TRC

DOUGLAS R. MURRAY, CCM

EDUCATION

M.S., Geoscience/Atmospheric Sciences, Purdue University, 1977
B.S., Atmospheric Sciences, State University of New York at Albany, 1975

PROFESSIONAL REGISTRATION

Certified Consulting Meteorologist, American Meteorological Society, (#415), 1987

AREAS OF EXPERTISE

Mr. Douglas R. Murray, CCM has program management and technical expertise in:

- Expert Testimony
- Air Quality Planning and Analysis
- Experimental Design and Field Project Management
- Dispersion Modeling and Model Evaluation
- Air Toxics Evaluation
- Odor Assessment and Modeling
- Materials Damage and Corrosion Assessment
- Air Quality and Meteorological Monitoring

REPRESENTATIVE EXPERIENCE

Mr. Murray has over 29 years of environmental consulting experience. Mr. Murray is a Principal Consulting Scientist and a Certified Consulting Meteorologist. He performs dispersion modeling, meteorological and air quality monitoring studies, and applied research for a variety of industrial, utility, and governmental clients. His experience includes modeling and model development for traditional and nontraditional sources; meteorological, aerometric and remote sensing data acquisition; dispersion modeling for power plants and industrial sources; odor surveys and modeling; toxics and emergency response modeling; materials damage and economic assessments; regulatory reviews; dispersion model performance evaluations; and various other programs involving the atmospheric sciences.

Expert Testimony

Mr. Murray is a Certified Consulting Meteorologist, the highest professional certification of the American Meteorological Society, and has provided expert reports and testimony for litigation and before public agencies.

Drayer vs. Lallier, Litigation Support – Mount Holly, NJ (Expert Witness: 1996)
Mr. Murray quantified dust emissions from a commercial horse stable and the impact of the emissions on a neighboring property. He testified regarding findings at a civil trial.

M. Shane Buckley et al. vs. American Electric Power, Robinson and McElwee, LLP, Litigation Support (Expert Witness: 1999)
Mr. Murray served as an expert witness in a civil suit claiming automobile and residential paint damage attributable to power plant emissions. Following field investigation and submittal of an expert report, the case was dismissed.

Anne S. Finder et al. vs. Springhill Terrace Associates, Gulash and Riccio, Litigation Support – CT (Expert Witness: 1998 – 1999)
Mr. Murray reviewed meteorological data and provided expert witness testimony in an accident related civil suit.

LaMalfa, et al. vs. ML&P Trucking, L.L.C., Litigation Support – Portland, CT (Expert Witness: 2001)
Mr. Murray Inspected damage of materials in-place and collected materials damage field samples for microscopic analysis in TRC's in-house laboratory. He provided expert witness services on atmospheric induced materials damage in a civil suit.

United States vs. Illinois Power Company, (Civil Action No. 99-833-DRH), Akin, Gump, Strauss, Hauer, Feld, LLP – Baldwin, IL (Expert Witness: 2002 – 2003)
Mr. Murray served as an expert witness in New Source Review (NSR) case under the Clean Air Act regarding the impact of power plant emissions on architectural and cultural/historical materials.

Mannheimer vs. City of Bremerton, WA, Carney, Badley, Smith and Spellman – Bremerton, WA (Expert Witness: 1998 – 2000)
Mr. Murray served as an expert witness on air quality and odor modeling in class action suit against the City of Bremerton, WA/Olympic View Sanitary Landfill.

United States vs. W.R. Grace, et al., Libby, MT, Kirkland and Ellis, LLP – Libby, MT (Expert Witness: 2006 – Present)
Mr. Murray is serving as an expert witness on air quality and dispersion modeling for asbestos in a criminal trial.

Valley Protein, Mays and Valentine, Air Quality Modeling – VA (Expert Witness: 2000)
Mr. Murray testified in an adjudicatory proceeding in Virginia regarding air quality and odor modeling for a proposed rendering plant.

Lane Construction, Air Quality Modeling – Brainard, NY (Expert Witness: 1995 –1996)
Mr. Murray testified as an expert witness regarding air quality and atmospheric modeling for an adjudicatory proceeding for a proposed hard rock quarry.

D&J Earthworks, Air Quality Modeling – Old Lyme, CT (Expert Witness: 2004 –2005)
Mr. Murray served as Expert Witness before the Inland Wetland Commission of Old Lyme, Connecticut regarding a proposed quarry operation's impact on air quality and ecological resources.

Air Quality Planning and Analysis

Mr. Murray has directed or participated in numerous air quality evaluation programs, both for individual sources and for regional planning. These programs have utilized both modeling and monitoring approaches to assess or predict air quality. In addition, Mr. Murray has consulted with the U.S. Environmental Protection Agency (USEPA) at the science policy level to establish the National Ambient Air Quality Standards (NAAQS).

PPL Services Corporation, BART Compliance – PA and MT (Project Manager: 2006 – Present)
Mr. Murray is managing visibility modeling and engineering assessments for compliance with Best Available Retrofit Technology (BART) rules under the Regional Haze Regulations.

American Electric Power, Great Bend and Mountaineer IGCC Air Permitting – OH and WV (Air Quality Modeler: 2006 – Present)
Mr. Murray provided air quality analyses in support of PSD permitting for Integrated Coal Gasification/Combined Cycle turbine power projects.

PPL Services Corporation, Air Quality Permit Modeling for Montour and Brunner Island Generating Stations – PA (Project Manager: 2005)
Mr. Murray managed air quality modeling program air pollution control system installations at two coal-fired generating stations.

MGM Mirage, City Center Project – Las Vegas, NV (Project Task Manager: 2005)
Mr. Murray managed air quality modeling program for construction of the City Center Project on the Las Vegas Strip, one of the largest private development projects in the United States.

Meridian Gold, Inc., Esquel Mine, Air Quality Modeling – Esquel, Argentina (Project Task Manager: 2003 – 2006)
Mr. Murray managed air quality modeling to international standards for a proposed gold mine in the foothills of the Andes.

PPL Generating/ Kings Park Energy LLC, Simple Cycle Turbine Generating Station, Environmental Permitting – Kings Park, NY (Air Quality Modeler: 2000 –2001)
Mr. Murray provided air quality analyses in support of New York Article X Application on Long Island.

Lake Road Generating Company, Combined Cycle Turbine Generating Station, Environmental Permitting – Killingly, CT (Air Quality Modeler: 1999)
Mr. Murray conducted and reported air quality dispersion modeling and visual impacts analysis for a greenfields power plant development project in Connecticut. This project followed all CTDEP modeling guidelines for modeling a major stationary source.

CRRA, Existing and Potential Future Landfill Operations Evaluation – Windsor, CT (Visual Impacts Assessor: 2000)
TRC assisted CRRA in its engineering, environmental, and economic evaluation of existing and potential future operations at the Windsor Landfill. TRC provided assistance in consideration of the opportunities associated with the partnering of CRRA and the Town of Windsor in the future operation and management of the landfill. Mr. Murray conducted visual impacts analyses for CRRA and the public using computer and field-based techniques.

Kleen Energy, LLC, Environmental Permitting of the Kleen Energy Project – Middletown, CT (Visual Impacts Assessor: 2001)
TRC is responsible for all environmental permitting for the siting of this large electric power generation facility. Mr. Murray conducted visual impacts analyses using computer and field-based techniques as part of the regulatory compliance requirements for the air permit application.

Calpine-Lawrence, Combined Cycle Generating Station, Environmental Permitting – Lawrence County, OH (Air Quality Modeler: 2000 – 2001)
Mr. Murray provided air quality analyses and complex terrain modeling for a large, combined cycle generating station in Ohio.

Calpine-Stony Brook, Combined Cycle Generating Station, Environmental Permitting – Stony Brook, NY (Air Quality Modeler: 2002 – 2003)
Mr. Murray provided air quality analyses, modeling and permitting for a large, combined cycle generating station/cogen facility in New York.

Astoria Energy, LLC, Combined Cycle Turbine Generating Station, Environmental Permitting – Astoria, NY (Air Quality Modeler: 1999 – 2003)
Mr. Murray provided air quality analyses in support of New York Article X Application and PSD application in New York City.

ARCO Alaska, Exxon USA, and BP, Environmental Fatal Flaws Analysis for Alaska North Slope Gas Commercialization Project, Environmental and Regulatory Review Team – Multiple Locations, AK (Project Manager: 1977 – 1998)
Mr. Murray conducted environmental fatal flaws analysis for proposed gas pipeline and terminal facilities. Primary air emissions sources included natural gas turbines. He evaluated project impacts against various regulatory requirements.

USEPA, Environmental Criteria and Assessment Office, Air Quality Criteria Documents for Oxides of Nitrogen, Photochemical Oxidants and Particulate Matter – Nationwide, U.S. (Project Author and Expert Reviewer: 1990 – 1995)
Mr. Murray is the author of the NO_x and ozone criteria documents and a paid reviewer of the particulate criteria document. Criteria documents form the scientific basis for USEPA's NAAQS.

USEPA, Development of Dispersion Parameters for Complex Terrain – Nationwide, U.S. (Task Manager: Prior to 1990)
Mr. Murray reviewed and analyzed airborne and surface concentration measurements collected by the USEPA's Las Vegas Laboratory in complex terrain settings throughout the Rocky Mountains. He used various mathematical fits to parameterize the raw data.

Allegheny County, State Implementation Plan (SIP) Development – Allegheny County, PA (Air Quality Analyst: Prior to 1990)
Mr. Murray performed modeling in the complex terrain and highly industrialized setting of Allegheny County to explore control strategies for SIP development and NAAQS compliance.

American Petroleum Institute, Chapter 6, Dispersion of Gases – Nationwide, U.S. (Project Author: Prior to 1990)
Mr. Murray prepared the "Dispersion of Gases" chapter for API's handbook on refinery emissions.

ASARCO, Air Quality Modeling and Model Evaluation – East Helena, MT (Air Quality Modeler: 1992)
Mr. Murray participated in an extensive complex terrain modeling and monitoring program for a primary lead smelter in Montana.

Confidential Client, Evaluation of Sulfur Dioxide Monitoring Network – Globe, AZ (Project Manager: Prior to 1990)
Mr. Murray Inspected and multi-station air quality and meteorological monitoring network and performed complex-terrain air quality dispersion modeling.

Charles River Associates/USEPA, Diesel Exposure – Nationwide, U.S. (Project Manager: Prior to 1990)
Mr. Murray estimated the frequency of personal exposure to detectible odors of diesel fumes in urban environments based on modeling and available monitored air quality data.

California Energy Commission, Externalities Cost Model for Power Plant Siting – Statewide, CA (Air Quality Modeler: 1991 – 1992)
Mr. Murray participated in the design and implementation of an air quality/economic impact model to optimize power plant siting in California's air basins.

City of Hudson, Environmental Impact Statement (EIS) Review – Hudson, NY (Project Manager: Prior to 1990)
Mr. Murray conducted an independent review of an EIS for an oil re-refinery proposed for the shore of the Hudson River.

Kennecott Copper Company, Evaluation of Ozone SIP – Salt Lake City, UT (Project Task Manager: 1993 – 1994)
Mr. Murray evaluated the technical and modeling basis of the ozone SIP proposed for the Salt Lake-Provo, Utah area.

Geneva Steel, Carbon Monoxide (CO) Non-Attainment Area Evaluation – Provo, UT (Air Quality Analyst: 1991)
Mr. Murray analyzed an extensive set of meteorological, air quality and atmospheric tracer data to determine the contribution of the mill to CO concentrations in a non-attainment area.

Lane Construction, Brainard Quarry, Air Quality Modeling – East Nassau, NY (Project Manager: 1995 – 1996)
Mr. Murray performed air quality modeling and testified in an adjudicatory hearing under New York State's Environmental Quality Review Act (SEQRA) process regarding particulate matter and crystalline silica generation from the proposed hard rock mine and resulting community exposures.

USEPA, Area Source Module Evaluation – Nationwide, U.S. (Project Task Manager: Prior to 1990)
Mr. Murray evaluated the technical basis of area source algorithms as implemented in various USEPA regulatory models.

Procter and Gamble, Hamilton County SIP Development Assistance - Ivorydale, OH (Project Manager: 1990)
Mr. Murray assisted Procter and Gamble with modeling to understand the impact of the proposed Hamilton County SIP on their operations.

American Energy Systems, Complex Terrain Modeling - Jobos, PR (Air Quality Modeler: 1993 – 1995)
Mr. Murray conducted multi-source, complex terrain modeling in support of construction and operating permits for a new power plant installation.

Alyeska Pipeline Service Company, Complex Terrain Modeling – Valdez, AK (Project Manager: 1994 – Present)
Mr. Murray conducted complex terrain modeling for Alyeska's implementation of a marine vapor control system and other air quality related issues at the Valdez Marine Terminal. The modeling was intricate due to the number and types of sources involved, including a fleet of tankers involved in the Alaska trade.

Conectiv Energy, NO_x RACT Compliance – DE and MD (Project Manager: 2000)
Mr. Murray assisted utility client in development of alternative NO_x RACT limits for three generating stations in Delaware and Maryland.

Experimental Design and Field Project Management

Mr. Murray has designed and conducted several large, multi-contractor field projects. These projects have required extensive planning and management skills to attain the project goals.

Electric Power Research Institute (EPRI), Plume Model Validation and Development Project – Nationwide, U.S. (Technical Manager: Prior to 1990)
Mr. Murray served as Technical Manager for EPRI's Plume Model Validation project, a $32 million, multi-year atmospheric research effort. He oversaw the activities of several contractors and subcontractors. He supervised the implementation of a large database management system with associated dispersion models and statistical software. He directed the design of a comprehensive quality assurance program, designed field measurements programs including tracer network design and monitor siting, and oversaw the field monitoring program involving air quality and meteorological data collection and utilizing state-of-the-art remote sensing equipment and aircraft.

Alyeska Pipeline Service Company, Valdez Air Health Study – Valdez, AK (Project Manager: 1989 – 1992)
Mr. Murray served as Project Manager for an innovative personal air toxics monitoring and tracer program, the Valdez Air Health Study. He oversaw the design and implementation of an intensive personal and indoor/outdoor volatile organic compound (VOC) monitoring program using atmospheric tracers to apportion emissions. He was the editor of the final, multiple contractor risk assessment report.

Puerto Rico Environmental Quality Bureau, Air Monitoring and Risk Assessment Time Critical Removal Action at Former Vieques Naval Training Range – PR (Air Quality Analyst: 2005 – Present)
Mr. Murray reviewed the air quality monitoring sites and data reports relative to ordnance removal operations at a former naval practice bombing range. He reviewed air quality monitoring system design for controlled forest burns as part of the remediation program.

EG&G/Department of Energy, Rocky Flats Plant, Winter Validation Study – Boulder, CO (Program Manager: 1990 – 1991)
Mr. Murray served as overall manager of the Winter Validation Study at the Rocky Flats Plant, an extensive tracer, meteorological and remote sensing program. The project was cooperative with DOE's ASCOT program and included 14 field measurements contractors or cooperative agencies with several subcontractors. The study provided plume data for the evaluation of Rocky Flat's sophisticated plume dispersion model.

Minneapolis Energy Center, Inc., Urban Downwash Study – Minneapolis, MN (Project Manager: 1990)
Mr. Murray served as Project Manager for a study of plume downwash in an urban core area for the Minneapolis Energy Center. He designed and implemented a meteorological and tracer measurement program for downtown Minneapolis to evaluate the applicability of the USEPA's Industrial Source Complex model for predicting SO_2 concentrations. He statistically analyzed the results to show that the model over-predicts during stable, low wind speed conditions.

Confidential Client, Property Transfer – Nationwide, U.S. (Field Coordinator: 1995)
Mr. Murray coordinated nationwide file searches and record reviews of 29 manufacturing facilities on a very compressed project time schedule. The seller agreed to retain environmental liability for previous releases at the facilities and needed a complete set of materials handling records, manifests, etc. for their legal department to use in the event of future law suits or Superfund actions. The results of the file searches were put into a database by chemical and facility to enable the client to respond to potentially responsible party (PRP) notifications. He also supported the client with response to a CERCLA 104 information request.

Consolidated Edison Company of New York, Evaluation of PCB Inventories for Oil Filled Electrical Equipment – New York City, NY (Project Manager: 1998 – 1999)
Mr. Murray designed and conducted a project to evaluate the precision of PCB concentration information contained in Con Ed's inventories that are used for compliance with TSCA and for emergency response in the event of a fire or spill. He prepared the sampling approach, oversaw field sampling and performed the

database evaluation which was reported to the New York State Department of Environmental Conservation and the Public Service Commission as well as the New York City Department of Environmental Protection and the Fire Department.

U.S. Army Corps of Engineers, Hurricane Georges Cleanup – Salinas, PR (Field Manager: 1998 – 1999)
As part of the disaster response and cleanup from Hurricane Georges, the Corps of Engineers designed and constructed an incinerator to handle storm damaged materials. Mr. Murray participated in negotiations with the Environmental Quality Bureau and USEPA Region II personnel regarding the design of an air quality monitoring program for a waste handling/incinerator site. He directed a field crew and subcontractors in around-the-clock monitoring for the site while still under disaster conditions (disrupted power, communication and transportation systems, tropical disease health warnings in effect). The project succeeded in meeting required data capture targets and the Corps of Engineers was able to demonstrate environmental compliance.

Dispersion Modeling and Model Evaluation

Mr. Murray has modeled a wide variety of emissions sources using USEPA "Guideline" models, various Gaussian and first-order closure models and physical models (wind tunnel). He has played a key role on several model evaluation projects.

American Petroleum Institute, Model Evaluation Program – Nationwide, U.S. (Air Quality Analyst: Prior to 1990)
Mr. Murray was responsible for creating a computer archive of experimental data containing over 80,000 station observation hours from 17 tracer dispersion programs. These data were the basis for an extensive evaluation of USEPA's air quality dispersion models.

USEPA, Narrative Example – Nationwide U.S. (Project Author: Prior to 1990)
Mr. Murray conducted the statistical evaluation and authored the "Narrative Example" for the USEPA's Interim Procedures for Evaluating Air Quality Models.

American Mining Congress, Model Evaluation – Nationwide, U.S. (Air Quality Modeler: Prior to 1990)
Mr. Murray compared model predicted concentrations against monitored air quality data for several surface mining operations.

American Petroleum Institute and Western Oil and Gas Association, Model Evaluation – Nationwide, U.S. (Air Quality Modeler: Prior to 1990)
For offshore oilfield development projects, Mr. Murray evaluated the technical applicability of available modeling approaches and compared model predictions to onshore monitored data.

Confidential Client, Deposition Algorithm Evaluation – Classified (Project Manager: 1993 – 1994)
Mr. Murray reviewed available particle and gas deposition modeling algorithms for inclusion in a model to determine the impact of a conventional weapon strike on a hardened target containing biological and chemical warfare agents.

Pennsylvania Electric Company/General Public Utilities, Model Evaluation Programs – Western PA (Air Quality Modeler: 1991 – 1998)
Mr. Murray performed modeling and air quality model performance evaluations for several electric generating stations in the complex terrain of western Pennsylvania.

North Shore Mining, Model Evaluation – Silver Bay, MN (Project Manager: 1994 –1995)
Mr. Murray prepared an evaluation protocol following the USEPA's "Interim Procedures for Model Evaluation" and executed the statistical procedures for a complex, multi source mineral processing facility.

Wyoming Mining Association, Model Performance Evaluation – Various Western Mines (Air Quality Modeler: Prior to 1990)
Mr. Murray conducted an evaluation of the applicability of AP42 emission estimates and the ISC model to surface mining operations.

USEPA, User's Guide for the ISC Model – Nationwide, U.S. (Project Author: Prior to 1990)
Mr. Murray prepared sections of the User's Guide for the ISC model.

China Technical Corporation, Inc., Model Training and Emissions Evaluation – Taipei, Taiwan (Project Role: 1992)
Mr. Murray provided dispersion model training to CTCI staff engineers, subcontractors and members of the Republic of China environmental regulatory community. He also conducted field evaluations of emissions sources in industrial parks in Kaosuing in southern Taiwan.

Dairyland Power, Acid Deposition/Long Range Transport Modeling – WI (Air Quality Modeler: Prior to 1990)
Mr. Murray modeled power plant emissions to determine the contribution of the facilities to regional acid precipitation.

FMC Corporation, Total Suspended Particulate Modeling – Pocatello, ID (Air Quality Modeler: Prior to 1990)
For an elemental phosphorous plant, Mr. Murray conducted emissions surveys and air quality modeling to assess compliance with NAAQS for total suspended particulate (TSP).

Pennsylvania Department of Environmental Protection (PADEP) Bureau of Air Quality, Modeling Assistance – Statewide, PA (Project Manager: Prior to 1990)
Through the USEPA's State Assistance Program, Mr. Murray provided expert meteorological and modeling advice to the PADER Bureau of Air Quality.

USEPA, Pollutant Episode Analysis – Nationwide, U.S. (Task Manager: Prior to 1990)
Mr. Murray analyzed meteorological and air quality data collected during episodes of high observed concentrations of ozone and other criteria pollutants. The objective of the study was to identify underlying meteorological causes of elevated concentration events.

GE Silicones, Risk Assessment Modeling – Waterford, NY (Air Quality Modeler: 1996 – 2006)
Mr. Murray performed dispersion modeling to assess community health risks under USEPA's BIF regulations.

Air Toxics Evaluation/Accidental Release

Mr. Murray has conducted a variety of air toxics monitoring, dispersion modeling and model evaluation projects.

Connecticut Resources Recovery Authority, Health Assessment Modeling for Landfill - Hartford, CT (Air Quality Modeler: 1995)
Mr. Murray employed modeling (ISCST3), monitoring and emissions data to assess the health risks associated with operation and expansion of an urban area regional landfill.

Cosmed Group, Permitting Assistance – RI and NJ (Project Task Manager: 2002 –2006)
Mr. Murray provided emission measurement, permitting and regulatory assistance for ethylene oxide sterilizer facilities.

Posillico Brothers Asphalt Company, Plume Modeling Study – Farmingdale, NY (Project Manager: 2002)
Mr. Murray provided air toxics modeling for an asphalt plant in response to DEIS public comments.

PPL Generation, LLC, Lake Wallenpaupack Project Hydrogen Sulfide Emissions – Lake Wallenpaupack, PA (Project Manager: 2001 – 2002)
Mr. Murray estimated maximum long and short term concentrations arising from tailstock emissions.

The Fertilizer Institute, Ammonia Release Modeling – Nationwide, U.S. (Project Manager: 1995 – 1996)
To assist its members in meeting the requirements of USEPA's Risk Management Program under Section 112r of the Clean Air Act Amendments (CAAA) of 1990, Mr. Murray modeled worst-case and alternative scenario accidental releases of anhydrous ammonia for a variety of tank sizes and configurations.

Louisiana Ammonia Producers Association, Ammonia Release Modeling – Statewide, LA (Project Role: 1996)
To assist with 112r compliance, Mr. Murray performed a series of worst-case and alternative scenario modeling runs using appropriate dense gas modeling algorithms. Employed several different modeling approaches and compared their results.

General Public Utilities Generating Company, Shawville Generating Station, Risk Management Plan (RMP) Review – Shawville, PA (Air Quality Modeler: 1996)
Mr. Murray reviewed the existing OSHA Process Safety Management (PSM) plan and recommended additional steps needed to comply with USEPA's RMP requirements. He also performed worst case, dense gas modeling for compounds stored onsite.

Confidential Client, RMP Worst-Case and Alternative Scenario Modeling – Various Upper Midwest States (Project Manager: 1996 – 1997)
For an ammonia production and transportation client, Mr. Murray assisted in defining alternative release scenarios and performed dense gas modeling using DEGADIS and HGSYSTEM to determine distance to endpoint for RMP compliance.

Chemical Manufacturers' Association, Model Evaluation – Nationwide, U.S. (Air Quality Modeler: Prior to 1990)
Mr. Murray conducted an evaluation of dense gas and other models applicable to accidental releases.

Duane Arnold Energy Center, Chlorine Spill Modeling – Palo, IA (Air Quality Modeler: Prior to 1990)
To assess the impact of an accidental chlorine spill on operations of a nuclear power station control room, Mr. Murray modeled several potential accident scenarios and used "what if" analysis techniques to predict accident consequences on both personnel and reactor control hardware.

Ciba Geigy, Hypothetical Phosgene Gas Release Tracer Study – Toms River, NJ (Project Manager: Prior to 1990)
Mr. Murray used sulfur hexafluoride tracer to simulate low wind speed, stable meteorology condition accidental releases from a phosgene gas storage facility.

Carolina Power and Light, Meso-Scale Modeling, Accidental Release and Long-Term Exposure – Hartsville, SC (Air Quality Modeler: Prior to 1990)
Mr. Murray modeled potential accidental and long-term releases of radionuclides using the MESODIFF dispersion model.

Potentially Responsible Parties, McColl Superfund Site – Fullerton, CA (Air Quality Modeler: Prior to 1990)
Mr. Murray modeled odor and toxic air pollutant emissions from one of the first Superfund sites in the country.

Travenol Laboratories, Ethylene Oxide Modeling – Glenview, IL (Project Manager: Prior to 1990)
Mr. Murray modeled near field (employee) and far field (community) concentrations resulting from the operation of bulk sterilizers at a production facility.

Jacknife, Air Toxics Evaluation – Middletown, CT (Project Manager: Prior to 1990) Mr. Murray evaluated the air toxics exposure potential of a proposed movie battle scene for the Robert DiNiro movie "Jackknife".

USEPA, Toxic/Accidental Release Model Evaluation – Nationwide, U.S. (Project Task Manager: Prior to 1990)
Mr. Murray reviewed and prepared databases for the USEPA's evaluation of dense gas dispersion models. He subsequently participated in the model evaluation effort.

Exxon Bayway Refinery, Accidental Release – Bayway, NJ (Air Quality Modeler: 1990)
Mr. Murray collected meteorological data and performed modeling over a three state region in support of litigation actions following an accidental release.

Union Camp Corporation, Air Toxics Sampling – Savannah, GA (Project Manager: 1994)
Mr. Murray designed, conducted and analyzed an ambient sampling program to determine the concentrations of air toxics surrounding a large paper mill and to determine whether the paper mill was a significant source of the compounds measured.

City of Hartford, North Meadows Landfill, Meteorological and Air Quality Sampling Program – Hartford, CT (Air Quality Analyst: 1991)
In response to community concerns regarding landfill gas emission and population exposure, Mr. Murray designed a meteorological and air quality sampling program for the landfill.

Odor Assessment and Modeling

Mr. Murray is an author of TRC's ODOR model, designed to predict very short-term concentrations, and has conducted several odor measurement, survey and modeling studies.

Massachusetts Water Resources Authority, Odor Impact Evaluation and Odor Modeling Support – Boston, MA (Project Task Manager: 2001 – 2004)
Mr. Murray provided support for odor measurement and odor modeling activities for the Deer Island Treatment Plant in Boston Harbor.

City of Fort Lauderdale, Odor Modeling – Fort Lauderdale, FL (Air Quality Modeler: Prior to 1990)
Mr. Murray modeled odorous emissions for a variety of industrial sources in Fort Lauderdale in order to devise an economically viable control strategy.

Dexter Corporation, Odor Impact Evaluation – Windsor Locks, CT (Air Quality Analyst: Prior to 1990)
Mr. Murray conducted odor emission measurements, community odor surveys and odor modeling for a specialty paper company. The modeling used TRC's proprietary ODOR model and was performed to explore control strategy alternatives.

General Motors Truck and Coach, Odor Modeling – Pontiac, MI (Air Quality Modeler: Prior to 1990)
Mr. Murray performed odor modeling for foundry, spray booth and other sources at GM's facilities.

General Motors, Orion Plant, Odor Modeling – Lake Orion, MI (Air Quality Modeler: Prior to 1990)
Mr. Murray conducted odor modeling for proposed control strategies.

Tennessee Eastman, Odor Modeling – Kingsport, TN (Air Quality Modeler: Prior to 1990)
Mr. Murray conducted odor modeling for process control applications.

City of Baltimore, Back River Wastewater Treatment Plant (WWTP), Odor Study – Baltimore, MD (Air Quality Modeler: Prior to 1990)
Mr. Murray conducted odor emission and ambient sampling, and odor modeling for a large municipal WWTP.

Composting Facility, Odor Modeling – Montgomery County, VA (Air Quality Modeler: Prior to 1990)
Mr. Murray conducted odor modeling and community odor evaluation for a state of the art composting facility.

Clark County, Nevada, Odor Modeling – Clark County, NV (Air Quality Modeler: Prior to 1990)
Mr. Murray conducted odor modeling and evaluations for a municipal WWTP.

General Motors, Odor Measurement and Modeling – Van Nuys, CA (Air Quality Modeler: Prior to 1990)
Mr. Murray participated in an extensive odor evaluation and control project at an automotive assembly plant in a heavily developed suburban area.

Valley Proteins, Odor Emissions Testing, Modeling and Professional Testimony – Winchester, VA (Air Quality Modeler: 2000)
Mr. Murray tested and modeled emissions from a poultry rendering facility. He testified in an adjudicatory hearing regarding the odor impact of siting a rendering facility.

Ford Motor Company, Odor Modeling, Twin Cities Plant – St. Paul, MN (Air Quality Modeler: Prior to 1990)
Mr. Murray evaluated the community impact of odors emissions from an automotive manufacturing plant.

Phthalchem, Inc., Odor Modeling – Cincinnati, OH (Air Quality Modeler: Prior to 1990)
Mr. Murray conducted dispersion modeling for emissions from a chemical manufacturing facility.

New Milford Landfill, Odor Modeling – New Milford, CT (Air Quality Modeler: 1996)
Mr. Murray performed extensive ISCST3 odor modeling to determine the impact of removing the existing permanent landfill cap and excavating the landfill to comply with a court decision requiring portions of the landfill materials to be removed from the site.

Canadian Technical Tape, Odor Modeling Evaluation – Montreal, Canada (Air Quality Modeler: 1996)
Mr. Murray supported a manufacturing plant in interpreting and complying with municipal regulations regarding the emission of odorous compounds in an urban setting.

Materials Damage and Corrosion Assessment

Mr. Murray has conducted several projects evaluating the impact of air pollutants on non-biological materials and is past Chairman of the Air and Waste Management Association's Materials Effects Committee.

Orange and Rockland Utilities, Materials Damage Study – Stony Point, NY (Project Manager: 1987 – 1990)
Mr. Murray designed and conducted a three-year field exposure study of the impact of a coal fired utility plant on metals, paints and structural stone. The study involved several field monitoring sites with concurrent air quality and meteorological monitoring.

USEPA, Coating Performance Evaluation – Jacksonville, FL (Project Manager: 2002 – 2005)
Mr. Murray designed and conducted a two-year field exposure study of coating performance at the Naval Air Station, Jacksonville, Florida. The study incorporated exposure coupons, fuel tank and runway striping coatings.

USEPA, Materials Damage Survey – AZ, NE, NC (Air Quality Analyst: Prior to 1990)
Mr. Murray conducted a field survey of single and multi-family residential, commercial and agricultural materials in-place in Tucson, Arizona, Lincoln, Nebraska and Charlotte, North Carolina. The objective of the survey was to quantify the types of exposed materials in pre-selected Census Tracts so that a predictive model of materials in place could be developed to support estimates of the economic consequences of air pollution induced materials damage to building exteriors.

California Air Resources Board, Economic Estimate of Air Pollution Materials Damage – Los Angeles, CA (Air Quality Analyst: Prior to 1990)
Using data bases of monitored air quality data, estimates of materials in place and materials damage functions, Mr. Murray estimated the total and per capita costs of air pollution induced materials damage in the South Coast Air Basin.

National Park Service, Air Pollution Damage to Statuary and Historic Building Facades – Nationwide, U.S. (Project Manager: Prior to 1990)
Mr. Murray designed and conducted a survey of art conservators, historic preservation groups and building contractors to quantify the economic impact of air pollution on culturally and historically significant properties including bronze statuary and masonry building facades.

First Brands Corporation, Severe Atmospheric Corrosion – Cartersville, GA (Project Manager: Prior to 1990)
Mr. Murray investigated equipment failure attributable to rapid atmospheric corrosion at three manufacturing facilities. Ambient sampling was conducted to identify chemically active ions and determine the likely sources of the damaging emissions.

Freeport Sulfur, Materials Damage/Emission Study – Jacksonville, FL (Air Quality Analyst: Prior to 1990)
Mr. Murray participated in a project to determine the particulate emissions from pelletized sulfur and determine the corrosion impact of sulfur.

City of Charleston, Materials Damage Pine Island WWTP – Charleston, SC (Project Manager: Prior to 1990)
Mr. Murray analyzed an acute rapid corrosion problem at the city's WWTP and recommended control strategies to resolve the corrosion problems.

Electric Motion, Materials Damage/Corrosion Evaluation – Winsted, CT (Project Manager: Prior to 1990)
Mr. Murray conducted an investigation of corrosion of electronics components stored in a warehouse environment. Using microscopy, he found that modifications to coating processes were needed.

National Acid Precipitation Assessment Program (NAPAP), Review of Acid Precipitation Impact on Materials – Nationwide, U.S. (Air Quality Analyst: Prior to 1990)
Mr. Murray conducted a critical review of NAPAP's findings regarding the effects and economics of acid precipitation on culturally significant and common architectural materials.

Fritzche, Dodge, Olcott, Materials Damage Review – New York, NY (Air Quality Analyst: Prior to 1990)
Mr. Murray reviewed materials damage and corrosion allegedly caused by material handling practices at a manufacturing facility.

Monitoring and Data Evaluation

Mr. Murray has been responsible for several air quality and meteorological monitoring programs.

Phelps Dodge, Metals Deposition Analysis – Norwich, CT (Air Quality Modeler: 2000)
Mr. Murray performed statistical/graphical analysis of geographic concentration pattern of metals in soil and streambeds to determine probable source locations.

New York State Department of Transportation, Carbon Monoxide (CO) Hotspot Monitoring – New York, NY (Project Task Manager: 1990 – 1991)
Mr. Murray installed and operated CO Hotspot monitoring sites around some of the busiest intersections in midtown Manhattan. The project was conducted as part of the West Side Highway rebuild environmental assessment.

New York Economic Development Corporation, Richmond County Ballpark at St. George Design – New York, NY (Air Quality Analyst: 1998)
Mr. Murray participated in design of a minor league baseball park on Staten Island by examining historical wind data to determine the appropriate distance to the outfield fence.

Industry Consortium, Pioneer Valley Hi-Vol Sampling Program – Statewide, MA (Air Quality Analyst: Prior to 1990)
Mr. Murray managed a 12-station TSP monitoring network throughout the Connecticut River Valley in Massachusetts.

Boston Edison Company, Meteorological Monitoring Pilgrim Station – Plymouth, MA (Air Quality Analyst: Prior to 1990)
Responsible for meteorological system maintenance, data processing and review to meet Nuclear Regulatory Commission (NRC) requirements for a safety related program with full NRC Quality Assurance (QA).

Sandia National Laboratory, Waste Isolation Pilot Plant (WIPP) – Carlsbad, NM (Air Quality Analyst: Prior to 1990)
Mr. Murray was responsible for meteorological data processing and reporting under NRC QA requirements. He also performed accidental release and long-term exposure modeling calculations for the proposed facility.

Finch Pruyn Corporation, Meteorological Monitoring System Design – Glens Falls, NY (Air Quality Analyst: Prior to 1990)
Mr. Murray designed a meteorological monitoring system to meet PSD and state monitoring requirements for onsite data collection in support of regulatory dispersion modeling.

Mashantucket Pequot Tribe, Meteorological and Air Quality Monitoring System Design – Ledyard, CT (Air Quality Analyst: 1994)
Mr. Murray prepared a conceptual design plan to assess the air quality impacts of development of the reservation property.

Yankee Atomic Electric Company, Meteorological Data Evaluation – Rowe, MA (Air Quality Analyst: Prior to 1990 – 1999)
In compliance with NRC safety requirements, Mr. Murray reviewed meteorological data collected at the Rowe power station.

Princeton University Plasma Physics Laboratory, Meteorological Data Evaluation, – Princeton, NJ (Air Quality Analyst: Prior to 1990 – 1999)
In compliance with NRC safety requirements, Mr. Murray reviewed meteorological data collected at Princeton's research facility.

PROFESSIONAL AFFILIATIONS

- American Meteorological Society, Certified Consulting Meteorologist

- Air and Waste Management Association (National and Connecticut Chapter, Chairperson)

SELECTED PUBLICATIONS AND PRESENTATIONS

Murray, D.R., "Experiences Using AERMOD," Presented *Air Quality Models Specialty Conference*, at *Air and Waste Management Association*, Newport, RI, April 2001.

Murray, D.R., "Compliance with USEPA's Risk Management Planning", *New Jersey Environment, Massachusetts Environment and Pennsylvania Environment,* Environment News Magazines, Inc., Bloomfield, CT, January 1997.

Murray, D.R., "Atmospheric Tracer Concentrations from Elevated Source in Urban Core", *Journal of Environmental Engineering, American Society of Civil Engineers*, Vol. 121, No. 1, January 1995.

Murray, D.R., "Observed Downwash Concentrations Compared to ISCST Predictions in Urban Core," *Journal of Environmental Engineering, American Society of Civil Engineers*, Vol. 121, No. 1, January 1995.

Murray, D.R., "Review of the Effects of Ozone and Nitrogen Oxides on Non-Biological Materials," 94MP1.02, Presented at the *87th Annual Meeting of the Air and Waste Management Association*, Cincinnati, OH, June 1994.

Murray, D.R., "CTDMPLUS Modeling Program Development and Implementation at the ASARCO Primary Lead Smelter," 94WP89.04, Presented at the *87th Annual Meeting of the Air and Waste Management Association*, Cincinnati, OH, June 1994.

Murray, D.R., "Preparing for CTDMPLUS Modeling Analysis: Necessary Enhancements to an Existing Meteorological Monitoring Network," Presented at the *8th Joint Conference on Applications of Air Pollution Meteorology, American Meteorological Society*, Nashville, TN, January 1994.

Murray, D.R., "Meteorological Aspects of Benzene Transport, Dispersion and Personal Exposure in Valdez, Alaska," Presented at the *8th Joint Conference on Applications of Air Pollution Meteorology, American Meteorological Society*, Nashville, TN, January 1994.

Murray, D.R., "Evaluation of REMTECH PA2 Phased Array SODAR Performance in Complex Terrain Using In-Situ Turbulence Instruments," Presented at the *8th Joint Conference on the Applications of Air Pollution Meteorology, American Meteorological Society*, Nashville, TN, January 1994.

Murray, D.R., "Impact of a Coal-Fired Power Plant on Architectural Materials," Presented at the *84th Annual Meeting of the Air and Waste Management Association*, Vancouver, Canada, June 1991.

Murray, D.R., "Valdez Air Health Study: Exposure Monitoring and Risk Assessment," Presented at the *International Symposium on Measurement of Toxic and Other Related Air Pollutants*, Raleigh, NC, March 1991.

Murray, D.R., "Comments on NAPAP's Program on Materials and Cultural Resources Effects", Presented at the *National Acid Precipitation Assessment Program Peer Review Meeting*, Charleston, SC, January l989.

Murray, D.R., "Plume Dispersion Project," Presented at the *2nd International Conference on Atmospheric Sciences and Applications to Air Quality*, Tokyo, Japan, October 1988.

Murray, D.R., "Design and Implementation of a Materials Deterioration Monitoring Study for an Electric Utility" Presented at the *81st Annual Meeting of the Air Pollution Control Association*, Dallas, TX, June 1988.

Murray, D.R., "Industrial Toxic Gas Storage Facility Dispersion Study," Presented at the *1988 USEPA/APCA Symposium on Measurement of Toxic and Related Air Pollutants,* Raleigh, NC, May 1988.

Murray, D.R., "Urban Power Plant Plume Studies," *EPRI EA5468, Electric Power Research Institute*, Palo Alto, CA January 1988.

Murray, D.R., "Dispersion of Gases", Manual on *Disposal of Refinery Wastes*, Volume on *Atmospheric Emissions, American Petroleum Institute*, Washington, D.C., 1987.

Murray, D.R., "Urban Dispersion Model Evaluation," Presented at the *Fifth Joint Conference on the Applications of Air Pollution Meteorology, American Meteorological Society*, Chapel Hill, NC, November 1986.

Murray, D.R., "Assessment of the Costs of Materials Damage from Air Pollution in Los Angeles, California," Presented at the *79th Annual Meeting of the Air Pollution Control Association*, Minneapolis, MN, June 1986.

Murray, D.R., "Ambient Odor Modeling to Determine Control Requirements," Presented at the *76th Annual Meeting of the Air Pollution Control Association*, Atlanta, GA, June 1983.

Murray, D.R., "Comparisons of Wind Observations Taken at Different Heights and Locations in a Flat Terrain Setting," Presented at the *3rd Joint Conference*

on Applications of Air Pollution Meteorology, American Meteorological Society, San Antonio, TX, January 1982.

Murray, D.R., "Use of a Fluctuating Plume Puff Model for Prediction of the Impact of Odorous Emissions," Presented at the *71st Annual Meeting of the Air Pollutant Control Association*, Houston, TX, June 1978.

Murray, D.R., "Characterization of St. Louis Urban Aerosol Using Scanning Electron Microscopy and Energy Dispersion XRay Analysis," *Thesis to the Faculty of Purdue University*, Lafayette, IN, December 1977.