible to satisfy state regulatory requirements. Services provided included equipment installation and start-up, operation and maintenance, data processing and validation, quality assurance and data reduction and reporting.

- Louisiana** For **Plantation Pipeline**, we supplied, installed and are operating through early 2007 a two station air quality and meteorological monitoring network consisting of two 10-meter meteorological towers; two continuous hydrocarbon (HC) monitors continuously measuring non-methane HC, methane and total HC; and HC canister samples for which laboratory speciation analysis is conducted for 43 speciated compounds.
- Louisiana** For **Lion Co-Polymer**, we supplied, installed and operated a one station air quality and meteorological monitoring network consisting of one 10-meter meteorological tower; one continuous hydrocarbon (HC) monitor continuously measuring non-methane HC, methane and total HC; and HC canister samples for which laboratory speciation analysis is conducted for 43 speciated compounds.
- Maine** For **Bath Iron Works**, we supplied, installed and operated a one year PSD air quality and meteorological monitoring station in Bath, Maine. The program consisted of one SO₂ monitor, five PM₁₀ samplers, and one 15 meter meteorological tower equipped to measure wind speed, wind direction and sigma theta.
- Massachusetts** For the **New England Power Company (NEPCO)**, we provided complete operation and maintenance, data processing and quality assurance for the Salem Harbor and Brayton Point networks. These two networks included 10 SO₂, six TSP, and two meteorological monitoring systems. We designed and installed the first data acquisition system in Massachusetts that telemetered the monitoring data in real_time to the Massachusetts Department of Environmental Quality Engineering.
- Michigan** For **Champion International Corporation**, we provided data reduction, data reporting, quarterly performance/systems audits, and operation and maintenance support for a single station PSD air quality and meteorological program in support of the Quinnesec Mill plant. Parameters included: SO₂, NO/NO₂/NO_x, O₃, TSP, PM₁₀, wind speed, wind direction, temperature, dew point, and solar radiation.
- New Hampshire** For the **Public Service Company of New Hampshire**, we designed and installed the meteorological monitoring system and provided quarterly meteorological calibration/audits and emergency support for the Seabrook nuclear generating station. Our services were subject to strict scrutiny under Nuclear Regulatory Commission QA/QC requirements.
- New Jersey** For **Roche Vitamins/DSM Nutritional Products**, we designed, supplied and currently operate a three-station air quality and meteorological

monitoring network in the vicinity of Belvidere, NJ measuring SO₂, volatile organic hydrocarbons and their speciated compounds, mercury deposition, and meteorology. Data from the network is being used to establish the first citizen emergency notification system in New Jersey in the event of elevated air pollution concentrations. Data is also to be used in a large health effects study.

For the **DuPont Company**, we supplied, installed and operated a four-station PSD air quality and meteorological monitoring network with measurements for SO₂, NO_x, TSP, PM₁₀, wind speed, wind direction, temperature, as well as many toxic air pollutants, including mercury vapor, dioxins, furans, trace metals, VOCs and SVOCs. SO₂ and NO_x were continuously monitored by a TECO 43 and TECO 14B/E analyzer, respectively. Meteorological data was measured with Climatronics Corp. instrumentation. This network began operation in support of a permit to construct a new rotary kiln incinerator and secure landfill in southern New Jersey. Our services included network design, installation and all phases of operation, maintenance, data reduction, data reporting and quality assurance associated with the project.

For **Bechtel Power Corporation and/or U.S. Generating Company**, we conducted four multi-year PSD monitoring programs in the vicinity of Deepwater, NJ. These networks consisted of one to three sites monitoring SO₂, NO_x, PM₁₀, and meteorological data. TECO analyzers comprised the SO₂ and NO_x monitoring instrumentation with Climatronics Corp. instrumentation installed on the meteorological towers. The monitoring programs were performed in support of air permit requirements for new cogeneration facilities. All network design, siting, installation, operation, maintenance, data reduction, data reporting and quality assurance was performed by our staff.

New York

For **Orange and Rockland Utilities**, we operated a meteorological and air quality monitoring network for the Bowline Point Power Plant for 14 years. The meteorological monitoring system consisted of one 100-meter tower, instrumented with Climatronics Corp. instrumentation at three levels. The data from this tower were used as backup for the Consolidated Edison meteorological monitoring system at the Indian Point nuclear power plant. Three monitoring sites for sulfur dioxide (SO₂), using TECO 43 pulsed fluorescent SO₂ monitors, made up the air quality monitoring network. We installed real-time computer equipment to replace previously used equipment. This data acquisition system was available for interrogation by Con Edison, Orange and Rockland, and the New York State Department of Environmental Conservation (DEC). We conducted

all phases of operation, maintenance, quality assurance, data processing, and report preparation.

In another project for **Orange and Rockland Utilities**, we installed and conducted one of the largest air quality and meteorological monitoring programs ever conducted for an electric power plant in support of the Lovett Generating Station coal reconversion project. This network included five meteorological towers and 12 SO₂ monitoring sites located throughout a state park, in complex terrain. We were responsible for the design, installation, and all phases of the operation, maintenance, quality assurance, data processing, and report preparation. All data was collected using our AIRDAS computer system that provided continuous real-time data transmission to the New York State DEC. We were also responsible for designing and implementing the computer software and communication protocols used by the New York State DEC to obtain data from this monitoring network.

For **Central Hudson Gas and Electric**, we operated and maintained a PSD meteorological network in support of the Roseton Generating Station and continue to maintain a previously operated air quality monitoring network. This network has been operated by our staff since 1987 and includes six SO₂ stations and one meteorological station with a 100 meter tower equipped with Climatronics Corp. instrumentation. All operation, maintenance, data reduction, data reporting and quality assurance activities, including a quarterly audit program, are included in this contract.

Ohio

For the **City of Toledo**, we conducted performance and systems audits of their four PM_{2.5} samplers, repaired malfunctioning samplers and conducted training program in proper operation and quality control.

For **PPG Industries'** Barberton Chemical Plant, we operated a seven-station SO₂ monitoring network and 100-meter meteorological tower instrumented at multiple levels in strict accordance with PSD requirements. Our responsibilities included design, installation, operation and maintenance, quality assurance and data reduction and reporting. The data from this network was used in a U.S. EPA authorized air quality model validation study and site-specific model development program conducted by us.

Also for **PPG Industries**, we installed and are currently operating a long-term PSD monitoring program in support of a hazardous waste incinerator. This network began operation in 1986 and has included monitoring for SO₂, NO_x, NMHC, TSP, various meteorological parameters, ambient

VOC measurements, and heavy metals analysis. TECO analyzers comprised the SO₂ and NO_x instrumentation, with meteorological parameters being measured with Climatronics Corp. instrumentation. The network currently monitors meteorological parameters. We conduct all phases of operation, maintenance, quality assurance, data processing, and report preparation.

For the **Cincinnati Gas & Electric Company (Cinergy)**, we provided ambient air quality and meteorological monitoring program support services to the Beckjord, Miami Fort, and East Bend plants where we were responsible for the supply, installation, operation, maintenance, data processing, and quality assurance of the monitoring programs for these plants in Ohio and Kentucky. In 1984, we installed and operated a PSD monitoring program to support the conversion of the W.H. Zimmer nuclear plant to a coal-fired facility. This is the first plant in the United States to undertake such a conversion. The American Electric Power Company, the Dayton Power and Light Company, and Columbus & Southern Ohio Electric Company are co-owners of this facility.

For **Cleveland Electric Illuminating Co. (FirstEnergy)**, Avon Lake, Eastlake, Ashtabula, and Lake Shore plants, we supplied, installed, and provided full service support for a continuous air pollution and meteorological monitoring program that has included 30 continuous SO₂ monitors, and two 100- and three 10-meter towers on which 26 meteorological parameters were monitored. Continuous air quality parameters were collected using TECO analyzers with all meteorological parameters collected using Climatronics Corp. instrumentation. Included in this program were four monostatic acoustic radar units and two doppler radar units. We were responsible for overall monitoring program supervision, operation and maintenance, administration of the quality assurance program, and analysis of all data from the monitoring network.

Pennsylvania

For **Conectiv**, we operated three PM₁₀ samplers in Bethlehem, PA to satisfy PSD construction permit monitoring requirements.

For **Foster Wheeler Power Systems, Inc.**, Livingston, NJ, we conducted a one-site SO₂ and NO₂ background PSD monitoring program near Scranton, PA. We prepared the monitoring plan for submittal to the PA Department of Environmental Resources (DER), leased and installed the monitoring equipment, and operated and maintained the network for the contract period. Operations included data processing, reporting to the Pennsylvania DER, and quality assurance.

Puerto Rico

For **Caribbean Petroleum Corporation**, we operated and maintained a PSD air quality and meteorological monitoring network in support of the CPC refinery in Bayamon, Puerto Rico. We installed three stations which monitor SO₂ and one station equipped with Climatronics instrumentation on a 30 meter meteorological tower. The tower measures wind speed, wind direction and sigma theta at two levels and also ambient temperature. All operation, maintenance, data reduction, data reporting and quality assurance activities, including a quarterly audit program, are conducted by us.

Texas

For the **University of Texas** under subcontract to the **Texas Commission on Environmental Quality**, we conducted performance and systems audits of 13 ozone monitors, 8 visibility monitors and 10 meteorological towers. Three sets of audits were conducted for each monitor over a two-year period.

For **City Public Service Board of San Antonio**, we operated and maintained an air quality PSD monitoring network at the Bastrop Plant, San Antonio, TX, from 1981 to 1987. The monitoring plan for this program was designed by us and approved by the Texas Air Control Board. The network consisted of a 61-meter tower with meteorological instruments at the 10- and 61-meter levels. Thirteen parameters were measured, including horizontal wind speed, horizontal wind direction, barometric pressure, temperature, dew point, precipitation and visibility.

For **Texas Air Control Board (Texas Commission on Environmental Quality)**, we provided quality assurance audits on existing meteorological systems at twelve ambient monitoring stations in Regions 7 and 10, followed by design, installation and calibration of new replacement meteorological monitoring systems. The entire scope of work was completed in one month, at the emergency request of TACB for the 1993 COAST monitoring project.

For **Key Laboratories**, we designed the network and installed hi-volume samplers at two site locations for the Dallas Independent School District. The scope of work also included operation, maintenance, quality assurance and data reporting. Parameters reported were total suspended particulates and lead.

Virginia

For **Mead/Westvaco**, we currently operate a four station monitoring network. The parameters monitored include meteorology, SO₂, H₂S, TSP and PM₁₀.

For **United Engineers and Constructors (UEC)**, we designed, supplied and conducted a single-station background PSD monitoring program near Sutherland, VA. The parameters monitored included O₃, SO₂, NO_x, TSP and PM₁₀, with a 100 meter meteorological tower consisting of 11 channels. Ozone was monitored using a TECO 49 analyzer while SO₂ was monitored using a TECO 43A analyzer. The 100 meter meteorological tower was equipped with Climatronics Corp. instrumentation at two levels. All quality assurance activities, including an independent quarterly audit program, were included in this contract.

West Virginia

For **Weirton Steel Company**, we conducted semi-annual meteorological performance and systems audits and provided technical support for a 10 meter meteorological monitoring system. The tower was equipped to measure wind speed, wind direction, temperature, humidity, barometric pressure, and precipitation.

Wisconsin

For **Wisconsin Power & Light**, we conducted a long term PSD air pollution and meteorological monitoring program in support of the Edgewater Plant in Sheboygan, Wisconsin. This program, which began in 1976, included the continuous measurement of SO₂ at five site locations with data telemetered to our centralized data collection and processing facility. Nitrogen oxides, ozone, non-methane hydrocarbons, and TSP concentrations were also measured. Surface and upper-air meteorological observations were made at two 330-foot meteorological towers, one at lakefront and another several kilometers inland. Horizontal wind direction, wind speed, standard deviations of wind direction, and temperature were measured at upper and lower levels on each tower. The vertical temperature structure of the atmosphere was measured by means of on-site acoustic radar and a radiosonde program.

2.2 OVERSEAS AMBIENT MONITORING PROGRAMS

Africa For **BHP-Minerals**, we designed, installed and provided semi-annual audits, data analysis and reporting for meteorological and air quality monitoring stations located in Mali and Zimbabwe. These programs were operated to meet World Bank environmental impact assessment requirements in conjunction with newly-developed mining and ore roasting facilities. Parameters monitored include SO₂, wind speed, wind direction, temperature, relative humidity, net radiation and precipitation. We provided complete training for monitoring station operation to BHP's local personnel, augmented by a cost-effective technical support program in conjunction with these monitoring projects.

Israel For **Ashkelon Regional Association of Towns for Environmental Quality**, we designed and installed a seven station air quality monitoring network with PC-based data acquisition systems in Ashkelon, Israel. We also conducted a training program for the local network technicians on the proper operation and maintenance of the instrumentation. Parameters installed included: SO₂, O₃, CO, NO_x, Total Hydrocarbon, TSP, PM₁₀, wind speed, wind direction, temperature, relative humidity, solar radiation and barometric pressure.

2.3 AIR QUALITY MONITORING PROGRAMS INVOLVING TOXIC AIR POLLUTANTS AND VOLATILE ORGANIC COMPOUNDS

Descriptions of selected ambient air quality and source emissions monitoring programs involving toxic air pollutants and VOC's follow.

Roche Vitamins We designed, installed and operated an air toxics monitoring program in western New Jersey with monitoring of volatile organic hydrocarbons and their speciated compounds and mercury deposition.

Plantation Pipeline We designed, installed and operate a hydrocarbon canister sampling program in Louisiana where samples are analyzed for 43 speciated compounds at two sites combined with meteorological monitoring.

Lion Co-Polymer We supplied, installed and are operating a hydrocarbon canister sampling program in Louisiana where samples are analyzed for 43 speciated compounds at one site combined with meteorological monitoring.

DuPont Company We designed, installed and operated a four-station PSD air quality and meteorological monitoring network with measurements for SO₂, NO_x, TSP, PM₁₀, wind speed, wind direction, air temperature, as well as over 100 toxic air pollutants, including speciated volatile and semi-volatile organics, dioxins, furans, organic matter and heavy metals collected on various sample media. This monitoring program, which operated from April 1992 to April 1993, was in support of a permit to construct a new rotary kiln incinerator and secure landfill in southern New Jersey. The monitoring program included all phases of operation, maintenance, data reduction, data reporting and quality assurance associated with air quality monitoring.

PPG Industries We installed and are currently operating a long-term PSD monitoring program in support of a hazardous waste incinerator. This network began operation in 1986 and has included monitoring for SO₂, NO_x, NMHC, TSP, various meteorological parameters, ambient VOC measurements, heavy metals analysis and speciated VOC and air toxics compounds. The air toxics monitored for this project included acetone, MEK, toluene, ethyl benzene, isobutanol, MIBK, 2-ethoxyethyl acetate, 2-butoxyethanol and n-butanol. TECO analyzers comprised the SO₂ and NO_x instrumentation and meteorological parameters were measured with Climatronics Corp. instrumentation. We conduct all phases of operation, maintenance, quality assurance, data processing, and report preparation.

**General Electric
Aircraft Engines**

We supplied Summa canister sampling equipment, laboratory analysis and reported results in support of FAA certification for a new jet engine. Sample analysis was performed using U.S. EPA Compendium Method TO-14 for over 40 different organic compounds.

**Ames Rubber
Corporation**

We conducted volatile organic and carbon monoxide compliance testing. Sample analysis was conducted on-site using multiple gas chromatographs under observation by state regulatory representatives.

**Confidential
Industrial Clients**

We conducted VOC sampling project utilizing two on-site portable gas chromatographs.

We conducted area source sampling for combustible gas emissions.

We developed and implemented a sampling technique to measure volatile organics from a batch process operation from a reactor vessel utilizing an on-site portable gas chromatograph. A correlation was developed between process parameters and pollutant emission rates.

We completed a sampling project located at a landfill site. Sampling methodology included sorbent tubes and low flow calibrated sampling pumps. Analysis methodologies utilized gas chromatography and mass spectroscopy.

Hercules

We conducted extensive VOC sampling preliminary to planned plant modifications. Services included analyses for recommended placement of gas sensors to detect unintentional releases of ethylene oxide and propylene oxide.

Mead Corporation

We conducted a VOC sampling project on a toluene recovery system.

**CIBA-GEIGY
Corporation**

We conducted emission testing at the Toms River Plant for methanol.

GAF Corporation

We conducted dioxane sampling utilizing a portable gas chromatography analyzer.

**ITT Avionics
Division**

We conducted a VOC testing program at four plant locations.

Unifoil	We conducted sorbent tube sampling of two exhaust vents on an oven for MEK and toluene.
Permacel	We conducted toluene emission testing and sampling from facility Units 4 and 5.
Ohaus Scale Corp.	We conducted emission testing at the Florham Park facility for THC, VOC, O ₂ , CO and CO ₂ .
Breed Corporation	We conducted indoor air sampling for worker exposure to VOCs.
Morton Thiokol	We conducted a pilot study to estimate releases of xylene from the Red B Dye process. Also performed equipment leak testing using U.S. EPA Method 21.
Manner Textile Processing	We conducted TVOC sampling at two locations.

2.4 EXPERTISE WITH AIR MONITORING INSTRUMENTS

Enviroplan Consulting's Air Quality Monitoring Division is experienced in operating and servicing a wide variety of leading manufacturers' air quality and meteorological monitoring instruments. Our expertise in this area includes but is not limited to the following categories of instruments and product lines:

1. **Manufacturers of Continuous Gas Analyzers, Dilution Calibrators, Permeation Calibrators and Clean Air Supplies:**

Thermo Environmental Instruments (TECO)	Byron
Columbia Scientific Industries (CSI)	Monitor Labs
Dasibi	Vici-Metronics

2. **Manufacturers of PM_{2.5}, PM₁₀, Air Toxics and Related Air Quality Sampling Systems and Instruments**

Andersen Instruments	Wedding and Associates
Rupprecht & Patashnick	Amatek
Graseby-Anderson	Staplex
General Metal Works	SKC

3. **Manufacturers of Meteorological Monitoring Systems and Instruments**

Climatronics Corp.	Teledyne-Geotech
R. M. Young	Setra
Met One	Eppley
Climet	Aerovironment

4. **Manufacturers of Digital Data Acquisition Systems and Chart Recorders:**

Odessa Engineering	Hewlett-Packard
Environmental Systems Corp. (ESC)	Esterline-Angus
Environmental Monitoring Co. (EMC)	Leeds and Northrup
SumX Corp.	Chessell

5. **Manufacturers of Test Instruments for Calibrating and Maintaining Monitoring Instrumentation**

Fluke	Data Precision
MKS	Hewlett Packard
Teledyne Hastings-Raydist	BGI
Bios	Datel
Waters	BK Precision
Brooklyn Thermometer	Tektronix

SECTION 3: CAPABILITIES OF KEY PERSONNEL

Enviroplan Consulting's 37 years of experience with designing, installing, operating, conducting data analysis and reporting and quality assurance for air quality and meteorological monitoring programs has made clear that the most important key to success in achieving the Data Quality Objectives of a monitoring program is to have the best staff directing and operating the monitoring program, where best is measured by the knowledge, experience, track record of performance, training and education of each staff member.

The main reason for this success in maintaining satisfied air quality and meteorological monitoring clients is the quality of our personnel for directing and operating these monitoring networks.

Table 3-1 summarizes the experience of the key Enviroplan Consulting managers responsible for all of our air quality monitoring programs. This table is followed by resumes of these key personnel and of several of the field technicians operating our current monitoring programs.

Table 3-1: Key Enviroplan Consulting Managers Responsible for Air Quality and Meteorological Monitoring Programs			
Name	Position	Years of Experience with Air Quality & Met. Monitoring	Highest Educational Degree
Dr. Howard Ellis, QEP	Senior Reviewer, Project Manager	35	D.B.A.
David Cummings	Project Manager, Oversight of Data Operations	23	A.A.S. Electronics
Kathy Stanwood	Data Operations Manager	27	M.S.
Thomas Ferree	QA Manager	15	B.S
Tom Surfus	Senior Technician	23	A.A.S. Electronics
Kevin Ruggiero	Senior Monitoring Engineer, Field Operations Manager	1	B.S.
Allen Dittenhoeffer	Senior Report Reviewer	31	Ph.D.

DR. HOWARD ELLIS, QEP

Key Position:	Project Manager
Years of Experience:	37
Years Experience with Air Quality Monitoring	35

Knowledge

Dr. Ellis is expert in all aspects of the management of large scale air quality and meteorological monitoring programs. He has served as project manager and overall manager of Enviroplan Consulting's over 110 air quality and meteorological monitoring programs over the past 35 years ranging in size from a single site with a single air pollutant to project manager of a program with over 65 sites measuring over 125 air pollutants. He has authored or coauthored approximately 20 publications in peer review journals and given at professional conferences as detailed in the publication list at the end of this resume. As a measure of his recognition as a national leader and expert in the air pollution sciences including air quality and meteorological monitoring, he has been selected by his peers to be a current member of the Editorial Review Board of EM published by the Air and Waste Management Association and he has previously served as Chairman of the AWMA Critical Review, Chairman of AWMA Meteorology Committee, Chairman of the AWMA Air Toxics Source and Emissions Characterization Subcommittee and Chairman of the ISO 14000 Intercommittee Task Force of the AWMA responsible for the training and dissemination of information on ISO 14000.

Experience in Air Quality and Meteorological Monitoring

Overview. Dr. Ellis has served as project manager and/or as overall manager of the operation and maintenance, data analysis and reporting for over a hundred air quality and meteorological monitoring programs involving hundreds of air quality and meteorological parameters in 19 states and two foreign countries. The parameters monitored include PM_{2.5}, PM₁₀, SO₂, NO_x, CO, VOC, SVOC, carbonyl, Lead, Metals, and various meteorological parameters.

Following are some of the projects Dr. Ellis has served on in a project management and/or overall management capacity.

Warren County, NJ Air Monitoring Program. Provided overall management support for this three year monitoring program mandated by the New Jersey Department of Environmental Protection and funded by Roche Vitamins in the Belvidere, NJ area. Designed, supplied and currently operate a three- station air quality and meteorological monitoring network measuring SO₂, volatile organic hydrocarbons and their speciated compounds, mercury deposition, and meteorology. Data from the network is being used to establish the first citizen emergency notification system in New Jersey in the event of

elevated air pollution concentrations. Data is also being used in a large health effects study.

Georgia Department of Natural Resources. Served as Project Manager for a one year contract to operate the majority of the state's air quality monitoring program including 19 continuous monitors for ozone, NO_x, SO₂, and CO; 19 PM₁₀ monitors; and about 60 air toxics samplers for metals, PUF, VOC, lead and carbonyl. Work involved full operation and maintenance, data analysis and reporting. Continuous data was displayed on Georgia DNR web page. Created the standard operating procedures and operated, maintained and conducted data analysis and reporting for the state's 29 station PM_{2.5} monitoring program.

Chemical Manufacturer's Association. Consultant on designing programs for equipment leak testing and mass emissions sampling from equipment components using Method 21 and bagging methods. Participated in EPA and Chemical Manufacturers Association meetings on developing protocols for equipment leak testing. Organized technical sessions and conferences at which equipment leak testing procedures and results were presented. Directed analyses of monitoring data collected and presented results in reports to EPA that were used in part to revise EPA's correlation equations for relating Method 21 screening concentrations to mass emission rates.

U.S. EPA Mandated Program Funded by Electric Utility Company. Served as Technical Director and Project Manager of a large scale field study and research program to quantify the most extreme vertical dispersion rates governing plume dispersion based on remote plume sensing data and air quality and meteorological monitoring data. Project included 13 stationary SO₂ monitors operated for a 12 month period, two mobile SO₂ monitors, airborne Lidar, Correlation Spectroscopy, SF₆ tracer release and measurement and two 100-meter meteorological towers instrumented at multiple levels. Developed models for plume transport based on study results.

Large Oil Refinery. Provide management and technical support for monitoring program consisting of 16 continuous monitors for ozone, NO_x, SO₂ and CO; six TSP and two PM₁₀ samplers; and one meteorological tower. Work involves full operation and maintenance, data analysis and reporting as well as quality control activities.

Power Plant. Developed principal portions of Monitoring Plan for multi-station PM₁₀ monitoring program about power plant in urban area.

Education.

B.S., Electrical Engineering, Massachusetts Institute of Technology
M.B.A., Harvard Graduate School of Business Administration
D.B.A., Harvard University.

Doctoral dissertation conducted jointly through the Harvard Business School and the Harvard School of Public Health concerned with development of rational approaches to government decisions concerning air pollution. Believed to be the first doctorate awarded by Harvard University dealing with the development of Risk Assessment Methods for air pollution control program decision making.

Completed training course to become a certified auditor of ISO 14000 environmental management systems. Course registered by the Governing Board of the International Register of Certificated Auditors. Certificate No. 141710962

Certifications.

Qualified Environmental Professional, Institute of Professional Environmental Practice

Publications.

Ellis, H.M., Hirtler, M.F., and Dittenhoefer, A.C. (2002) □New Developments Impacting Air Pollution Construction Permitting for New Combustion Turbines□, *EM Magazine*, July 2002.

Ellis, H.M., and Lippincott, B. (2002) □Survey of the Difficulty of Obtaining Environmental Permits for the Construction and Operation of New Power Generation Capacity in 28 States□. Presented at the Air & Waste Management Association 95th Annual Meeting, Baltimore, MD, June 24-28, 2002.

Hydari, N.H., Yousuf, A.A. and Ellis, H.M. (2002) □Comparison of the Most Recent BACT/LAER Determinations for Combustion Turbines by State Air Pollution Control Agencies□. Presented at the Air & Waste Management Association 95th Annual Meeting, Baltimore, MD, June 24-28, 2002.

Ellis, H.M., Hydari, N.H., Yousuf, A.A. and Bent, A. (2002) , Projected PM_{2.5} Attainment Status of Each County in the U.S. Based on 1999-2000 Monitoring Results and Projected Impact on Existing and Proposed New Electric Power Generation Facilities□. Presented at the U.S. Dept. of Energy National Energy Technology Laboratory Conference PM_{2.5} and Electric Power Generation: Recent Findings and Implications□, Pittsburgh, PA, April 9-10, 2002.

Ellis, H.M., Hirtler, M.F., and Dittenhoefer, A.C. (2001) “Impact of New Regulatory and Technological Developments on Obtaining Air Pollution Construction Permits for New Combustion Turbines for Electric Power Generation and Strategies for Dealing with These Developments”. Presented at Air & Waste Management Association 94th Annual Meeting, Orlando, Florida, June 24-28, 2001.

Ellis, H.M. and Ritz, P. (2001) "Bench Marking Survey of State Air Pollution Control Agencies on the Resources Required to Conduct Air Quality Monitoring Programs". Presented at Air & Waste Management Association 94th Annual Meeting, Orlando, Florida, June 24-28, 2001.

Ellis, H.M., Dittenhoefer, A.C. and Fridley, W. (1998) "Developing Environmental Management Systems Based on ISO 14000 Principles for Companies in the Metals Industries: Why and How". Presented at the Air & Waste Management Association Specialty Conference on Environmental Innovations in the Metals Industry for the 21st Century, Pittsburgh, PA, March 1998.

Ellis, H. M., (1997) "The Compliance Assurance Monitoring Rule: A Summary@, *Environmental Manager*, November, 1997.

Ellis, H.M., and Lackaye, R. (1989) "Estimating Fugitive Emissions of Volatile Compounds from Equipment Leaks", *JAPCA*, Vol. 39, No. 12, December 1989.

Ellis, H.M., Logan, M., and Chiu, C. and Tufts, S.A., PPG Industries (1984) "Investigation of Plume Dispersion Using Lidar Plume Measurements." Presented at 77th Annual Meeting of the Air Pollution Control Association, San Francisco, California, June 1984.

Ellis, H.M., Greenway, A.R., and Duplak, E., (1982) "Summary of the Federal Emissions Trading Policy Statement." *Journal of the Air Pollution Association*, August 1982.

Ellis, H.M. (1982) "Evaluation of Prediction Models for the Avon Lake Power Plant Under Unstable Meteorological Conditions". Third Joint Conference on Applications of Air Pollution Meteorology, January 12-15, 1982, San Antonio, Texas. Published by the American Meteorological Society, Boston, Massachusetts.

Ellis, H.M. and Liu, P.C. (1981) "Review of the Performance of the RAM Model in Predicting Highest Measured Concentrations." *Journal of the Air Pollution Control Association*, Vol. 31, No. 2, February 1981, pp 148-152.

Ellis, H.M. and Greenway, A.R. (1981) "The Prevention of Significant Deterioration of Air Quality - Summary of the Final Federal Regulation," *Journal of the Air Pollution Control Association*, Vol. 31, No. 2, February 1981, pp 136-138.

Ellis, H.M. and Liu, P.C., Enviroplan, Inc., and Runyon, C., Ohio Edison Co. (1980) "Comparison of Predicted and Measured Concentrations for 58 Alternative Models of Plume Transport in Complex Terrain," 72nd Annual Meeting of the Air Pollution Control Association, Cincinnati, Ohio, June 1980.

Ellis, H.M., Liu, P.C., and Dalzell, G. (1980) "Comparison Study of Measured and Predicted Concentrations with the RAM Model at Two Power Plants Along Lake Erie," Second Joint Conference on Applications of Air Pollution Meteorology, New Orleans, Louisiana, March 24-27, 1980.

Ellis, H.M. and Liu, P.C. (1980) "Discussion - An Air Quality Performance Assessment Package," *Atmospheric Environment*, Vol. 14, 1980, pp 1113.

Ellis, H.M., Liu, P.C., Bittle, C.R., and Deland, R., Enviroplan, Inc., Lyons, W.A., Mesomet, Inc., and Parker, K., Wisconsin Power & Light Co. (1979) "Development and Validation of a New Prediction Model for Treating Gaussian Dispersion, Aerodynamic Downwash, and Fumigation Due to Lakeshore Meteorology," Fourth Symposium on Turbulence, Diffusion and Air Pollution, January 15-18, 1979, Reno, Nevada.

Ellis, H.M. and Liu, P.C. (1977) "Comparison of Maximum Measured and Maximum Predicted SO₂ Concentrations with the U.S. EPA Single Source (CRSTER) Model," 70th Annual Meeting of the Air Pollution Control Association, Toronto, Ontario, Canada, June 20-24, 1977.

Ellis, H.M., Guise, D., and Liu, P.C. (1975) "Predicting SO₂ Impact from 1000-MW Power Plant," *Power*, July 1975.

Ellis, H.M. and Keeney, R.L. (1972) "A Rational Approach to Governmental Decisions Concerning Air Pollution," *Journal of Systems Engineering*, Vol. 3, No. 1, Summer 1972.

Doctoral Dissertation: Ellis, Howard, Application of Decision Analysis to the Problem of Choosing an Air Pollution Control Program for New York City, Harvard Graduate School of Business Administration, Boston, MA, June 1970

DAVID S. CUMMINGS

Key Position:	Project Manager, Oversight of Data Operations
Years of Experience:	23
Years Experience with Air Quality Monitoring	22

Knowledge

Mr. Cummings is Enviroplan Consulting's Vice President and Director, Air Quality Monitoring Division. He is responsible for overall management of ambient monitoring operations. Mr. Cummings has vast experience in all facets of project management, quality assurance, ambient air quality and meteorological monitoring.

Mr. Cummings has directed project teams conducting environmental programs ranging in size from \$60,000 to \$2,000,000 for numerous companies in the electric utility, manufacturing, chemical, petrochemical, waste-to-energy, general industry, and public sectors.

Areas of Specialization

Vice President and Director, Air Quality Monitoring Division. Responsible for overall management of ambient monitoring operations. Experienced in project management, quality assurance, ambient air quality and meteorological monitoring (all facets).

Project Experience

Project Manager responsible for network and station design, installation and monitoring program oversight for complete operation, maintenance, quality assurance, data reduction, validation, reporting, and administration for over thirty different clients and projects. Selected examples follow:

Alaska Department of Environmental Conservation (ADEC): Quality Assurance Reviewer for the review of Quality Assurance Project Plans (QAPPs) submitted by affected sources to ADEC for their respective meteorological monitoring programs. These data are submitted to ADEC by monitoring contractors in support of existing or future air permits, including for planned projects that will require air dispersion modeling evaluations. QAPP review ensures compliance with the Department's QAPP review checklist and QA/QC procedures. Also prepared and submitted Draft and Final Findings Report documenting all review findings.

Drummond Company: Designed, sited, installed and provide comprehensive support services for a single-station air quality monitoring program for continuous PM10 and meteorological parameters. Support services include operation and maintenance, independent quality assurance audits, data acquisition, processing, validation and reporting. Also designed and successfully

conducted a six-month monitoring study to assess and characterize ambient concentrations of air toxics, including VOCs, PAHs and trace metals.

Pollution Control Finance Authority, Warren County, NJ: Install and conduct two-station air quality monitoring project to satisfy Supplementary Environmental Project (SEP) requirement. Parameters monitored included SO₂ and meteorological parameters at each of the two stations. Supplied comprehensive support services for this monitoring program, including operation and maintenance, independent quality assurance audits, data acquisition, processing, validation and reporting.

DSM Nutritional Products: Designed, supplied, installed and provided comprehensive support services for a three-station air quality monitoring program to meet state and US EPA QA regulatory requirements. Monitored parameters included SO₂, continuous PM_{2.5}, various meteorological parameters and ambient concentrations of air toxics, including VOCs and mercury. Support services include operation and maintenance, independent quality assurance audits, data acquisition, processing, validation and reporting. Designed and uploaded data to a public-accessible website to enable citizens and stakeholders to access the measurement data and compare data statistics to relevant state and federal standards (e.g., NAAQS and air toxics exposure levels).

Plantation Pipe Line: Designed, supplied, installed and operated a two-station fenceline monitoring program for a tank farm in Louisiana. Monitored parameters included continuous measurement of total methane and non-methane organic compounds (TNMOC), episodic sampling of VOCs (VOC samples were automatically initiated and collected when TNMOC measurements exceeded a defined threshold on a real-time basis) and meteorological parameters. This project was part of a parish-wide effort to understand and characterize the potential contributions of ambient organic compounds on the formation and distribution of ground-level ozone for a locality classified as a severe non-attainment area. Wrote final report discussing possible correlations between the measurement data, facility emissions and ozone exceedance events.

DSM Copolymer: Designed, supplied, installed and operated a two-station fenceline monitoring program for a copolymer manufacturing facility in Louisiana. Monitored parameters included continuous measurement of total methane and non-methane organic compounds (TNMOC), episodic sampling of VOCs (VOC samples were automatically initiated and collected when TNMOC measurements exceeded a defined threshold on a real-time basis) and meteorological parameters. This project was part of a parish-wide effort to understand and characterize the potential contributions of ambient organic compounds on the formation and distribution of ground-level ozone for a locality classified as a severe non-attainment area. Wrote final report discussing possible correlations between the measurement data, facility emissions and ozone exceedance events.

Valero Energy Corp.: A six-station monitoring program for PSD in support of a coke-fired power generating plant and petroleum refinery in Delaware. Parameters include SO₂, NO-NO₂-NO_x, CO, O₃, TSP, PM₁₀ and various meteorological monitors.

Texas Commission for Environmental Quality: A single station operated for the Texas Commission for Environmental Quality (TCEQ) measuring NO-NO₂-NO_x, O₃ and various meteorological monitors. The station incorporates real time remote data transmission and calibration status signals posted to a website maintained by the TCEQ.

University of Texas at Austin, TX: Over a 14-month interval (2006-2007), performed three separate “rounds” of independent quality assurance audits on 13 monitoring stations representing 11 ozone monitors, 9 nephelometers, 11 relative humidity monitors, and 8 meteorological monitoring systems operated for the Texas Commission for Environmental Quality (TCEQ) in support of the Texas Air Quality Study II (TexAQS II) monitoring project.

NARSTO-Northeast: Auditor of 15 NARSTO air quality and meteorological monitoring sites throughout the Northeastern US and Canada. Planned, conducted and reported results of quality assurance systems and performance audits for all ground- and aircraft-based air quality and meteorological monitors contributing to the NARSTO-Northeast 1995-1996 field campaign.

State of Georgia: Technical advisor for contract with State of Georgia Department of Natural Resources Air Protection Branch to operate the majority of the state’s air quality monitoring program including 19 continuous monitors for ozone, NO_x, SO₂, and CO; 19 PM₁₀ monitors; 29 PM_{2.5} monitors; and about 60 air toxics samplers for metals, PUF, VOC, lead and carbonyl. Directly responsible for the redesign of QC checklists, sample data sheets and other documentation for the monitoring program. Assisted in preparing the PM_{2.5} monitoring program Standard Operating Procedures and beginning and operating the PM_{2.5} monitoring program for nine months. Work involved full operation and maintenance, data analysis and reporting as well as quality control activities and performance audits.

Bechtel Corporation: Five multi-station networks operated in support of PSD permitting requirements for three cogeneration power plants, two of which are located in southern New Jersey and one in Florida. These networks provided both pre- and post-construction air quality study data. Responsibilities included siting assistance and approvals, design, supply and installation of the monitoring stations, and complete program operation and management. Parameters include SO₂, NO-NO_x, PM₁₀, and meteorological monitoring. E.I. DuPont de Nemours: A four-station, multi-year monitoring network installed and operated in support of permitting for construction of a rotary kiln waste incinerator and secure landfill for this large chemical facility in southern New Jersey. Parameters include SO₂, NO-NO_x, PM₁₀, TSP, meteorological data, and a multi-media program for air toxics monitoring, including metals, organic matter, VOCs, SVOCs, mercury vapor, dioxins and furans.

Orange and Rockland Utilities: A thirteen-station PSD monitoring network operated in support of the coal conversion project for the Lovett generating station in Tomkins Cove, New York. Parameters include twelve SO₂ and five meteorological sites. Unique features of this program included challenging operation and maintenance logistics owing to the sites' location in a state park classified as a primitive area, with access improvements prohibited by law, and real-time data telemetry requirements for all sites to the New York State Department of Environmental Conservation. A special study for air toxics and particulates was also conducted as part of this program.

Cleveland Electric Illuminating: A twenty-station, multiple-network PSD monitoring program operated in support of two fossil-fueled power generating stations. Parameters include SO₂ and multiple meteorological stations incorporating instrumented towers ranging from 10 to 100 meters.

Wisconsin Power and Light: From five to twelve stations operated at various times during this PSD monitoring program in support of a fossil-fueled power generating station located in Sheboygan. Parameters included SO₂, NO-NO_x, O₃, non-methane hydrocarbons, TSP, multiple tall-tower meteorological sites, and acoustic radar to profile atmospheric temperature and stability characteristics.

Northern Indiana Public Service Company: A three-network, eight-station PSD monitoring program in support of three coal-fired power generating plants in northern Indiana. Parameters include SO₂, PM₁₀, and multiple meteorological sites with towers ranging from 10 to 100 meters.

City of Toledo: Supervised performance and systems audits of their four PM_{2.5} samplers, repaired malfunctioning samplers and conducted training program in proper operation and quality control.

American Electric Power Corp.: Five-station PSD monitoring network, including four SO₂ stations and a 60-meter, multi-level instrumented meteorological tower, operating in support of an Indiana-Kentucky Electric Power Generating Station.

BHP Minerals: Two meteorological monitoring stations, one in Mali, Africa, another located in Zimbabwe, Africa, operated in support of mining and processing facilities at these locations. Parameters monitored supported modeling studies conducted by Enviroplan Consulting to show compliance with World Bank ambient air quality standards for proposed expansion of these facilities. Parameters include SO₂, wind speed, wind direction, sigma theta, air temperature, net radiation, relative humidity, evaporation, and precipitation.

Caribbean Petroleum Corporation: Four-station monitoring network, including three SO₂ and one meteorological site operated in support of EPA permitting requirements for a petroleum refinery located in Bayamon, Puerto Rico. Designed and installed real-time alarms to transmit

high ambient SO₂ conditions via telemetry to refinery control center for corrective action and process control.

Bath Iron Works: A single-station PSD monitoring network operated in support of operating permit renewals for this shipyard in Bath, Maine. Assisted in station siting and approval by Maine Department of Environmental Protection, in addition to installation, operation, maintenance, and data reporting. Parameters included SO₂, PM₁₀, and meteorological monitoring.

Indianapolis Power and Light: Sited, installed and operated three PSD monitoring networks in support of permit applications for construction of a new fossil-fueled power generation plant to be located in Patriot, Indiana, and expansion of existing capacity at power generating stations in Pritchard and Indianapolis, Indiana. Parameters monitored include SO₂, NO-NO_x, CO, O₃, and PM₁₀.

United Engineers and Constructors: A pre-construction PSD monitoring network, which provided ambient data in support of planned construction of a new fossil-fueled generating plant near Sutherland, Virginia. Parameters monitored include SO₂, NO-NO_x, O₃, PM₁₀, TSP, heavy metals, and meteorological data from a 100-meter multi-level instrumented tower, including wind speed, wind direction, sigma theta, air temperature and temperature difference, dew point, and precipitation.

E.I. DuPont de Nemours: A four-station multi-year monitoring network installed and operated in support of permitting for construction of a rotary kiln waste incinerator and secure landfill for this large chemical facility in southern New Jersey. Parameters include SO₂, NO-NO_x, PM₁₀, TSP, meteorological data, and a multi-media program for air toxics monitoring, including metals, organic matter, VOCs, SVOCs, mercury vapor, dioxins and furans.

Central Hudson Gas and Electric: A seven-station PSD network monitoring SO₂, NO-NO_x, PM₁₀, TSP, and meteorological parameters in support of two fossil and gas-fueled power generating plants located in Newburgh, New York.

Pennsylvania Power and Ohio Edison: Four PSD monitoring networks comprised of thirteen separate monitoring stations operated in support of four power generating stations located along the Ohio River in Pennsylvania, West Virginia, and Ohio. Parameters include SO₂, PM₁₀, and multiple meteorological sites.

The Turbitrol Company: Designed and installed an ambient monitoring station in support of expansion of a New York City sewage treatment facility located in Coney Island. Parameters included SO₂, H₂S, CO, O₃, NO-NO_x, and six meteorological parameters. The station incorporated real time remote data transmission and calibration status signals. Enviroplan Consulting provided a complete operation and maintenance training program for sewage plant personnel as well.

Education

Associates of Applied Science in Electronics, University of Hartford, CT

Bachelors of Engineering Technology, University of Hartford, CT

U.S. EPA: Courses completed in a variety of air pollution topics

Affiliations

Member, Air & Waste Management Association

Member, American Wind Energy Association

KATHLEEN STANWOOD

Key Position:	Data Operations Manager
Years of Experience:	29
Years Experience with Air Quality Monitoring	27

Knowledge

Manager of Data Reduction, Processing, and Reporting and Laboratory Operations, Air Quality Monitoring Division. Responsible for Enviroplan Consulting's gravimetric laboratory for analysis of particulate matter samples. Fully versed in all phases of data analysis, reduction and report preparation, including State and Federal regulatory reporting requirements for ambient air quality and meteorological monitoring programs. Responsible for daily acquisition (via telemetry) of all monitoring station digital data, preparation of daily data summary reports in support of field operations management, receipt, organization and archival of all supporting data shipments from the field, and subsequent data analysis and reporting for all currently operating air quality and meteorological monitoring programs.

Selected Project Experience

Alaska Department of Environmental Conservation (ADEC): Principal Investigator and Project Manager for multiple projects involving the review of ambient air quality and meteorological data and data reports; and review of Quality Assurance Project Plans (QAPPs) submitted by affected sources to ADEC for their respective meteorological monitoring programs. These data are submitted to ADEC by permittees or monitoring contractors in support of existing or future air permits, including for planned projects that will require air dispersion modeling evaluations. All of these projects entailed a rigorous review of the monitored data set(s) to determine if the data met PSD (Prevention of Significant Deterioration) quality criteria by comparing the data and data reports to established ADEC and EPA (Environmental Protection Agency) documents, regulations and guidelines. QAPP reviews also ensured compliance with the Department's QAPP review checklist and QA/QC procedures. Also prepared and submitted Draft and Final Findings Reports documenting all review findings that affect data validity and PSD quality determinations.

Orange and Rockland Utilities, Inc.: Data Manager for SO₂ and meteorological monitoring data, including the analysis, reduction and validation of this data. Supervised the preparation of the data and prepared monthly, quarterly and annual reports to be submitted to state agencies and the client. Under Air Guide 19 requirements, responsible for weekly contact with New York State Department of Environmental Conservation (NYSDEC) for transmission of Quality Assurance data check information. Supported NYSDEC real-time data acquisition system by retrieval and transmission of network data during NYSDEC system downtime. Assured that calibration data

was current, valid and correctly applied to the data sets. The network consisted of twelve remote SO₂ stations, four remote meteorological stations and a 100-meter meteorological tower at a base station. Data was gathered through a real-time computer-based data acquisition system utilizing radio telemetry with back-up strip chart recorders for missing digital data and validation purposes.

Central Hudson Gas & Electric Corp.: Data Manager for SO₂, NO-NO₂-NO_x, PM₁₀ and meteorological monitoring data, including the analysis, reduction and validation of this data. Responsible for the preparation of monthly and semiannual reports submitted to the client and NYSDEC.

E.I. DuPont de Nemours & Co., Inc.: Data Manager for SO₂, NO-NO₂-NO_x, PM₁₀, TSP and meteorological data and the receipt, organization and analysis of laboratory results of air toxics data, including VOCs, SVOCs, metals, EOM and Dioxins and Furans. Responsible for the preparation of monthly and quarterly reports submitted to the New Jersey Department of Environmental Protection (NJDEP) and DuPont. Developed spreadsheet-based tabular and graphic data reporting formats for over 70 speciated target compounds as analyzed from samples obtained at each of four monitoring site locations. The custom reporting format allowed graphic correlation of the various data sets, enhancing user analysis and presentation of the monitoring program findings.

CIBA GEIGY Corporation: Organized methanol and epichlorohydrin in-vent sampling data for batch processes. Responsible for executing the computer program to organize data into report format. Subsequent review of data to quality-assure final results.

General

Has served as Data Manager for monitoring programs conducted by Enviroplan Consulting on behalf of numerous companies including: ABC Coke, American Electric Power, Bath Iron Works, BHP-Minerals International, Caribbean Petroleum Refining Corp., Central Hudson Gas & Electric, Cincinnati Gas & Electric, City Public Service Board of San Antonio, Cleveland Electric Illuminating Company, Consumers Power, Duquesne Light Company, E.I. DuPont, Ford Motor Company, Foster Wheeler, Indianapolis Power & Light, Massachusetts Port Authority, Motiva Enterprises, Northern Indiana Public Service Company, Old Dominion Electric Cooperative, Orange & Rockland Utilities, PPG Industries, Steel Dynamics, Westvaco Corp. and Wisconsin Power & Light Company, Baltimore Gas & Electric Company, Champion International, Consolidated Edison Company, Consumers Power Company, New England Power Company, Ohio Edison Company, and the City Public Service of San Antonio.

Responsibilities include staff oversight and management for monthly analysis and data reduction of pollutant sampling, including SO₂, NO_x, CO, O₃, TSP, PM₁₀, methane and non-methane hydrocarbons, air toxics pollutants, and various meteorological parameters. Review of data to quality assure final results. Preparation of monthly, quarterly and annual reports, including

PARS, statistical analysis, quality assurance data, wind roses, frequency distribution, data collection efficiencies, moving and non-moving block averages, discussion of the data with respect to regulatory compliance standards, and executive summaries.

Education

M.A., Environmental Studies, Montclair State College
B.S., Biology, St. Peter's College, Jersey City, NJ

THOMAS FERREBEE, III

Key Position: QA Manager and Senior Air Monitoring Engineer
Years of Experience 13 in Air Quality Monitoring

Knowledge

Thomas Ferreebee is Enviroplan Consulting's Quality Assurance Coordinator and Senior Air Monitoring Engineer for the Air Quality Monitoring Division. He is responsible for the installation of the ambient air and meteorological network, and ensuring the conformance of the monitoring network to the QAPP, Monitoring Plan, and SOP. Thomas Ferreebee has extensive experience in field supervision, network installation, and quality assurance for ambient air quality and meteorological monitoring. He is proficient in the operation, maintenance, calibration, service, and repair of all major air sampling equipment and monitoring instrumentation manufactured by General Metal Works, Andersen Instruments, Graseby Andersen, Ruppert & Patashnick Co., Columbia Scientific Instruments, Climatronics, Inc., R.M. Young Co., and Thermo Environmental Instruments.

Thomas Ferreebee has installed, managed and supervised ambient air quality and meteorological monitoring networks for state and local government agencies, electric utility, pulp and paper mill, steel, manufacturing, and petrochemical industries.

Experience in Air Quality and Meteorological Monitoring

Overview. Quality Assurance Coordinator responsible for conducting system and performance audits, data review, reduction, validation, and AIRS coding. Calibrate and certify the network and audit dynamic gas dilution calibrator standard. Senior Air Monitoring Engineer responsible for the installation of air quality and meteorological monitoring networks. Service, troubleshoot, repair, and calibrate instrumentation, data acquisition systems and meteorological equipment for air quality. Hiring, training and providing technical support to field technicians for complex air pollution projects and multiple air quality network tasks. Problem solving monitoring network configurations, and applications.

Georgia Department of Natural Resources. Field Manager and Supervisor for the routine operation of a 40 site/station SLAMS network. The network collected samples and monitored the air for 13 pollutant parameters: TSP Lead, TSP Metals, PUF, VOC TO14, Carbonyl, PM₁₀, PM_{2.5}, SO₂, CO, NO, NO_x, NO_y and Ozone. Trained 12 technicians on daily operation, maintenance, and preventive maintenance of samplers and monitors at each site/station. Perform calibrations, precision checks and quality assurance audits on the sampling and measuring instrumentation.

Large Oil Refinery. Conduct quarterly performance and system audits to four R&P Teom PM2.5 continuous samplers, and seven TSP VFC Hi Volume Air Samplers. Installed, calibrated, and serviced four TEI SO₂, Ozone, CO, and NO-NO₂-NOX continuous monitoring analyzers, five meteorological parameters (Wind Speed, Wind Direction, Ambient. Temperature, Dew Point, and Precipitation), one PM10 VFC Hi Vol air samplers, two TSP VFC Hi Vol air samplers, and two TSP MFC Hi Vol air samplers. Perform operation and maintenance duties in the absence of the site technician. Certify the site dilution calibrator standard for quality network operation.

MeadWestvaco. Conduct quarterly performance and system audits on two TEI SO₂ continuous monitoring analyzers, one H₂S continuous monitoring analyzer, three TSP MFC Hi Volume Air Samplers, and three PM10 MFC Hi Volume Air Samplers. Conduct semi annual performance and systems audit to nine MET monitoring instruments and systems. . Certify the site dilution calibrator standard for quality network operation.

Roche Vitamins/ DSM Nutritional Products. Conduct quarterly performance and system audits to three SO₂ continuous monitoring analyzer, one R&P TEOM PM2.5 continuous sampler. Conduct semi annual performance and system audit to MET instrumentation and systems. Installed, calibrated, and serviced three TEI SO₂ continuous monitoring analyzers, six MET parameters (2-WS, 2-WD, Ambient. Temp, and Solar Radiation), one TEOM PM2.5 continuous air sampler. Certify the site dilution calibrator standard for quality network operation.

NiSource (Northern Indiana Public Service). Conduct quarterly performance and system audits to seven TEI SO₂ continuous monitoring analyzers, and three PM10 MFC Hi Volume Air Samplers. Conduct semi annual performance and systems audit to thirty-three MET monitoring instruments and systems.

ABC Coke. Conduct quarterly performance and system audits one R&P TEOM PM10 continuous sampler. Conduct semi annual performance and system audits to five MET instruments and systems.

SDI-SMD, Steel Dynamics- Structural Mill Div. Conduct quarterly performance and system audits to three PM10 VFC Hi Vol air samplers. Conduct semi annual performance and system audit to three MET instruments and systems. Installed, calibrated, and serviced three PM10 VFC Hi Vol air samplers, and three MET parameters (WS, WD, and Ambient. Temp).

University of Texas. Conduct Systems and Performance Audits of 13 ozone monitors, 8 visibility monitors and 10 meteorological towers consisting of three audits over a two year period.

Plantation Pipeline. Conduct Systems and Performance Audits of following parameters: two 10-meter meteorological towers; two continuous hydrocarbon (HC) monitors continuously measuring non-methane HC, methane and total HC; and HC canister samples for which laboratory speciation analysis is conducted for 43 speciated compounds.

Education

Bachelors of Science Degree, Electronic Engineering Technology, Savannah State University

THOMAS W. SURFUS

Key Position:	Senior Monitoring Engineer
Years of Experience:	32
Years Experience with Air Quality Monitoring	23

Knowledge

Mr. Surfus is a senior field engineer in Enviroplan Consulting's Air Quality Monitoring Division specializing in the installation, operation, and in-field management of air pollution and meteorological monitoring networks.

Experience in Air Quality and Meteorological Monitoring

Mr. Surfus has installed, operated, maintained, and provided repair for three air quality and meteorological monitoring networks having flame-photometric and chemiluminescence air monitors, high-volume samplers, and multi-level meteorological tower systems; conducted radiosonde launch programs; and performed systems and performance quality assurance audits.

Mr. Surfus has been the field project manager for a major study conducted by Enviroplan Consulting to develop emissions factors for fugitive dust from coal piles at two electric utility power plants. He also has continuing responsibilities for monitoring equipment research and development for special field studies.

SDI Bar Products

Mr. Surfus is responsible for the operation of a three station air quality and meteorological monitoring network in the Indianapolis, IN area monitoring for SO₂, CO, NO, wind direction, wind speed and temperature.

Wisconsin Power & Light

For ten years, Mr. Surfus was responsible for the operation and maintenance of and air quality and meteorological monitoring network about the Wisconsin Power & Light Co. Edgewater Plant with 14 air quality parameters and 16 meteorological parameters.

Wisconsin Department of Natural Resources

Prior to his employment with Enviroplan Consulting, Mr. Surfus was an electronic technician with the Air Pollution Control Monitoring Section of the Wisconsin

Department of Natural Resources for more than three years where he conducted installation, maintenance, calibration, repair, and modification of continuous air monitoring instruments.

Education

Certificate of Proficiency as an Electronics Technician from the United Technical Institute in Milwaukee, Wisconsin

KEVIN RUGGIERO

Key Position:	Senior Monitoring Engineer
Years of Experience:	22
Years Experience with Air Quality Monitoring	1

Knowledge

Senior Monitoring Engineer in various capacities since joining Enviroplan including data review and quality assurance, field operations technical support, performing network installations and network operations and maintenance.

Project Experience

Alaska Department of Environmental Conservation (ADEC). Principal Investigator responsible for the review of a Quality Assurance Project Plan (QAPP) submitted by the City and Borough of Sitka to ADEC for a meteorological monitoring program. Reviewed the QAPP for consistency with Department review checklist and regulatory guidance, and ensured that it meets the quality assurance requirements under a Prevention of Significant Deterioration (PSD) program. Submitted a Draft Finding's report and incorporated any ADEC comments into a Final Report. Also a Principal Investigator on multiple pollutant and meteorological monitoring review contracts to perform detailed reviews of the data sets for validity and accuracy; and report the findings to the Project Manager

Northern Indiana Public Service Company (NIPSCO). Senior Monitoring Engineer responsible for conducting independent performance audits on RM Young meteorological monitors for wind speed, wind direction, temperature, temperature difference and dew point. Monitors are installed at multiple levels on tall towers (60 to 100 meters in height).

Valero Delaware City Refinery. Senior Monitoring Engineer responsible for conducting quarterly independent performance audits on air quality monitors for suspended particulate matter (PM) and meteorological monitoring in and around a refinery in northern Delaware. Monitors audited include continuous R&P TEOM PM10, R&P TEOM continuous TSP, episodic TSP (high-volume samplers) and Climatronics Corp. meteorological monitors for wind speed, wind direction, temperature, dew point and precipitation.

Pollution Control Finance Authority (PCFA). Senior Monitoring Engineer responsible for operation and maintenance of a two-station air quality and meteorological monitoring network located in Warren County, NJ. Monitoring parameters include SO₂ and various meteorological parameters.

BP Wind Energy, North America. Senior technician responsible for design, installation, operation and maintenance of self-contained, mobile power systems for lidar instruments operated at remote field locations. Power systems are battery-based, highly regulated and automatically re-charged via an on-board generator. An integrated microprocessor-based data logger monitors and controls all power system functions.

Prior to joining Enviroplan, Mr. Ruggiero ran his own construction company for over 12 years performing residential and commercial applications and is licensed by the state of New Jersey. He also has experience in commercial power plant maintenance including power generation and wastewater treatment.

Education

Bachelor of Science in Finance and a certificate in database programming from Fairleigh Dickinson University

ALLEN DITTENHOEFFER

Key Position:	Senior Report Reviewer
Years of Experience:	30
Years Experience with Air Quality Monitoring	30

Knowledge.

Dr. Dittenhoefer has 28 years of experience as an environmental consultant in areas including review of air quality monitoring program data, estimation of toxic air emissions and other chemical releases from complex mobile and stationary sources, atmospheric dispersion modeling, long range transport, atmospheric chemistry, aerosol physics, atmospheric visibility and multimedia environmental audits. His responsibilities include principal investigator, project management and senior review, administration of company research programs and coordination of new technical developments, regulatory negotiations, and other air pollution consulting services.

Dr. Dittenhoefer has managed projects relating to estimating and measuring emissions from complex source groups such as coke batteries, storage tanks, equipment components and surface impoundments; complex area and volume sources; air pollution control systems; licensing of cogeneration facilities, including multi-disciplinary impact assessments; plume transport and diffusion in hilly terrain and in lakeshore environments; dispersion model development and evaluation; ozone chemistry and transport; long range and mesoscale transport; air quality and precipitation chemistry trends; plume sulfur chemistry; and coal sulfur variability.

Experience in Air Quality and Meteorological Monitoring

Overview. Dr. Dittenhoefer has managed projects involving the detailed review of air quality and meteorological monitoring data, relating to estimating and measuring emissions from complex source groups such as coke batteries, storage tanks, equipment components and surface impoundments; complex area and volume sources; air pollution control systems; licensing of cogeneration facilities, including multi-disciplinary impact assessments; plume transport and diffusion in hilly terrain and in lakeshore environments; dispersion model development and evaluation; ozone chemistry and transport; long range and mesoscale transport; air quality and precipitation chemistry trends; plume sulfur chemistry; and coal sulfur variability.

Following are some of the projects Dr. Dittenhoeffer has served on in as a principal technical investigator, and/or project manager.

Ohio Edison (FirstEnergy). Project Manager to analyze data collected from an airborne plume tracer field study conducted downwind of a major source or air pollution. The objectives of the study were to compare observed plume rise to that predicted using standard formulas, to determine an empirical relationship between rising terrain and elevation of plume centerline above ground level, and to quantify the effects of hilly terrain on plume dispersion for input into a site-specific dispersion model.

Cleveland Electric Illuminating Co. (FirstEnergy). Project Manager to analyze ground- and aircraft-based monitoring data collected from a field study of plume dispersion at a major plant. Study objectives were to study plume dispersion under conditions of lake-effect fumigation and to develop and evaluate a site-specific fumigation dispersion model for the plant.

National Research Council/National Oceanic and Atmospheric Administration. National Research Council Post-Doctoral research Associate at the Mauna Loa Observatory, Hawaii. The purpose of this research assignment was to monitor global baseline concentrations of atmospheric sulfate particles, quantify their impact on light scattering and precipitation chemistry, and investigate the long range transport of soil dust and anthropogenic sulfur particles from Eastern Asia to Hawaii.

Project Manager to analyze recent sulfur wet deposition and SO₂ emissions trends in Eastern North America. The objectives of this study were to 1) investigate the relative importance of meteorological versus SO₂ emissions with respect to precipitation sulfate concentrations, 2) examine the relative importance of local versus distant SO₂ source regions on sulfate concentrations, and 3) estimate the degree of linearity between regional SO₂ emissions and sulfate wet deposition in the northeastern U.S.

The Pennsylvania State University/U.S. Department of Energy. Ph.D. Dissertation. The objectives of this research were to measure the chemical transformation of SO₂ to sulfate in a coal-fired power plant plume and to estimate the relative importance of various gaseous/aqueous phase chemical mechanisms for plume sulfate formation. The study involved sampling of the Keystone Power Plant plume in western Pennsylvania using instrumented aircraft and featured use of an innovative technique to quantitatively detect sulfate in individual particles with an electron microscope.

Education.

B.S., Meteorology, Cornell University

M.S., Meteorology, Cornell University

Ph.D. Meteorology, The Pennsylvania State University

Publications.

Ditterhoefer, A.C., et. al. (2003) "Projected Attainment Status of Each County in the U.S. with the PM_{2.5} National Ambient Air Quality Standards Based on 1999-2001 Monitoring Data and Strategies for Dealing with Nonattainment Designations", Air and Waste Management Association Annual Meeting, San Diego, CA, June 2003

Dittenhoefer, A.C. (1998) "A MACT Residual Risk Issues Facing the Metals Industry", Presented at the Air & Waste Management Association Specialty Conference on Environmental Innovations in the Metals Industry for the 21st Century, Pittsburgh, PA, March 1998

Dittenhoefer, A.C., Fleck, C.M., Hirtler, M.F., and Pan, S.C. (1997) "Hazard Assessment Modeling Under Clean Air Act Section 112(r) at Iron and Steel Facilities", Air & Waste Management Association 90th Annual Meeting, Toronto, Canada, June 8-13, 1997.

Dittenhoefer, A.C. and Menne, M.L., (1992) "Evaluation of the U.S. EPA SRDT and Net Radiation-Based Stability Classification Systems," Air & Waste Management Association 85th Annual Meeting, Kansas City, MO, June 21-26, 1992.

Dittenhoefer, A.C., Ellis, H.M., Romano, R.R., and Arnold, S. (1992) "Correlation Equations and Default Zero Emission Rates for Equipment Components: Comparison of Results from U.S. EPA's SOCFI Study and a New Study of 17 Chemical Plants", Air & Waste Management Association Specialty Conference, King of Prussia, PA, April 21-24, 1992.

Dittenhoefer, A.C., Simpson, E.B., and Romano, R.R. (1991) "Status Report on the Chemical Manufacturers Association/U.S. EPA Fugitive Emissions Bagging Study for Ethylene Oxide and Butadiene Production Facilities", Air & Waste Management Association Specialty Conference on SARA Title III Section 313, New Orleans, LA, March 12-14, 1991.

Dittenhoefer, A.C. and Fridley, W.I., (1991) "Industry Guide for Improving the Accuracy of SARA Title III Section 313 Release Estimates", Air & Waste Management Association Specialty Conference on SARA Title III, Section 313, New Orleans, LA, March 12-14, 1991.

Dittenhoefer, A.C. and Fridley, W.I., (1989) "Toxic Emissions from the Coke, Iron, and Steel Industries: A Guide to SARA Title III Reporting.", Air & Waste Management Association 82nd Annual Meeting, Anaheim, CA, June 25-30, 1989.

Dittenhoefer, A.C., Fridley, W.I., and Holcombe, R.S. (1989) "SARA Title III, Section 313 R Form Preparation for Gulf States Steel, Inc.", Air & Waste Management Association Specialty Conference on SARA Title III, Section 313 - Industry Experience in Estimating Chemical Releases, King of Prussia, PA, April 3-6, 1989.

Berglund, R.L.; Dittenhoefer, A.C.; Ellis, H.M.; Watts, B.J.; and Hansen, J.L. (1987) "Evaluation of the Stringency of Alternative Forms of a National Ambient Air Quality Standard for Ozone", APCA International Specialty Conference on The Scientific and Technical Issues Facing Post-1987 Ozone Control Strategies, Hartford, Connecticut, November 16-19, 1987.

Dittenhoefer, A.C. and Solinski, P.J. (1987) "On the Use of Elemental Tracers for Regional Sulfate Source Apportionment", 80th Annual Meeting of the Air Pollution Control Association, New York, New York, June 21-26, 1987.

Dittenhoefer, A.C. and Ferullo, A.F. (1985) "Analysis of Recent Sulfur Wet Deposition and SO₂ Emissions Trends in Eastern North America", 78th Annual Meeting of the Air Pollution Control Association, Detroit, Michigan, June 16-21, 1985.

Dittenhoefer, A.C. and Ferullo, A.F. (1985) "A Comparison of Predicted and Measured Sulfate Concentrations for Precipitation Events at Whiteface Mountain", 78th Annual Meeting of the Air Pollution Control Association, Detroit, Michigan, June 16-21, 1985.

Dittenhoefer, A.C. and Ferullo, A.F. (1984) "A Comparison of Lagrangian Precipitation Statistics Computed with Two Regional-Scale Atmospheric Transport Models", 77th Annual Meeting of the Air Pollution Control Association, San Francisco, California, June 24-29, 1984.

Dittenhoefer, A.C. (1984) "Evidence of Aqueous Phase SO₂ Oxidation in Power Plant Plumes", 77th Annual Meeting of the Air Pollution Control Association, San Francisco, California, June 24-29, 1984.

Dittenhoefer, A.C. (1983) "Critical Review of the National Research Council Report on Acid Deposition", Enviroplan Report No. 1141-285, prepared for the Ohio Electric Utility Institute.

Dittenhoefer, A.C. and Ferullo, A.F. (1983) "A Dual-Mode Regional Air Back-Trajectory Model," Air Pollution Control Association Specialty Conference on The Meteorology of Acidic Deposition, Hartford, Connecticut, October 16-19, 1983.

Dittenhoefer, A.C. (1983) "Measurements of Power Plant Plume Dispersion in Hilly Terrain", 76th Annual Meeting, of the Air Pollution Control Association, Atlanta, Georgia, June 19-24, 1983.

Dittenhoefer, A.C. (1982) "The Effects of Sulfate and Non-Sulfate Particles on Light Scattering at the Mauna Loa Observatory", *Water, Air and Soil Pollution* 18, 105-121.

Dittenhoefer, A.C. (1982) "The Effects of Sulfate Particles on the Precipitation Chemistry of Hawaii," Second Symposium on the Composition of the Nonurban Troposphere, Williamsburg, Virginia, May 25-28, 1982.

Dittenhoefer, A.C. (1982) "The Effects of Sulfate and Non-Sulfate Particles on Light Scattering at the Mauna Loa Observatory," in *Long-Range Transport of Airborne Pollutants*, D. Reidel Publishing Company, Dordrecht, Holland.

Dittenhoefer, A.C. (1982) "A Critical Review of Long Range Transport/ Acid Precipitation Models." 75th Annual Meeting of the Air Pollution Control Association, New Orleans, Louisiana, June 20-25, 1982.

Dittenhoefer, A.C. (1981) "The Long-Range Transport of Atmospheric Sulfate Observed at the Mauna Loa Observatory," AMS/CMOS Conference on Long-Range Transport of Airborne Pollutants, Albany, New York, April 27-30, 1981.

Dittenhoefer, A.C. and de Pena, R.G. (1980) "Sulfate Aerosol Production and Growth in Coal-Operated Power Plant Plumes," *Journal of Geophysical Research* 85, 4499-4506.

Dittenhoefer, A.C. and de Pena, R.G. (1979) "The Conversion of SO₂ to Sulfate Particles in Coal-Fired Power Plant Plumes," Fourth Symposium on Turbulence, Diffusion, and Air Pollution, Reno, Nevada, January 15-18, 1979.

Dittenhoefer, A.C. and de Pena, R.G. (1978) "A Study of Production and Growth of Sulfate Particles in Plumes from a Coal-Fired Power Plant," *Atmospheric Environment* 12, 297-306.

Dittenhoefer, A.C. and Dethier, B.E. (1976) "The Precipitation Chemistry of Western New York: A Meteorological Interpretation," Office of Water Research and Technology, U.S. Dept. of Interior, Washington, D.C., 45 p.