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Research and Development



FY-1985 EPA Research Program Guide



Notice

The program descriptions and resource estimates included in this document reflect the latest detailed information available at time of publication. Time will change some of this information. In addition, the resource figures have been rounded off and some smaller programs omitted. For the latest information, you may want to contact the individual listed.

FY-1985 EPA Research Program Guide

October 1, 1984 — September 30, 1985

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**Office of Research and Development
U.S. Environmental Protection Agency
Washington, DC 20460**

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Introduction

The free and open exchange of knowledge both stimulates and provides quality control for the progress of science. This report provides information on the research which EPA is planning for fiscal year 1985, on how much we intend to spend on each program area, and on whom to contact for further details. More than 60 percent of our \$306.0 million fiscal year 1985 research budget will be spent through extramural contracts, grants and cooperative agreements with organizations outside of EPA's laboratories.

It is our intent to increase the efficiency and effectiveness of this research by placing great emphasis upon open competition for extramural support. We hope that the information in this report will stimulate qualified parties and to make their capabilities known to our research managers so that we all might gain from a sharing of experience and expertise. Please feel free to contact any of the parties listed in this report.

How to Use the Program Guide

The following descriptions of ORD's research program are organized first by media such as air, water, hazardous wastes, etc. These categories are further broken down into research foci such as scientific assessment, monitoring and quality assurance, health effects, environmental processes, and engineering technology. Each description is a very broad summary of the research being done, where that research is being done, who to contact for more information about the program, and both the approximate total funding for that area and the percentage of total funding which is reserved by EPA for in-house research. Funding which is not reserved for in-house research is spent through extramural contracts, grants and cooperative agreements.

For each program description, one or more contacts are listed along with the major research areas to be pursued. For further information, you may call the contacts. Their commercial and Federal (FTS) telephone numbers are listed in a separate section near the end of this report. Where two or more research laboratories are listed, please turn to the "EPA R&D Organization" section of this report for descriptions of the major mission and functions of each.

Some of the research funded for fiscal year 1985 will be done in-house by EPA's laboratories. The rest will be accomplished extramurally. Proposals for funds for research in areas of interest to the agency are welcomed and are considered on a competitive basis. To receive information regarding application procedures for extramural funds, please contact the person indicated in the area of specific interest to you. In addition, approximately fifteen percent of EPA's research budget is used to support long-term exploratory research. Information regarding funds for exploratory research grants can be obtained from the:

Research Grants Program
Office of Exploratory Research (RD-675)
U.S. EPA
Washington, DC 20460
(202) 382-5750

Finally, for further information regarding Office of Research and Development research publications (600/series) or for additional copies of this report, please contact:

Center for Environmental Research Information
U.S. EPA
26 W. St. Clair
Cincinnati, OH 45268
(513) 684-7562

Air Gases and Particles

Scientific Assessment

The main objective of the scientific assessment program for gases and particles is to develop *criteria documents* for sulfur oxides, particulate matter, and lead. Criteria documents are used in regulatory decision making related to setting or revision of National Ambient Air Quality Standards. Criteria documents summarize scientific data on the health and welfare effects of a specific pollutant.

The program is presently focussed on revising the air quality criteria document for lead (Pb). An external review draft of the Pb document, prepared by agency scientists and non-EPA expert consultants completed peer review by the Clean Air Scientific Advisory Committee (CASAC) of EPA's Science Advisory Board in 1984. The final document will be available in early 1985. In addition, technical evaluations will be provided to OAQPS to support the development of the NAAQS for lead, particulate matter, and sulfur oxides during 1985.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ECAO/RTP	Dennis Kotchmar	919	49
OHEA/HQ	Tom Miller	89	100

Health Effects

This research program has three major goals: to provide data on health effects of exposure to gases, SO₂, particles, and lead using both human and animal studies; to provide better models to extrapolate animal data to humans; and to develop improved test methods for research into the physiological response of humans to gaseous air pollutants and particles.

Much of the health effects research refines and improves the toxicological data base relevant to a *size-resolved particle standard*. Fine-mode particles, mostly in the 1-2 micron range, will be studied in normal and susceptible human and animal populations. Both human and animal dose-response studies will devote special attention to determining the deposition, clearance, and pulmonary function effects of particles, alone and in combination with ozone, NO₂, and SO₂. Most of the human work is done in-house, while many of the animal studies are done extramurally.

The *neurological consequences* of lead, especially at levels previously considered to be safe in children (<60 µg/dl), will be studied epidemiologically. Also, primate neurotoxicology studies will be performed extramurally. The significance of the effects noted will be evaluated for use in assessing health risks.

Air Gases and Particles

In 1985, work will be done to provide faster, more reliable, *extrapolation techniques* using animal data to predict human pulmonary and morphological responses to gas and particle exposure. About half of this work will be done by contract. Research will also provide data on biochemical, pulmonary, and cardiovascular disease and impairment in susceptible populations following SO₂ exposure.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
HERL/RTP OHR/HQ	Richard Dickerson Karen Morehouse	10,873.9	35

Environmental Engineering and Technology

Existing technology to control gaseous and particulate pollutants is expensive. For new utility sources, approximately 30% of boiler costs are attributable to air pollution control. Design and performance data for low cost, high-reliability *emission reduction technology* are needed to support the agency's regulatory functions. Technical support to regulatory and regulated entities will be provided by conducting assessments and fundamental research on technologies for reduction of stack emissions of SO_x and particulate matter (PM) as well as PM fugitive emissions.

Sulfur oxides (SO_x emissions reduction technology: In-house pilot efforts will emphasize evaluation of lower cost, more active sorbents and additives for spray drying and other dry scrubbing systems. Regional workshops are planned to present a recently developed inspection and performance evaluation manual for wet scrubbing systems. A symposium on SO_x emission reduction via flue gas cleanup will be conducted.

Particulate emissions reduction technology : In-house laboratory and pilot efforts will emphasize investigation of advanced concepts for lowering the costs of particulate control baghouses and electrostatic precipitators (ESPs). The range of work will include electrostatic augmentation of fabric filters (baghouses), larger diameter electrodes for ESPs, and simultaneous particulate/SO_x removal in existing ESPs. Extramural studies of controlling condensation aerosols and fugitive emissions will also be conducted. Symposia and workshops will be used to transfer the technology.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
AEERL/RTP OEET/HQ	Everett Plyler George Rey	3,841.3 0	59

Air Gases and Particles

Acid Deposition Environmental Monitoring and Quality Assurance

Improved air pollution monitoring methods are being developed to help determine air quality trends, support compliance with standards, and meet enforcement needs. The data from these methods are often used as the basis of regulatory action. The areas investigated extramurally include ambient and source methods development, quality assurance guidelines and procedures development, and audit materials preparation.

Ambient and source monitoring *methods* for gases and particulate matter pollutants will be developed and evaluated. Ambient methods development will focus on measuring particulate matter in support of anticipated changes to the National Ambient Air Quality Standards. Source methods will be developed and evaluated under field conditions. EPA researchers will continue to analyze the mass and chemical composition of filters collected through the Inhalable Particulate Network. Also, fiber filters from national, state and local air monitoring stations will be analyzed for mass and trace metals.

Quality Assurance (QA) support will be provided through a standards laboratory and repository of quality assurance materials. Routine and special *audits* will be conducted on laboratories making ambient and source measurements and on compressed gas vendors. Quality assurance guidelines, handbooks, data handling systems, and a precision and accuracy reporting system will be maintained and updated. QA procedures, materials, and audit techniques will be developed for compliance monitoring.

The *Atmospheric Processes and Effects* objectives of this program are to develop air quality models in support of the National Ambient Air Quality Standards (NAAQS) and the prevention of significant deterioration (PSD), and to develop information on the effects of gases and particles on materials.

Model development research will focus on improved atmospheric dispersion parameters in air quality models, SO₂ air quality dispersion models for use in complex terrain and particulate dispersion models for use on urban, meso-, and regional scales. Procedures for computing dispersion from elevated sources and near-source dispersion models for use in complex terrain will be improved. A full-scale plume study of a three dimensional complex terrain area* will continue. Work will improve urban and regional scale particulate models to support proposed revisions of State Implementation Plans (SIPs) for particulate matter. A regional scale particulate matter air quality model which will accurately describe the long-range transport of particles and alternative control strategies is being developed.

Air Gases and Particles

Second generation source apportionment methods (SAM) will be developed. Research will be initiated with the Peoples Republic of China to study the dispersion of pollutants. Studies on materials damage will develop estimates of the cost of air pollution in terms of damaged materials or accelerated maintenance schedules. Studies will also be conducted to determine the air pollution and meteorological factors that contribute to visibility reduction.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
EMSL/RTP	John Puzak	5,162	60
EMSL/LV	James McElroy	6,121	67
ADEMQA/HQ	J. M. Shackelford	147	100
ESRL, RTP(APE)	Al Ellison	7,710.9	25
ADEMQA/HQ(APE)	William Keith	368.1	57

Air Oxidants

Scientific Assessment

Photochemical oxidants are secondary pollutants produced by chemical reactions in the atmosphere between primary pollutants, notably nitrogen oxides, and volatile organic compounds (VOC). Ozone (O₃) is by far the most abundant of the photochemical oxidants.

A *criteria document* evaluates the available scientific information on the health and welfare effects of a criteria pollutant and, as such, is the primary source of information used by EPA regulatory decision makers in reviewing and possibly revising the NAAQS. EPA scientists and expert consultants are developing draft chapters for the ozone/photochemical oxidants criteria document. This document critically assesses data on health effects from ozone and pollutant mixtures and environmental effects related to crop loss. An external review draft was published in August, 1984. CASAC review and a final criteria document will be completed during 1985. In addition, the next review of the nitrogen oxides criteria document will begin in 1985.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ECAO/RTP	Beverly Tilton	935	39
OHEA/HQ	Tom Miller	76	100

Health Effects

This program has two major goals: to provide data from human and animal studies on a full range of health effects of O₃ and NO₂ exposure, and to provide better models to extrapolate animal data to humans.

The health effects *data* from this program is incorporated into EPA criteria documents which are used to set and revise standards for photochemical oxidants. Research provides data on the degree to which oxidants cause or exacerbate the development of non-carcinogenic chronic disease. Animal, human clinical, and epidemiology studies are performed. Biological endpoints to be examined include development of cardiovascular or pulmonary disease, aggravation of existing conditions, changes in biochemistry and host defense mechanisms, and changes in pulmonary structure or function. Emphasis is currently placed on determining the acute and chronic effects of NO₂ inhalation.

Tests will be run to improve the *models* used to *extrapolate* animal biochemical and metabolic responses to human effects. Both human and animal experiments will provide data on the functional, morphological, and biochemical changes which occur following exposure to ozone and NO₂. Animal dose-response studies, many

Air Oxidants

performed extramurally, will concentrate on the effects of chronic exposure of rodents to oxidants.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
HERL/RTP OHR/HQ	Richard Dickerson Karen Morehouse	4,722.5	33

Environmental Engineering and Technology

Research in this program supports the development of New Source Performance Standards (NSPS) and State Implementation Plans by aiding in the development of pollutant control technology which is cost-effective and energy-efficient. The focus of the research is on the reduction of both VOC and NO_x emissions.

Volatile Organic Compounds (VOCs) are a major cause of non-attainment of National Ambient Air Quality Standards. Extramural research will evaluate *VOC abatement technology* such as carbon adsorption, thermal oxidation, and catalytic oxidation. Of particular interest will be effective and affordable control methods for small VOC-emitting industries. Field tests of process modifications for VOC emission reduction from printing and coating operations will be conducted jointly with industry.

Combustion modification methods of controlling NO_x and other emissions will be evaluated to determine combustion modification (CM) methods for reducing NO_x emissions and improving the performance of utility and industrial boilers, process furnaces, and stationary engines. Utility boilers account for about 53% of the national stationary source NO_x emissions; industrial boilers for about 14%; process furnaces for about 6%; and stationary engines for about 21%. Prior work has proven the CM methods can be effective for control of NO_x as well as other emissions, if each method is tailored to the characteristics of the specific combustion equipment (e.g., stoker or package boilers, coal or oil burners, and I.C. engines or gas turbines). This program, to support OAQPS standards setting activities in FY85, 86 and 87, will assess low NO_x heavy oil burner (precombustor) technology for industrial boilers and for the combustion of highly nitrated waste fuels. Work on a coal-fired precombustor burner for high NO_x/SO_x control will be continued. The program will evaluate in-furnace NO_x reduction (reburning by secondary fuel injection) technology on small scale gas-, oil-, and coal-fired combustors. It will continue in-house tests of selective catalytic reduction (SCR) systems for internal combustion engines. It will complete evaluation of CMs for pilot-scale

Air Oxidants

refinery process heaters and cement kilns. Basic NO_x control techniques, selected from those available and those under development, can soon be integrated into combination systems to achieve the greatest possible NO_x reduction for these sources.

Fundamental research on *combustion processes* will also be conducted to improve the technical basis for estimating achievable emissions, to help develop NO_x-SO_x emissions reduction technologies and to support development of an industrial boiler NSPS.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
AEERL/RTP	W. Gene Tucker	3,237.2	34
	Robert E. Hall		
OEET/HQ	Kurt Jakobson		100
	George Rey		

Environmental Processes and Effects

A preliminary national assessment on the *economic impacts* of ozone on agriculture will be provided for incorporation into the EPA criteria document used to update the National Ambient Air Quality Standard (NAAQS) for ozone. Research to be conducted to improve the accuracy of crop loss assessments will include: the evaluation of the effects of ozone on the yield of representatives of the hay crop group, the examination of ozone response differences among crop varieties, and the determination of the influence of soil/water relations on ozone responses.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ERL/COR	Dave Tingey	2,218	30
OEPR/HQ	Kenneth Hood		

Acid Deposition Environmental Monitoring and Quality Assurance

Research activities in this area emphasize the development of monitoring *methods* and the provision of quality assurance *samples* and support. EPA's *monitoring methodology* for oxidant precursors will include the evaluation of volatile organic compound monitoring methodology and the preparation of an operations manual and performance guidelines for commercial monitoring instruments. Laser technology to measure aerosol mass associated with oxidant transport will be provided as technical support to the regions. The National Bureau of Standards will assist with the development of standard reference material.

Quality Assurance for the oxidants research program is essential to ensuring that the data used for regulatory and

Air Oxidants

enforcement decisions is accurate. Reference samples, gas samples, permeation devices and flow rates standards traceable to NBS will be supplied to the user community. Short-term monitoring support will be provided to the OQAPS and the EPA regional offices for use in review of State Implementation Plans for air transport model development.

The *Atmospheric Processes and Effects* portion of this program is to develop and validate air quality models that predict the formation of photochemical oxidants (primarily ozone) in the atmosphere, and to determine the economic impacts of ozone on agriculture.

Air quality models predicting the air quality impacts associated with air pollutant abatement strategies are used in the evaluation and development of State Implementation Plans for the control of photochemical oxidants. Two major types of ozone air quality models are under investigation: urban scale which focuses on local air quality impacts and regional scale which addresses the long range transport phenomena of ozone and its precursors (volatile organic compounds and nitrogen oxides). Over the next few years, emphasis will be placed on developing better chemical mechanism within the models for describing ozone formation in the atmosphere. Also, a second generation regional scale model for ozone will be tested and evaluated using the Northeast Regional Oxidant Study (NEROS) air quality data base.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
EMSL/RTP	John Puzak	698	70
EMSL/LV	James L. McElroy	244	83
ADEMQA/HQ	J. M. Shackelford	77	100
ASRL/RTP(APE)	Basil Dimitriades	2,546.7	21
ADEMQA/HQ(APE)	Deran Pashayan	120.6	97

Air Mobile Sources

Scientific Assessment

The Clean Air Act requires the agency to prescribe emission standards for carbon monoxide, hydrocarbons, and oxides of nitrogen for heavy-duty and light-duty vehicles. To do this, the agency requires information on the chemical composition of fuels, fuel additives, and diesel and gasoline exhausts, as well as information on actual human exposure to motor vehicle pollutants.

The scientific assessment program will continue to support the development of the carbon monoxide NAAQS during FY 85 by providing technical evaluations for OAQPS.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ECAO/RTP	James Raub	19	100
OHEA/HQ	Tom Miller	71	62

Health Effects

The health effects program funded by the Health Effects Research Laboratory in mobile sources develops and validates techniques to produce dose-response data on the toxic effects of carbon monoxide, and then uses those techniques to produce dose-response information.

Clinical studies will be used to produce dose-response data on the toxic effects of low-level exposure to CO. The cardiac and respiratory effects of CO will be evaluated in human studies, as will a method to relate ambient CO levels to blood levels. Non-invasive techniques will be used to measure the cardiac effects of CO exposure. This information will be used in performing health risk assessments by the scientific assessment program.

Extramural funding will also be provided to the Health Effects Institute, sponsored jointly by EPA and the automobile industry to perform research on the health effects of pollutants related to mobile sources.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
HERL/RTP	Richard Dickerson	3,894.2	15
OHR/HQ	Donna Kuroda		

Acid Deposition Environmental Monitoring and Quality Assurance

Research in this area will focus on development of methodology for determining population exposures to carbon monoxide (CO) and other vehicular air pollutants. Field studies conducted in Washington, DC, and Denver, Colorado, have provided extensive human CO exposure data bases. The proposed National Ambient Air Quality Standard (NAAQS) is designed to assure that 99% of the population has blood levels below 2.5%

Air Mobile Sources

carboxyhemoglobin. Data from field studies will be used to estimate the proportion of this population above the 99% criterion, and to determine the validity of human exposure models and statistical approaches. Models for computing blood carboxyhemoglobin from human exposure profiles will be validated with breath data bases, and human activity patterns will be statistically summarized and evaluated for use in models. Models relating commuter exposures to roadway types, traffic volume, model year, vehicle age, and average speed will be tested and evaluated. The human exposure methodology developed for CO will be adapted, where possible, to other vehicular air pollutants.

The registration of fuels and fuel additives, as mandated by Congress, will be maintained. Also, the quality assurance program will distribute samples and otherwise assist state and local agencies in generating precise and accurate air monitoring data for use in judging compliance with NAAQS.

The focus of the *Atmospheric Processes and Effects* program is to provide information necessary to evaluate the impacts of regulated and unregulated mobile source emissions on ambient air quality. Research is conducted to characterize gaseous and particulate emissions, including volatile organic components from in-use light and heavy duty diesel and gasoline powered vehicles. Emissions data are obtained through tests conducted under simulated conditions using dynamometers.

Research in FY-1985 will focus on: characterizing emissions from late model diesel vehicles including turbo-charger and exhaust gas recirculation equipped diesel passenger cars and light trucks; refining and/or developing measurement procedures to permit accurate analysis of methanol and formaldehyde emissions from vehicles fueled by pure methanol and methanol/gasoline blends; characterizing emissions from future model year diesel vehicles with and without particle control devices; determining impact of methanol fuel emissions on ozone air quality; and assessing the effect of low ambient temperature on emissions from late model vehicles. Information obtained will be used to update emissions factor data bases used in air quality models to assess the impacts of mobile source emissions on ambient air quality.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
EMSL/RTP	G. Akland	835	59
ADEMQA/HQ	Wayne Ott	49	100
ASRL/RTP(APE)	Frank Black	575.5	25
ADEMQA/HQ(APE)	William Keith	10.6	35

Air Hazardous Air Pollutants

Scientific Assessment

Scientific assessments of hazardous air pollutants (HAP) encompass all known research findings concerning the health and environmental effects of particular substances and/or their transformation products, as well as background information on physical and chemical properties, sources, emissions, transport and transformation, and ambient concentrations.

The current agency strategy for evaluating hazardous air pollutants calls for assessing the toxicity of 37 chemical substances, and for reviewing the health basis for existing HAP regulations for several other substances. During 1985 comprehensive health assessment documents will be completed on 14 chemicals (vinylidene chloride, dioxins, methylene chloride, cadmium, trichloroethylene, tetrachloroethylene, vinyl chloride, hexachlorocyclopentadiene, chlorinated benzenes, asbestos, ethylene dichloride, ethylene oxide, chloroform, epichlorohydrin). In addition Tier I final reports or external review documents will be prepared for propylene oxide, copper, acetaldehyde, phenol, chloroprene, dibenzofurans, nickel, beryllium, phosgene, acrolein, 1,3-butadiene. Tier I reviews will be started for seven additional chemicals in FY 85.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ECAO/CIN	Jerry Stara	296	34
ECAO/RTP	Michael Berry	1,401	39
OHEA/HQ	Tom Miller	2,354	52

Health Effects

The health research program in hazardous air pollutants (HAPs) has three goals: to develop and validate methods to produce dose-response data on the toxic effects of HAPs, to produce the dose-response data on the toxic effects of HAPs, and to develop models which improve our ability to use dose-response data in risk assessments. Extramural research will support efforts in all three areas.

EPA researchers will develop *methods* to provide data on the genetic, developmental, and neurotoxic effects of HAPs. Emphasis of this research will be on the toxic components of gaseous-aerosol complex mixtures.

In *dose-response* toxicological research, data on the mutagenic and carcinogenic activity of potential HAPs will be determined. These HAPs will be selected based upon assessments prepared by the Office of Health and Environmental Assessment (OHEA). The effects of selected chemicals suspected of being hazardous to the nervous system will be studied.

Air Hazardous Air Pollutants

Animal *models* of respiratory physiology and function will be developed to provide more reliable methods for estimating specific doses to critical lung tissues. Models of neurologic toxicity will be developed involving physical, chemical, and behavioral tests to predict human responses to insult from potential HAPs.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
HERL/RTP OHR/HQ	Richard Dickerson Donna Kuroda	3,604.3	57

Environmental Engineering and Technology

The engineering program for hazardous air pollutants (HAP) is comprised of three parts: (1) to assess various industrial and combustion sources of HAPs to determine the magnitude of emissions and to assess the capability of technologies to reduce or eliminate HAP emissions, (2) to conduct source-related measurements and participate in the management of the Agency's Integrated Air Cancer Project, and (3) to assess the emissions from and controllability of sources of indoor air pollutants.

Conventional devices for controlling particulate and VOC emissions will be evaluated for their effectiveness in controlling specific HAPs from industrial and combustion sources. Research will be initiated on cleaner-burning wood stoves, with inherently low emissions of HAPs, for practical and energy-efficient residential use.

Field and laboratory measurements of hazardous substances, especially mutagenic substances from residential wood stoves will be made as part of the FY 85 field studies of the Integrated Air Cancer Project. Various designs of catalyst-equipped and conventional stoves will be tested.

Laboratory measurements of organic pollutant emissions from unvented space heaters, building materials, and consumer products will be continued from indoor air quality projects initiated in FY 84. A field study to demonstrate the effectiveness of low-cost methods to reduce radon concentrations in homes will also be continued. Further work to develop indoor air quality models is also planned.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
AEERL/RTP OEET/HQ	W. Gene Tucker George Rey	1,531.1	36

Air Hazardous Air Pollutants

Acid Deposition Environmental Monitoring and Quality Assurance

At present, there is a particular need for technology to monitor non-criteria contaminants at the regional, state, and local level. EPA maintains a monitoring station for non-criteria pollutants in Philadelphia. This station will function as a focal point for development and evaluation of methods for the characterization of monitoring methods. Stationary source methods will be evaluated and validated. This will involve measurement of instrument drift, establishing control limits, defining out-of-control limits, and specifying corrective action and alternate methods. Focus will be on developing and assessing advanced methods for concentrating and analyzing samples. The advanced methods to be evaluated are: cryogenic preconcentration, tuneable atomic line molecular spectrometry, and gas chromatography/fourier transfer infrared spectrometry. The methods that will be evaluated at the center were developed from our extramural program.

To support quality assurance needs within the program, reference samples will be developed and maintained, guidelines for procedures will be developed, and laboratory audits will be performed.

Methods development for monitoring indoor air quality will continue. Emphasis will be placed on evaluating devices to measure particulates, NO₂, and formaldehyde. A multipollutant field survey will be designed and implemented.

The goal of the *Atmospheric Processes and Effects* research is to provide information on the *atmospheric transport, transformation*, and *fate* of hazardous air pollutants. The information is used in preparing health assessment documents to determine if the chemicals present a hazard. Laboratory and field studies will be conducted to determine the atmospheric lifetimes and transformation products of hazardous air pollutants to determine deposition and removal rates of hazardous chemicals; and identify the factors responsible for concentration levels and spatial and temporal (i.e., seasonal) variability of selected volatile organic compounds. Also research studies will examine the atmospheric chemical and physical processes that are important in producing mutagenic compounds in the atmosphere.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
EMSL/RTP	John Clements Steve Bromberg	6,628	54
ASRL/RTP(APE)	Larry Cupitt	944.6	35
ADEMQA/HQ(APE)	Deran Pashayan	20.5	19

Air Stratospheric Modification

The stratospheric modification research program will investigate the effects of pollutants on stratospheric ozone, the resulting ultraviolet-B radiation characteristics and of enhanced ultraviolet-B radiation on important crops and aquatic food-chain organisms. The program will continue coordination of federal research activities in this area, will update the comprehensive assessment of the state of science, will deliver the required biennial report to Congress, and will provide up-to-date information so that the most current data will be available for policy and regulatory decisions.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
OPSA/HQ	Herbert Wiser	875	15

Drinking Water

Scientific Assessment

Revision of national drinking water regulations and health advisory guidance given to the states requires an assessment of the potential hazard to human health from exposure to chemicals in drinking water. Health assessment documentation will be started for nine chemicals and responses to public comments made on 1984 health assessment documents will be performed during 1985.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ECAO/CIN	Michael Dourson	324	77
OHEA/HQ	Thomas Gleason	125	100

Health Effects

This research program provides dose-response data on organic, inorganic, and microbiological contaminants. It provides information on the best methods to obtain that data, and information on the best methods to perform risk assessments.

Selected contaminants will be evaluated (chlorinated ethanes, vinyl chloride, trichloropropane, chlorobenzene, and barium), for possibly setting Maximum Contaminant Levels or developing Health Advisories. Increasing emphasis will be put on determining the health effects of exposure to disinfectants and their by-products. Work will be done to improve methods for extrapolating health effects research data in order to assess the risks associated with simultaneous exposure to multiple chemicals in complex mixtures. Focus will also be placed on concentrating, isolating, and identifying infectious disease agents in drinking water. In addition, epidemiology studies on drinking water disinfectants and radon are being conducted.

Finally, in conjunction with the Centers for Disease Control, research will design methods to identify and evaluate outbreaks of waterborne infectious diseases in order to aid the states in alleviating any emergency affecting public water systems.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
HERL/RTP	Leland McCabe	10,026.0	36
OHR/HQ	David Kleffman		

Environmental Engineering and Technology

To support revision of the national drinking water standards, this program provides data on the technologies available, what they can attain in terms of drinking water quality, and what they cost. Focus is on removal of volatile organic compounds, organics formed during treatment,

Drinking Water

naturally occurring organics responsible for formation of trihalomethanes, inorganic and microbiological contaminants and on problems related to maintaining water quality in distribution systems. Emphasis will be on developing cost information for treatment processes and for entire water systems. Evaluation will also be made of the tradeoffs in planning for rehabilitation of older water systems. In addition, efforts will be made to address the problems of small utilities and to assist the states and municipalities in complying with maximum contaminant levels.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
WERL/CIN OEET/HQ	Gordon Robeck Bala Krishnan	5,758 218	44 100

Acid Deposition Environmental Monitoring and Quality Assurance

This program will provide the overview for the Agencywide mandatory quality assurance program. The ten regional laboratories will be evaluated annually in support of the National Interim Primary Drinking Water Regulations monitoring certification program. This program will also provide methods development and analytical procedures to produce precise and accurate total measurement systems for chemical, radiochemical and microbiological analysis. It will provide technically and economically feasible analytical procedures to monitor contaminants for use by the Agency, States, municipalities and operators of public drinking water systems. In addition, the following groundwater program will be provided; development of a method to locate abandoned wells; development of geophysical methods to detect and evaluate underground movement of fluids from injection wells; evaluation and development of fiber optics techniques for monitoring groundwater; development of accurate and reliable total measurement systems through the development of standardized methods, laboratory evaluation, performance evaluation and quality control sample development, sample testing and verification; and provide quality control procedures and guidelines.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
EMSL/CIN	Robert Booth	1,532	74
EMSL/LV	Glenn Schweitzer	1,366	36
ADEMQA/HQ	Vernon Laurie		

Groundwater

Environmental Processes and Effects

Ground water is a major source of drinking water for the nation. This research program seeks to improve methods for determining the transport and transformation of contaminants in the subsurface, methods for predicting the behavior of pollutants in aquifers based on site-specific subsurface characteristics and on characteristics of the pollutants. In addition, research will evaluate *in-situ* aquifer reclamation methods. Extramural efforts will be directed toward several areas. Methods will be developed for determining not only the quantity and type of subsurface microorganisms, but also their activity in terms of potential for biotransformation of pollutants. Methods will also be developed for *in-situ* detection of other subsurface parameters important to predicting pollutant behavior. Biological, physical/chemical, and hydrologic processes and their interrelations in the subsurface will be studied to develop mathematical representations that can be included in models. Subsurface (site-specific) characteristics that influence such processes will be determined. Finally, promising reclamation methods (e.g., biotransformation) will be studied at laboratory scale and evaluated at one small field site.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
RSKERL/ADA	George Keeler	4,641	25
OEPER/HQ	Steve Cordle	606	23

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Water Quality

Scientific Assessment

EPA's overall research program with regard to water quality emphasizes development of the scientific and technical base to help states develop site-specific standards and to conduct use-attainability analyses. The scientific assessment program will provide guidance for assessing the risk of human exposure to mixtures of toxic chemicals, evaluate *site-specific* health *hazards* as required by the states and EPA, and prepare evaluations for Section 301(g) permit modification requests.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ECAO/CIN	Michael Dourson	265	66
OHEA/HQ	Thomas Gleason	32	100

Health Effects

Investigators will use existing short-term tests for carcinogenic, mutagenic, and reproductive effects to determine whether or not a site receiving a large number of chemical contaminants is a public health risk. Health effect indicators for shellfish growing water are being developed.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
HERL/RTP	Lyman Condie	966.5	46
OHR/HQ	David Kleffman		

Environmental Engineering and Technology

This program develops data correlating sludge treatment processes with environmental impacts for use in determining appropriate treatment levels for sludge prior to ocean dumping as well as treatment levels for wastewater discharged through ocean outfalls.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
WERL/Cin	Fred Bishop	174	100
OEET/HQ	Tom Pheiffer	27.0	100

Environmental Processes and Effects

This program has two objectives: support for a water quality-based regulatory approach, and support for environmentally sound ocean disposal of wastes.

A *water quality-based* approach to pollution control provides for correction of ambient water quality problems

Water Quality

that remain after mandated minimum pollution control technology (e.g., secondary treatment, effluent guidelines) is in place. This requires the ability to translate water quality standards into specific effluent condition and discharge limitations for municipalities and industry. Research will be undertaken to provide the necessary information base and scientific tools, including: site-specific criteria modification protocols, contaminated sediment assessment techniques, wasteload allocation techniques, complex effluent bioassays, biomonitoring methods, and use attainability analyses.

If *ocean disposal* is to become an acceptable waste management option, there is a need to provide decision-makers with rationale and procedures which are both expeditious and scientifically sound. These should provide guidance for the acquisition of information, and the interpretation of this information in order to support ocean disposal permit decisions. The research program in ocean disposal will develop techniques and data for evaluating the impacts of alternative disposal strategies to identify the optimal approach for both ocean dumping and discharge from ocean outfalls. Emphasis will be given to: development of a hazard assessment procedure to define the probability of harm to the marine environment resulting from the ocean disposal of wastes; development of procedures for predicting bioaccumulation of contaminants from sediments and sewage sludge and determination of the linkage between tissue residues and biological effects; and development of procedures to satisfy monitoring needs for permit, surveillance, and hazard assessment application for coastal and deep water sites.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ERL/ATH	Walter Sanders	1,004	85
ERL/COR	Ronald Garton	1,208	75
ERL/DUL	Nelson Thomas	1,908	86
ERL/NARR	William Brungs	4,054	85
ERL/GB	Thomas Duke	208	88
OEPER/HQ	Sam Williams	1,037	81

Acid Deposition Environmental Monitoring and Quality Assurance

The monitoring research program develops chemical, physical, and biological methods for measuring site-specific and ambient water pollution concentrations. Most of this research is conducted in-house at EMSL/Cincinnati with a small portion being conducted at EMSL-LV.

Research on *chemical* measurement methods emphasizes standardization of measurement and quality assurance methods for priority toxic pollutants, as well as increasing the sensitivity of methods for measuring toxic metals in

Water Quality

water. Research on *biological* monitoring methods emphasizes methods for screening toxic concentrations of pollutants in ambient waters, characterizing the biological condition of ambient waters, provision of quality assurance procedures to analyze chronic and acute toxicological effects, and standardization of microbial and viral sampling and analysis methods. Research on *physical* measurement methods concentrates on documenting the validity and accuracy of sampling regimes and flow-sensing equipment. The *quality assurance* program provides quality control calibration materials and procedures for standardization of chemical and biological analysis. Virus sample preservation and assay protocols will be standardized.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
EMSL/CIN	Cornelius Weber	1,918	80
EMSL/CIN	James Lichtenberg		
EMSL/CIN	John Winter	113	100
EMSL/LV	Wesley Kinney	252	81
ADEMQA/HQ	Charles Plost		

Great Lakes

Environmental Processes and Effects

This program will develop and test methods to measure, describe, and predict the sources, distribution, movement, dynamics, and effects of toxic substances on nearshore areas and harbors for "areas of concern" identified by the US/Canada Water Quality Agreement. This program will also provide the International Joint Commission (IJC), the Great Lakes National Program Office (GLNPO), EPA Regions and Great Lakes states with technical support and research data synthesis related to activities under the US/Canada Water Quality Agreement.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ERL/DUL	Norbert Jaworski	2,338.1	42
ERL/ATH	Robert Ambrose	50.0	0
ERL/NARR	Victor Bierman	50.0	0
OEPER/HQ	Herbert Quinn	50.3	22

Municipal Wastewater

Scientific Assessment

The scientific assessment program provides health assessment profiles to support regulatory decisionmaking on the effective treatment, conversion, use and disposal of municipal sludge. Preliminary data profiles and hazard indices are being prepared for a number of chemical contaminants of municipal sludge. .

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ECAO/CIN	Steven Lutkenhoff	82	100
OHEA/HQ	Thomas Gleason	12	100

Health Effects

Health effects research focuses on two areas: human health implications of innovative wastewater treatment technologies and human health aspects of municipal sludge disposal. The information from these areas are used by the agency for formulation of regulations, permits, and guidelines under the Clean Water Act. For *innovative and alternative* technologies, research seeks to assess the effects on human health resulting from exposure to pathogens, including parasites, viruses, and bacteria and to chemical toxicants contained in wastewater applied to land. The greatest emphasis, at present, is on land disposal of *municipal sludge* which requires careful assessment of the effects on human health of exposure to pollutants contained in the sludges. An appraisal is being prepared on any potential risks from land application of municipal sludge. Research will focus on pathogenic organisms, particularly parasites and viruses, heavy metals, and organic chemicals.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
HERL/RTP	Michael Pereira	1,916.0	51
OHR/HQ	W. Wade Talbot		

Environmental Engineering and Technology

Revisions to the Clean Water Act provide incentives for the use of innovative wastewater treatment technology. This research program will provide engineering support to the innovative technologies and sludge management programs, and on techniques to improve the reliability of wastewater treatment plants.

In the area of *innovative/alternative* (I/A) technologies, assistance will be provided to the construction grant program in reviewing project plans, recommending innovative technologies, and in making available detailed planning, engineering and analytical assistance for innovative technology. Post-construction evaluations of

Municipal Wastewater

full-scale operational projects will produce feedback information of designing, energy, capital, and operation and maintenance costs.

Engineering support of *municipal sludge management* is provided in two areas—treatment and disposal. In the treatment area, emphasis will be on innovative stabilization digestion and thermal conversion processes that are more efficient in reducing the volume of sludge. Research in the disposal area will focus on characterizing the mechanisms controlling the uptake and the transformation of toxic organics and pathogenic organisms in sludge-amended soils.

In the *compliance achievement* support program, emphasis will be on providing design and cost information on two low cost upgrading methods through the integration of high biomass reactors and improved air aeration technology.

Evaluations of the *toxics treatability* of various municipal processes will be carried out. Toxicity reduction evaluation procedures will be developed to support the Agency's "Policy for Development of Water Quality-Based Permit Limitations."

In the area of *water quality planning and regulation support*, the engineering data base necessary for states to assess various control options and water quality impacts to achieve national water quality goals at optimum cost savings will be provided.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
WERL/CIN	James Kreissl (I/A) Joseph Farrell (sludge) Ed Barth (upgrading) Fred Bishop (toxics) Lew Rossman (WQ)	6,492	25
OEET/HQ	Tom Pheiffer (HQ)	218.0	100

Industrial Wastewater

Environmental Engineering and Technology

This program supports Agency regulatory activities relating to control of specific pollutants or toxicity in industrial wastewater discharges. Efforts will supply data to enable permitting authorities to issue BPJ discharge permits for industry to meet water quality based standards in the most cost-effective manner possible. During 1985 this will be accomplished by means of laboratory and pilot plant scale evaluations of biological (particularly anaerobic) and physical/chemical wastewater treatment methods. This work will focus on complex, highly toxic wastewaters such as dye and pigment manufacturing, aluminum smelters, and organic chemicals production.

Also, efforts will provide manuals and methods for conducting site specific toxicity reduction evaluations (TRE's) to be used by permitting authorities to issue discharge permits to industry, based on a toxicity as a major parameter, particularly in the case of multiple industrial contributions. The TRE method will be developed by identifying the inplant sources of aquatic toxicity, measuring stream toxicity, identifying industrial contributors and recommending control alternatives. The complete method will be verified at specific sites in conjunction with OMSQA and is applicable to complex effluents not easily controlled by the WQA chemical-by-chemical approach. Initial efforts will include toxicity reduction for pesticide manufacture, inorganic chemicals, and petrochemicals.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
WERL/CIN OEET/HQ	Alden Christianson Tom Pheiffer	918 27	20 100

Environmental Processes and Effects

This program is needed to identify potential problem areas and set priorities in taking environmental protection measures. The research will separate, characterize and measure organic and inorganic chemical species in industrial effluents. The gas chromatographic/mass spectrometric tape library will be expanded and information on the composition of complex industrial effluents will be generated.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ERL/ATH	Charles Anderson	311	100

Industrial Wastewater

Acid Deposition Environmental Monitoring and Quality Assurance

Research will support the Agency in the implementation of technology-based effluent limitation regulations and the modification of enforcement activities as required by water quality-based permit adjustments. Methods standardization research will be directed to the improvement in precision, accuracy, and method detection limit of existing regulated organic contaminants. Research will also validate and correct analytical methods for high priority industrial wastewater components and evaluate alternative analytical methods to support the National Pollution Discharge Elimination System (NPDES) program.

Quality Assurance activities include the Discharge Monitoring Report Quality Assurance (DMRQA) study; preparation and distribution of repository, quality control, and performance evaluation samples; and performance evaluation studies. The research program will support NPDES quality assurance by providing quality control samples and protocols and by maintaining the standards repository, including auditing monitoring systems data reliability, DMRQA and documentation of its precision and accuracy.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
EMSL/CIN	James J. Lichtenberg	1,391	69
EMSL/CIN	John A. Winter		
ADEMQA/HQ	Charles Plost	128	92

Energy

Acid Rain

The acid rain program supports research in seven areas: estimating emissions, understanding atmospheric processes, monitoring, analyzing aquatic effects, analyzing terrestrial effects, quantifying effects on materials, evaluating control techniques, and producing integrated assessments.

A. Estimating emissions from man-made sources:

Emissions inventories will be developed focusing principally on SO_x and NO_x, and expanding into volatile organic compounds and carbon monoxide. Models to forecast emission trends and costs of various control programs are being developed. These economic sectoral models and the emissions inventories will be used to support regional and national policy analysis and assessment.

B. Understanding atmospheric processes: This research is designed to improve our capability to examine and predict the movement and atmospheric chemistry of air masses. Field studies using chemical tracers of emissions, recently developed gas measuring instruments, and extensive monitoring may be undertaken to study the movement and transformation of acids and precursors from sources to receptors. Modules will be developed for the acid deposition regional model.

C. Developing a deposition monitoring data base: Efforts will be increased to develop real-time precipitation measurement methods, evaluate procedures for precision and accuracy of precipitation data, standardization of pH measurements, quality assurance and data system support, measurement of dry deposition, and analysis of the spatial and temporal variation of data.

D. Understanding and quantifying aquatic effects: Research will develop methods to determine trends in acidity and sensitivity of water bodies, estimate acid precipitation effects on the interactions between runoff and soil water, continue a national survey of lakes and streams, and determine the effects of acid precipitation on fish populations and other biota.

E. Quantifying terrestrial effects: A variety of field and laboratory studies will attempt to estimate and predict the effects of acid precipitation on forests, rangelands, wetlands, wildlife and crops. The effects of soil infiltration, soil chemistry, weathering, metal transport, exchange and depletion of nutrients and soil sensitivity will be addressed. A national survey of terrestrial sites is planned.

F. Quantifying the effects on materials and cultural resources: By developing an assay of materials at risk, we seek to estimate the extent of acid deposition effects.

G. Assessing Control Technologies: This program assesses emerging technologies for removing acid deposition precursors from combustion sources. The work considers

Energy

non-hardware approaches such as fuel switching as well as retrofit technologies such as the limestone injection multi-stage burner.

H. Integration of research assessments: This program responds to questions that cut across several research objectives by supporting integrated assessment functions, characterization of mass flows, assessment of control strategies, assessment of potentially sensitive areas, and economic analysis of controlling damage versus controlling emissions.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
EMSL/CIN	Jack Pfaff (A)	1,200	10
EMSL/RTP	Thomas Hauser (B)	10,576	17
AEERL/RTP	David Mobley (C)	4,357	10
ASRL/RTP	Jack Durham (D)	8,022	11
ERL/COR	Ray Wilhour (E)	5,610	10
ERL/DUL	John Eaton (F)	975	15
ADEMQA/HQ	Gary Foley (G)	600	14
	Gary Foley (H)	3,025	26

Explanatory Note: EPA conducts its acid deposition research in cooperation with the National Acid Precitation Assessment Program. The other agencies with substantial roles are the Forest Service, the National Oceanic and Atmospheric Administration, the National Park Service, the Geological Survey, the Fish and Wildlife Service and the Department of Energy.

Health Effects

The integrated health and environmental risk analysis for synfuel industries provides the framework by which the scientific documentation of risks can be utilized in regulatory and enforcement decisions and determines the extent to which pollution control processes are required. The FY'85 program anticipates completing and publishing, in a refereed journal the risk analysis methodology. A user's guide on the health and environmental risk analysis methodology for complex mixtures will be developed.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ASRL/RTP	Joe Bufalini	66.0	100
ERL/COR	Craig McFarlane	237.2	100
OEPER/HQ	Alan Moghissi	1,536.2	6

Environmental Engineering and Technology

This area is supporting two types of research: the development for commercialization of an integrated NO_x/SO_x control technology—Limestone Injection through a Multistage Burner (LIMB), and evaluation of pollutants from proposed synfuel facilities and alternate energy sources.

Energy

The *LIMB control technology* can substantially reduce both NO_x and SO_x emissions while at the same time reducing the costs for control. A systematic development is underway to bring the LIMB technology to the point where industry would be willing to commercialize it. The 1985 program will include: research on sorbent reaction mechanisms, research at the small bench and pilot scale for a wide range of fuel types, prototype scale testing of the tangentially-fired experimental systems for extrapolating the performance to commercial scale, detailed analysis to identify potential operability and reliability problems, planning and site preparation for the industry/EPA cofunded full scale demonstrations on wall-fired utility boilers.

To control *synfuel pollutants* ORD provides special support to the regional and state permitting process and review of EISs and environmental monitoring plans of SFC sponsored projects through special studies and technical assistance. Direct consultation will be provided to SFC's process developers as required by the Energy Security Act, Section 131(e) which identifies EPA as one of the consulting agencies to SFC. Limited evaluation will be made of discharge characterization and controls on key problem areas at SFC sponsored plants or other operating plants. Efforts will be initiated on a data management and interpretation system for monitoring data from SFC plants. Research will provide for the evaluation of reduced sulfur species control for oil shale and coal based technologies and codisposal of oil shale solid wastes with process waters.

The laboratory at RTP is responsible for the evaluation of synfuel processes and characterization of the emissions, waste streams, and control technologies. This includes coal based synthetic fuels, oil shale, tar sands, geothermal and other energy-related technologies.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
AEERL/RTP	Robert Hangebrauck	18,292.9	15
OEET/HQ	Jim Abbott Kurt Jakobson Gregory Ondich		

Environmental Processes and Effects

The Agency's Cold Climate Research Program defines the impacts of oil and gas development, mining activities, and atmospheric pollution on arctic and sub-arctic

Energy

environments and proposes mitigative measures. Projects in the FY'85 program include: (1) assessing the impact of oil development on coastal tundra wetlands of the Alaska North Slope; (2) developing criteria for protection of surface waters impacted by placer mining; (3) performing a literature review and field study of the biodegradation and toxicity of hydrocarbons in oiled waters; and (4) developing predictive models that will describe the dispersion, downwash and deposition of industrial air pollutants along Alaska's North Slope.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ERL/COR	James McCarty	400	0

Hazardous Wastes

Scientific Assessment

This program provides assessments of the health effects and risks arising from hazardous wastes; improved methods for performing such assessments; and, chemical-specific health summaries. These are supplied to the EPA's Office of Solid Waste (OSW) to support a variety of regulatory activities and to OSW, EPA regional offices and the states for use in evaluating permit and enforcement actions.

One type of *assessment*, the health and environmental effects profile, characterizes a waste and assesses the hazards posed to humans or the environment by exposure to it. The profiles support decisions on listing or delisting a chemical as a hazardous waste. Most of this work is done by extramural contract.

In addition, an in-house team develops *methods* to assess the extent of human health effects and human exposure to complex hazardous wastes. These methods support efforts to assess and refine proposed RCRA permits and to prepare supporting documentation for enforcement decisions. Finally, to support the prevention and containment of hazardous spills, extramural contractors develop chemical-specific *health summaries* for use in evaluating alternatives for dealing with hazardous spill contaminants.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ECAO/CIN	Christopher DeRosa	1,334	32
OHEA/HQ	Thomas Gleason	1,042	54

Health Effects

Listing of substances under RCRA requires the ability to characterize the potential health hazards of wastes. This research program focuses on developing biological short-term tests to make determinations of the potential health hazard of manufacturing residues. Emphasis will be on recognizing complex mixtures as hazardous wastes for disposal purpose. This current research is to develop two screens for Level 1 of a three-level testing battery. The first, a prescreen protocol, will be an abbreviated and inexpensive screen for large numbers of Resource Conservation and Recovery Act (RCRA) samples. The other screen will be a Level 1 confirmation screening protocol to provide a more accurate preliminary assessment of the potential toxicity of RCRA samples. Levels 2 and 3 of the testing battery will not be the subject of research in this current plan.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
HERL/RTP	Joellen Lewtas	1,742.8	44
OHR/HQ	W. Wade Talbot		

Hazardous Wastes

Environmental Processes and Effects

Cost-effective decisions on regulation of hazardous wastes require methods for determining which waste constituents are hazardous, the potential impacts on human health and the environment of various disposal and regulatory options, and the suitability of sites proposed for disposal facilities. In addition, field-validated methods for quickly assessing the potential impacts of hazardous material releases (spills) on the environment are needed for decisions on counter-measures.

For determining whether wastes are hazardous, ERL/Duluth is adapting quantitative structure-activity relationship methods, developed for predicting the *toxicity* of single chemicals for use on multi-chemical wastes. RSKERL/Ada is developing microcosm (e.g., soil column) technology which will provide a relatively fast and inexpensive determination of the potential for wastes to move in the subsurface environment and thus to contaminate an aquifer.

Models are being developed to determine the exposure of humans and the environment to hazardous wastes. RSKERL/Ada is developing, improving, and field-evaluating ground-water models, while ERL/Athens is coordinating ground water and other routes of exposure (surface water, air) into multimedia methods which can predict exposure on a consistent basis through multiple routes.

Criteria developed in FY 1984 by RSKERL/Ada for *site selection* and evaluation based on hydrogeological factors will be evaluated in several hydrogeological settings in cooperation with the U.S. Geological Survey in FY 1985. RSKERL/Ada is also developing a comprehensive technical data base on new and existing technologies for *land treatment of hazardous wastes* for which incineration or conventional land disposal are inappropriate, infeasible, or ineffective.

For *assessment* of the potential hazard of materials released into the terrestrial or aquatic environment, ERL/Corvallis is developing and evaluating a multitrophic-level bioassay protocol. In FY 1985 the protocol will be evaluated at a third field site, and the protocol will be augmented with selected alternative testing techniques.

Three studies will be continued to assist the Agency in defining the threat from dioxin contamination: its bioavailability in fish, its potential for human exposure through the food chain, and its mobility and persistence in soils and ground water.

Hazardous Wastes

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ERL/ATH	George W. Bailey	737	73
RSKERL/ADA	George Keeler	3,465	33
ERL/COR	Spencer A. Peterson	538	63
ERL/DUL	Philip M. Cook	1,426	56
OEPER/HQ	Will C. LaVeille	529	49

Environmental Engineering and Technology

This program develops data on control technologies, how they function, and whether they will, in fact, allow hazardous waste disposal facilities to meet performance standards.

In order to develop performance standards for the treatment, storage, and disposal of hazardous wastes it is necessary to understand the *operational characteristics* of the different kinds of treatment and disposal available. Methods for use in measurement protocols will be developed to determine incinerator destruction efficiency and to continuously monitor control technology. With regard to *landfilling*, synthetic and clay liners will be studied and the effectiveness of alternative closure, and monitoring procedures for surface impoundments will be investigated. Technical Resource Documents will be developed for use by regional and state agencies for *permitting* hazardous waste disposal facilities and for *enforcing* applicable regulations. This program will update documents for disposal facility design, operation, maintenance, and closure.

Incineration Research focuses on four areas: characterizing performance of existing thermal destruction technologies; developing methods of rapid cost-effective compliance monitoring of these facilities; characterizing the products of incomplete combustion and their formation conditions; and developing methods to predict performance to avoid process failure and control process reliability. The research is conducted at laboratory and pilot scale in HWERL facilities in Cincinnati and Jefferson, Arkansas. The hypotheses from these programs are verified in full-scale field tests. The program examines conventional incineration as well as high temperature industrial processes.

The treatment program examines both existing and emerging alternative technologies for treating or detoxifying hazardous materials. Emphasis is being placed on those waste streams which will be banned from land disposal facilities.

Research is being conducted to evaluate in-situ methods for the destruction/detoxification/containment of *dioxins* and pollutants related to the production of dioxins and

Hazardous Wastes

similar toxicants. One major investigation will involve the accelerated evaluation of the mobile incinerator at the Denney Farm site near Verona, Missouri. The purpose of this research is to determine the economic viability of the technique and to establish: (a) test burn protocols, (b) health and safety protocol, (c) site specific, risk assessment protocol, (d) an economic model for estimating the cost of treatment per unit of material processed, and (e) national and state permit protocol.

Finally, to provide technical support in preventing and containing hazardous *spills*, reports will be issued summarizing research on the evaluation of specialized equipment and techniques for prevention, control, removal, and disposal.

The implementation of this program is divided between two laboratories. The Hazardous Waste Engineering Research Laboratory in Cincinnati is responsible for land disposal and control of hazardous spills, incineration research as well as for advanced technologies such as chemical, biological and physical treatment alternatives. The Air and Energy Engineering Research Laboratory in RTP is responsible for the development of emissions sampling and analysis protocols.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
HWERL/CIN	E. Oppelt N. Schomaker Al Klee	19,304	27
OEET/HQ	Marshall Dick	342	88

Acid Deposition Environmental Monitoring and Quality Assurance

To improve procedures to *characterize* wastes for listing under RCRA, research will develop methods for characterizing and detecting particular wastes and providing criteria for determining if those wastes constitute a potential hazard. Methods will be tested for application to highly toxic wastes in soil and sediments, for detection of organics in the ambient air of waste disposal facilities, and for determining the reactions of wastes in all media.

Techniques for *field monitoring* of hazardous waste sites will be improved, including statistics for sampling design and evaluated standard methods for media sampling. Of particular importance is post-closure monitoring of sites and investigation of new techniques for monitoring soils, and biota, ambient air, and waste incinerator emissions.

To support RCRA permitting and enforcement activities, research is developing *screening methods*, biological monitoring methods, and developing remote monitoring

Hazardous Wastes

techniques. A substantial extramural effort will be directed toward validating waste incinerator test methods for volatile and semi-volatile organic compounds and monitors for carbon monoxide and total hydrocarbons on waste incinerator stacks.

To support prevention and containment of hazardous releases, work will be done to develop techniques and methods to gather and *analyze* data through such means as aerial photos, and thermal and multispectral imagery techniques for site characterization. Tasks will identify spills, spill movement, and to assist in cleanup operations.

Finally, to ensure that the data on which regulation and enforcement are based is accurate, *quality assurance* efforts will include distribution of analytical and standards reference materials, on-site field audits of sampling efforts, laboratory performance evaluations and support in methods used.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
EMSL/CIN	Robert Booth	2,508	26
EMSL/LV	Glenn Schweitzer	5,965	47
EMSL/RTP	Thomas Hauser	1,308	21
ADEMQA/HQ	John Koutsandreas	437	65

Superfund

Scientific Assessment

This program provides technical support to the Office of Emergency and Remedial Response (OERR) for use in establishing and implementing regulations mandated by Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as well as technical support and assessment methods development for the Office of Waste Programs Enforcement (OWPE) for use in enforcement decisions. This program produces *rapid response health summaries*, for use by on-scene coordinators after hazardous materials spills or other emergency response situations. Evaluation of these chemical-specific summaries should permit a determination of potential hazards. The literature search is done by extramural contract.

Following emergency or remedial response at a hazardous waste site, residual levels of hazardous substances may remain in the environment. *Protocols* are being developed for estimating aggregate acceptability indices for exposure to residual levels of complex chemical mixtures. This is mainly an in-house project. In addition, *health effects data* are being gathered from the scientific literature and used to rank health risks posed by individual chemicals. The final ratings are one factor among several used in determining a "*reportable quantity*" for each chemical. The majority of this work is done by extramural contract.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ECAO/CIN	Christopher DeRosa	630	13
OHEA/HQ	Thomas Gleason	620	13

Environmental Engineering and Technology

Clean-up of uncontrolled hazardous waste sites requires technologies for response and remedial action, for protecting the personnel involved and for supporting enforcement actions.

The R&D support program develops and evaluates *clean-up* technology, demonstrating proto-typical equipment such as mobile incineration systems and mobile soil washing systems. *Remedial* technology will be assessed and handbooks provided which will include design data, and cost and effectiveness information. Engineering expertise will be applied to the assessment of uncontrolled hazardous waste site situations to assist the Office of Emergency and Remedial Response, Regions and others in the development of corrective measure options. Manuals will be developed establishing *personnel safety* protocols and evaluating equipment and techniques, especially for decontamination

Superfund

of equipment and personnel. In addition, short-term, quick turn-around technical advice and consultation will be provided to the regional programs and the Office of Waste Programs Enforcement for *enforcement* support.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
HWERL/CIN OEET/HQ	Ronald Hill Ray Thacker	6,158 84	30 100

Environmental Processes and Effects

To support on-scene coordinators of emergency and remedial response activities, a manual will be prepared which provides technical guidance on the mechanisms and applications of biological field sampling at hazardous waste sites. A comprehensive ground and surface water modeling applications guide will be produced for use in predicting the extent of contamination from hazardous waste sites. Technical assistance will be provided to Regions on ground water investigation methods, hydrology, and geology.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
OEPER/HQ	Will C. LaVeille	163	100

Acid Deposition Environmental Monitoring and Quality Assurance

This program supports the National Contracts Laboratory Program and three major activities: situation assessments, quality assurance and enforcement and technical assistance.

Between 50 and 60 laboratories are involved in the National Contracts Laboratory Program which will perform the analytical tests for *site and situation assessment*. The ORD program will ensure the quality of the data from these laboratories through on-site laboratory evaluations, blind samples analyses, quarterly reviews and a 10 percent data audit. Remote sensing provides detailed data on sites to help the Superfund Office to prioritize sites and determine methods of clean-up. Air monitoring assessment and sampling methods will be evaluated for use in field assessment of hazardous waste sites.

The *Quality Assurance* program will provide the basis to estimate the scientific accuracy of the data acquired by Superfund.

Enforcement cases will be provided with increased monitoring expertise to ensure that clean-up by industry is consistent with proved scientific protocols. Also, geophysical monitoring and a referee laboratory to provide quick turnaround will be available to the regions and the program office.

Superfund

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
EMSL/LV	Glenn Schweitzer	349.4	27
EMSL/RTP	Thomas Hauser	619.7	27
EMSL/CIN	Robert Booth	665.0	22
ADEMQA/HQ	Robert Holmes	100.0	95

Toxic Substances

Scientific Assessment

The scientific assessment research program relating to toxic substances provides overview of scientific documents, and develops uniform methodologies for performing risk assessments. To provide an *overview* of scientific documents, carcinogenicity, mutagenicity, adverse reproductive effects and exposure assessments are reviewed upon request from the Office of Toxic Substances. Newly developed data are being gathered to improve *risk assessment* methodologies and to ensure continuity throughout the Agency in the use of risk assessment methods. Mutagenicity, carcinogenicity and exposure *methods* are being revised and reproductive effects methods are being developed.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
OHEA/HQ	Tom Miller	271	81

Health Effects

This research program identifies and quantifies risks to human health from toxic substances through test method development for provision of dose response data to be used in risk assessment methods development and structure-activity model development.

Testing methodology research has three purposes: to determine which laboratory tests best predict the human response, to determine the chemical reactivity of metabolic intermediate compounds, and to improve biological mathematical extrapolation models.

Risk Assessment activities are directed primarily toward improving methods to predict toxicity based upon similarities in chemical structure, improving extrapolations from high-dose to low-dose, and improving extrapolations from animal species to humans. This includes the development of biological markers which are measurable indicators of exposure, susceptibility, and effect of the molecular level. By combining epidemiologic studies with exposure markers, it may be possible to predict the human health risks from exposures to toxic material more precisely.

Research into *structure-activity* relationships will be used to develop methods which can use data on molecular structure descriptors or combinations to predict genetic and carcinogenic activities using pattern recognition and statistical techniques. Also, we will construct a chemical data base in several areas of toxicological responses and relate each to effects upon individual organ systems.

Toxic Substances

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
HERL/RTP OHR/HQ	Bill Durham Charles Mitchell	11,113.2	35

Environmental Engineering and Technology

The areas of focus in this research program are: the identification and evaluation of alternatives to mitigate release and exposure of chemicals which will be used by the Agency in regulating the manufacture and use of existing chemicals; the development of predictive capabilities to be used in assessing release and exposure in the review of Premanufacturing Notices (PMN's) for new chemicals as required by TSCA; and the assessment of physical, chemical and biological techniques and devices to contain and destroy genetically engineered organisms under TSCA.

Alternatives to mitigate release and exposure of specific existing chemicals will be defined in cooperation with industry, through the evaluation and adaptation of control measures related to the release in the workplace and into the environment of the chemicals during their life cycles. Technologies, management practices, and personal protective equipment to limit the release and exposure of chemicals will be evaluated.

Models to predict the release and exposure of different classes of new chemicals will be developed in cooperation with industry. The models will address different chemical unit operations, unit processes and physical/chemical properties of chemicals and predict potential exposure and release levels as well as best control measures to mitigate release and exposure of new chemicals. Pilot scale testing for the treatability of classes of potentially toxic chemicals will be conducted to validate these predictive models for waste streams.

A program to support PMN review related to genetically engineered organisms will be conducted through technology and engineering assessments of the potential for environmental contamination, and physical, chemical and biological techniques and devices to contain and destroy these organisms. Engineering safety and quality control programs will be emphasized.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
WERL/CIN OEET/HQ	Clyde Dempsey Don Tang	569.4 50	64 100

Toxic Substances

Environmental Processes and Effects

Determination of the movement, transformation, and ultimate disposition of toxic substances and genetically engineered organisms in all environmental media, and how plant and animal organisms and larger ecosystems in these media are affected by toxic substances, are the subjects of this research effort. This involves specific activities for developing and validating tests and methodologies for assessing environmental hazards and exposure, integrating these into risk assessments, developing structure-activity relationships (SAR) for rapid estimation of the fate and effects of new chemicals and providing technical assistance on specific existing chemical evaluations and rule makings.

Environmental hazard assessment research focuses on the development, improvement, and validation of single and multi-species toxicity tests (including acute and chronic toxicity), bioconcentration assays, comparative toxicological relationships using fish, indirect human exposure methods, and system-level process organisms. The developed methods are validated in both laboratory (microcosm) and field ecosystem environments in order to define their applicability to real-world situations.

Studies on *environmental exposure assessment* will develop tests and mathematical models of chemical transport, transformation and fate in order to determine the concentrations of toxic substances in various environmental media and to relate these to actual terrestrial environments, modeling accumulation of toxic chemicals in food chains, and developing soil core microcosms for determining chemical fate and biodegradation processes. Laboratory and field studies are conducted as a final improvement/verification step.

Environmental risk assessment studies on the linkage of environmental exposure and hazard assessment techniques, and development of methods to evaluate risks associated with genetically engineered organisms have been initiated.

Structure-activity relationship research develops methodologies based upon molecular structure characteristics to rapidly assess the environmental fate and toxicity of new chemicals. Structure-activity correlations include those for bioaccumulation, toxicity, and fate. Activities also include development of data bases on plant uptake, fate of organic chemicals, toxicity to fish, and reactivity of chemicals in air.

Technical assistance is provided to the Office of Toxic Substances on complex problems relating to environmental fate, exposure, effects, hazards, and the environmental risk of toxic chemicals as necessary for risk assessment.

Toxic Substances

Activities in this program are carried out at six field laboratories. Their locations as well as the kinds of research they conduct are as follows:

- ERL/Athens - transport and transformation of organic and inorganic substances in freshwater and multi-media environments, and development of SAR regarding fate of chemicals;
- ERL/Duluth - effects of toxic substances in freshwater environments, and development of SAR regarding effects of new chemicals;
- ERL/Narragansett - chemical fate and effects in marine environments;
- ERL/Corvallis - fate and effects of toxic substances and genetically engineered organisms in terrestrial environments;
- RSKERL/Ada - terrestrial subsurface fate of chemicals;
- ERL/Gulf Breeze - fate and effects of chemicals and genetically engineered organisms in estuarine/marine environments.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ASRL/RTP	Alfred H. Ellison	216	31
ERL/ATH	Walter M. Sanders	1,895	83
RSKERL/ADA	Clinton W. Hall	70	0
ERL/COR	Thomas A. Murphy	1,526	66
ERL/DUL	Norbert A. Jaworski	1,188	64
ERL/NARR	William A. Brungs	503	84
ERL/GB	Henry F. Enos	2,134	56
OEPER/HQ	Charles W. Hendricks	967	59

Acid Deposition Environmental Monitoring and Quality Assurance

Efforts to protect human health from the adverse impacts of environmental exposure to toxic substances are supported by EPA research to improve monitoring capabilities, to more accurately determine exposure to chemicals, and to provide quality assurance. This research includes the development of new statistical techniques and sampling design methods for use in conducting the risk assessments required by the Toxic Substances Control Act.

Research related to monitoring human and environmental *exposure* to chemicals involves identification of the major transport and transformation processes. These processes are identified through monitoring data, and through monitoring systems capable of linking environmental concentrations of chemicals to human exposure. This exposure program requires the development of monitoring methodology to determine the extent of exposure and field testing of monitoring techniques and methods for a chemical of interest.

Toxic Substances

Quality Assurance efforts improve measurement methods, field monitoring systems, and associated protocols. Under this program, methods will be developed and evaluated for sampling and analyzing volatile organic compounds which are currently difficult to isolate. Biological measurements will be emphasized and deliverables will include guidelines for conducting collaborative tests of biological test methods as well as selected biological reference materials for use in various analytical procedures.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
EMSL/CIN	Robert Booth	657	0
EMSL/RTP	Thomas Hauser	1,361	27
EMSL/LV	Glenn Schweitzer	3,054	42
ADEMQA/HQ	Michael Dellarco	200	0

Pesticides

Scientific Assessment

In support of EPA's role in regulating pesticides, EPA's researchers prepare and review risk assessment documents for carcinogenicity, mutagenicity, adverse reproductive effects and exposure for pesticide compounds as requested by OPP. Risk assessment methods for mutagenicity, carcinogenicity, reproductive effects and exposure (dermal and inhalation) are being updated.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
OHEA/HQ	Tom Miller	401	93

Health Effects

This program develops methods to determine health endpoints and health effects, methods to determine risk, and ways to provide quality assurance.

To define the *health endpoints* of pesticides which are of concern, data will be provided on the immunological effects of biological pesticides on mammalian cells. In addition, research will investigate how pesticides affect children differently from adults.

In order to identify the *health effects* of pesticides, EPA requires industry to supply specific pesticide data. EPA's research in this area develops test protocols and health assay methods for industry to use to produce that data. During FY 1985, additional test methods will be developed in the areas of reproduction/teratology, mutagenesis/carcinogenicity (genotoxic effects), neurotoxicology and immunotoxicology.

Research also develops methods to improve *risk assessment* to determine whether a pesticide poses unreasonable adverse risk to the public health and the environment.

A computerized data management and analysis system for mutagenic/carcinogenic testing of pesticides will be developed and applied to assist in finding solutions to specific toxicological problems.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
HERL/RTP OHR/HQ	William F. Durham Charles T. Mitchell	4,603.5	45

Environmental Engineering and Technology

This research program supports the Office of Pesticides Regulatory Program in making determinations as to whether or not certain types of protective clothing reduce exposure to pesticides during application. Laboratory studies will be initiated on the permeability and penetrability by highly toxic pesticide compounds for

Pesticides

various fabric and rubber compounds used for protective clothing. This work will establish effects of wearing apparel degradation and decontamination (e.g., laundering) on pesticide retention and on continued protective capability of the fabrics.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
WERL/CIN OEET/HQ	Alden Christianson Don Tang	552.3 27.0	3 100

Environmental Processes and Effects

This research program is designed to determine the environmental transport, degradation, fate and effects of certain pesticides; to assess the environmental exposures; and to assess hazard and associated risks. *Environmental effects* research will develop methods and field-evaluate predictive techniques to estimate the effects of biological control agents and chemical pesticides on biota in aquatic and/or terrestrial environments. Extramural research will be sponsored through EPA laboratories in Gulf Breeze, Corvallis, and Duluth on field evaluation of pesticide hazard assessment techniques.

To help to *assess environmental exposure* to pesticides, additional techniques will be developed to estimate adverse pesticide exposure in aquatic and terrestrial environments. Such determinations will include pesticide distribution and exposure levels in ecosystems and in physical habitats such as soil, sediment chemical measurements, and sorption kinetics. Extramural research through EPA laboratories in Athens and Gulf Breeze will focus on evaluation of predictive (modelling) techniques for environmental exposure in the field.

In support of Agency development of *environmental risk assessment* capabilities, this research program will select environmental risk assessment methods for selected populations or their surrogates. Methods will be developed to perform assessments by integrating new or existing exposure and effects data into models. These methods are used by EPA in analyzing the data submitted by industry to determine the risks and benefits from pesticide use. In addition, *technical assistance* is provided to the Office of Pesticides Programs on complex problems relating to environmental fate, exposure, effects, and hazards as necessary for risk assessment. Several field laboratories conduct pesticide research. These are:

- ERL/Athens - transport and transformation of pesticides in freshwater and multi-media environments;

Pesticides

- ERL/Corvallis - exposure and effects of pesticides in terrestrial environments;
- ERL/Duluth - effects of pesticides in freshwater environments;
- ERL/Gulf Breeze - pesticide fate and effects in marine/estuarine environments.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ERL/ATH	George Bailey	398.4	62
ERL/COR	Thomas A. Murphy	250.0	76
ERL/DUL	Norbert A. Jaworski	355.3	78
ERL/GB	Henry Enos	1,258.0	100
OEPER/HQ	Charles W. Hendricks	353.6	90

Acid Deposition Environmental Monitoring and Quality Assurance

The pesticides quality assurance program ensures the accuracy of the data which is attained through testing and analysis. This program maintains a pesticide repository of high purity chemicals which are used by more than 1,400 laboratories in the United States and in foreign countries. These samples are used as standard reference samples for internal quality control. In addition, interlaboratory comparison samples are prepared. Also, the program will provide samples of pesticide chemicals no longer produced, but still regulated, in the United States. Such reference samples are necessary to perform analyses in soil, plant, or animal tissues at the required degree of accuracy.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
EMSL/LV	R. K. Mitchum	1,152	45

Radiation

Health Effects

The goal of the radiation health research program is to provide data and methodologies to assess the health effects of exposure to non-ionizing radiation. The program currently focuses primarily on neurologic effects; long-term, low-level exposures; dose-extrapolation modeling (improving extrapolations from high to low dose and from animals to man); and studies on extremely low frequencies (ELF) (60 Hz).

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
HERL/RTP OHR/HQ	Joe Elder Hugh McKinnon	1,899.4	48

Acid Deposition Environmental Monitoring and Quality Assurance

The overall goal of the research program in radiation is to provide the scientifically credible data necessary to assess public exposure to nonionizing radiation and to man-made radioactive materials and to allow decisions to be made regarding control of that exposure.

In addition, this program provides quality assurance for the Agency's programs for monitoring radiation in the environment. These are supported by providing a common source of radionuclides standards and reference materials and through the conduct of laboratory intercomparison studies to assure data of known quality from analyses of environmental samples such as milk, water, air and food.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
EMSL/LV	Charles Costa	223	93

Intermedia

Scientific Assessment

The scientific assessment program provides uniform Agency-wide guidance on, and assures the consistency of, exposure and risk assessments that support regulatory decisionmaking by EPA. The Agency is developing guidelines for the assessment of exposure and risk (oncogenicity, mutagenicity, reproductive toxicology, systemic effects, and complex chemical mixtures) from chemical compounds during 1985.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
ECAO/CIN	Jerry Stara	148	100
OHEA/HQ	Tom Miller	952	68

Exploratory Research Core Program

There are three major components to the exploratory research program: a grants program, a research centers program, and a visiting scientists program. The grants program supports research to advance the state-of-the-art in key areas of interest to the Agency which are announced annually in the "Solicitation for Research Grant Proposals." The research centers program includes eight university research centers which conduct multidisciplinary research in areas of high-priority interest to the Agency. In 1984, guidelines for the periodic review and sponsorship of the exploratory research centers were developed. The research centers are:

Waste Elimination: (Illinois Institute of Technology and the University of Notre Dame) Innovative technology and process modification to reduce industrial pollutants.

Intermedia Transport: (University of California at Los Angeles) Definition of chemical/physical processes governing pollutant exchange at air-land and air-water boundaries.

Ecosystem Management: (Cornell University) Identify and apply ecosystem principles to environmental management problems.

Marine: (University of Rhode Island) Assess marine ecosystem health, emphasizing exposure of marine organisms to toxics.

Advanced Control Technology: (University of Illinois, Urbana) Separation technology, thermal destruction, biological separation, and chemical detoxification.

Ground Water: (University of Oklahoma, Oklahoma State University, and Rice University) Subsurface characterization, transport and fate, and ground-water horizon modeling.

Intermedia

Epidemiology: (University of Pittsburgh) Basic epidemiology methods and airborne particulate health effects.

Hazardous Waste: (Louisiana State University) Design, construction, maintenance, operation, and closure of hazardous waste landfills.

The visiting scientists program was initiated in 1984 to bring distinguished senior scientists into the Agency to assist in strengthening its science policy and research program.

Office or Laboratory	Contact	Total Funds (\$k)	Percent In-House
OER/HQ	Roger Cortesi	20,860.2	2.7

ORD Organization

The Office of Research and Development is responsible for research, development, and demonstration programs in pollution sources, fate, and health and welfare effects; waste management and utilization technology; environmental sciences; and monitoring systems. Please note, the list below includes both commercial (CML) and Federal (FTS) telephone numbers. Where only one number is listed, it serves both purposes.

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Cincinnati, OH 45268

Office of Exploratory Research

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Director, Clarice Gaylord	(202) 382-7473
Research Centers Program	
Director, Robert A. Papetti	(202) 382-7473
Visiting Scientists Program	
Director, John Reuss	(202) 382-2573

Office of Health and Environmental Assessment

Director, Elizabeth L. Anderson	(202) 382-7317
Deputy Director, Paul A. Martin	(202) 382-7315
Headquarters, Washington, DC (RD-689)	
Cancer Assessment Group	
Acting Director, Robert McGaughy	(202) 382-5952
Exposure Assessment Group	
Director, James Falco	(202) 475-8909
Reproductive Effects Assessment Group	
Director, Peter Voytek	(202) 382-7303
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Office of Environmental Engineering and Technology

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Deputy Director, Lou Lefke
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Office of Environmental Processes and Effects Research

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Energy and Air Division
Acting Director, Alfred A. Galli (202) 382-5776

Toxics and Pesticides Division
Acting Director, Charles Hendricks (202) 382-5967

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Deputy Director, Marvin L. Wood FTS 8-743-2224
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Ada, OK 74820

Environmental Research Laboratory
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200 SW 35th Street
Corvallis OR 97333

Environmental Research Laboratory
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Associate Director for Research, (Vacant) FTS 8-783-9549
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Environmental Research Laboratory
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Air, Noise and Radiation Division
Acting Director, Hugh McKinnon (202) 382-5893

Health Effects Research Laboratory
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Deputy Director, Robert Lee, Jr. FTS 8-629-2281
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Office of Acid Deposition, Environmental Monitoring, and Quality Assurance

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Acid Deposition Research Division
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Environmental Monitoring and Support Laboratory
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 Deputy Director, (Vacant)
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Environmental Monitoring Systems Laboratory
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 Deputy Director, (Vacant) FTS 8-545-2525
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 Las Vegas, NV 89114

Vint Hill Station
 Director, Vernon Webb CML (703) 347-6224
 P.O. Box 1587, Building 166 FTS 8-557-3110
 Warrenton, VA 22186

Atmospheric Sciences Research Laboratory
 Director, A. H. Ellison CML (919) 541-2191
 Deputy Director, Jack H. Shreffler FTS 8-629-2191
 Research Triangle Park, NC 27711

ORD Organizational Descriptions

Office of Exploratory Research

The Office of Exploratory Research is responsible for planning, administering and managing research in response to EPA priorities as articulated by agency planning mechanisms and ORD's research committees. Its responsibilities include: analyzing and assessing long-range environmental research trends and problems; planning, administering, managing and evaluating EPA's anticipatory and extramural research through competitive grants and centers of excellence programs; supervising and supporting visiting scientists and summer fellows programs; managing small business innovative research activities; identifying federal workforce training programs to be used by state and local governments; and assuring the participation of minority institutions in environmental research and development activities.

Office of Health and Environmental Assessment

The Office of Health and Environmental Assessment is responsible for an agency-wide program to provide a scientific foundation for evaluating the effects of environmental pollutants in varying exposure situations on human health and ecological systems and determining the degree of risks from these exposures.

The Environmental Criteria and Assessment Office in Research Triangle Park, North Carolina, is responsible for preparing air quality criteria documents and air pollutant health assessment documents for use in agency regulatory activities, as well as legislatively required health-related reports.

The Environmental Criteria and Assessment Office in Cincinnati, Ohio, prepares health and hazard assessment documents on water pollution and solid and hazardous wastes and hazardous air pollutants. Additionally, comprehensive methodologies are prepared for health assessments of both single chemicals and complex mixtures. Technical assistance to various agency programs and Regional Offices concerning acceptable pollutant levels and dose-response relations are also provided.

Office of Environmental Engineering and Technology

The Office of Environmental Engineering and Technology is responsible for the assessment and the development of methods for control of the environmental and socio-economic impacts of municipal and industrial operations and of energy and mineral resource extraction, processing, conversion, and utilization systems.

The Hazardous Waste Engineering Research Laboratory in Cincinnati, Ohio, investigates ways to prevent, control,

and treat hazardous wastes and Superfund related activities. This includes defining and characterizing sources of pollution, catalyzing advances in the state-of-the-art of pollution control, providing engineering concepts for cost-effective engineering solutions to difficult pollution problems and early-warning of emerging sources of pollution.

The Water Engineering Research Laboratory in Cincinnati, Ohio, investigates, develops and demonstrates cost-effective methods for the prevention, treatment and management of municipal wastewater and sludges and urban runoff; and of industrial processing and manufacturing and toxic discharges; and the development of technology and management systems for the treatment, distribution and presentation of public drinking water supplies.

The Air and Energy Engineering Research Laboratory in Research Triangle Park, North Carolina, evaluates control technologies and process modifications needed to establish and meet standards for air emissions in a timely and cost-effective manner, and supports EPA's regulatory and enforcement programs. The Laboratory also environmentally assesses manufacture and use of synthetic fuel and other current and emerging energy sources and technologies.

Office of Environmental Processes and Effects Research

The Office of Environmental Processes and Effects Research develops the scientific and technological methods and data necessary to understand, predict, and manage the entry, movement, and fate of pollutants in the environment and the food chain, and to determine the effects of pollutants upon nonhuman organisms and ecosystems.

The Robert S. Kerr Environmental Research Laboratory in Ada, Oklahoma, conducts research and development projects on ground water, natural systems for treating wastewater, and the land treatment of hazardous wastes.

The Environmental Research Laboratory in Athens, Georgia, develops techniques for predicting the movement of pollutants through soil and water, and the subsequent changes that take place there. This includes agricultural and silvicultural sources of pollution, and environmental systems to control them; and development of models to help judge the environmental consequences of a contaminant reaching certain parts of water-soil systems.

The Environmental Research Laboratory in Corvallis, Oregon, determines the effects of pollution on terrestrial and freshwater ecosystems—linking air, land, and water. Studies include air pollutant effects on terrestrial and

aquatic ecosystems, toxic effects of chemicals and products of biotechnology on plants and animals in terrestrial and aquatic ecosystems, restorative efforts for dying lakes, the effects of pollution on wetlands, the ecological effects of runoff, and impacts of energy development in cold climates.

The Environmental Research Laboratory in Duluth, Minnesota, conducts research on the toxic effects of chemicals, pesticides and other pollutants on freshwater ecosystems. This laboratory has primary research responsibility for describing the fate and effects of pollutants that enter the Great Lakes.

The Environmental Research Laboratory in Narragansett, Rhode Island, studies the impacts of pollution on marine ecosystems, including the build-up of pollutants, chemical and physical behavior of pollutants in ocean life systems, and responses of marine organisms to environmental stress. This research provides a base for agency decisions on use of the oceans, specifically regarding ocean discharges and dumping.

The Environmental Research Laboratory in Gulf Breeze, Florida, conducts research on toxicological test guidelines and systems and the exposure-effects relationships of pesticides, toxic substances, and products of biotechnology in marine, coastal, and estuarine ecosystems. Emphasis is on the development, evaluation, and application of techniques and test systems for measuring and predicting the transport, fate, and biological and ecosystem effects of pesticides and toxic substances, including products of biotechnology.

Office of Health Research

The Office of Health Research is responsible for developing toxicity test methods and for providing toxicity data to enable the agency to accurately identify hazards and determine human risk from environmental exposure. From this mission, four principal areas of research are derived:

- generation of dose-response data
- toxicity test method development
- extrapolation of laboratory animal data to man
- development of methods to use dose-response data to estimate human morbidity and mortality.

The Health Effects Research Laboratory (HERL) with divisions in Research Triangle Park, North Carolina and Cincinnati, Ohio, works in all four of these areas with emphasis on inhalation toxicology, genetic toxicology, reproductive and development toxicology, neurotoxicology, non-ionizing radiation, waterborne diseases, and epidemiology.

Office of Acid Deposition Environmental Monitoring and Quality Assurance

This Office is responsible for: (a) monitoring the cause and effects of acid deposition; (b) research and development on the causes, effects and corrective steps for the acid deposition phenomenon; (c) research with respect to the transport and fate of pollutants which are released into the atmosphere; (d) development and demonstration of techniques and methods to measure exposure and to relate ambient concentrations to exposure by critical receptors; (e) research, development and demonstration of new monitoring methods, systems, techniques and equipment for detection, identification and characterization of pollutants at the source and in the ambient environment and for use as reference or standard monitoring methods; (f) establishment, direction and coordination of agency-wide Quality Assurance Program; and (g) development and provision of quality assurance methods, techniques and material including validation and standardization of analytical methods, sampling techniques, quality control methods, standard reference materials, and techniques for data collection, evaluation and interpretation.

The Environmental Monitoring Systems Laboratory in Research Triangle Park, North Carolina, develops methods to measure and monitor pollutants in ambient air and emissions sources; operates the quality assurance program for measurement of air pollutants, develops techniques to assess population exposure to air pollutants; and, characterizes non-criteria pollutants in air.

The Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, conducts research and development programs related to monitoring of pollutants in the environment, develops sampling strategies and techniques for monitoring hazardous waste leachates in soil and groundwater, develops remote sensing techniques, evaluates analytical methods for the characterization and quantification of hazardous wastes, and provides quality assurance in support of the EPA's hazardous waste, "Superfund," pesticides and ionizing radiation programs.

The Environmental Monitoring and Support Laboratory in Cincinnati, Ohio, standardizes analytical test procedures to identify and measure major pollutants and microorganisms of health significance in drinking water, ambient receiving waters, and municipal and industrial effluents; operates the quality assurance program for the monitoring data on water pollutants; develops screening methods for use at hazardous waste sites; and provides technical support to water and waste monitoring programs.

The Atmospheric Sciences Research Laboratory in Research Triangle Park, North Carolina, determines the effects of air pollution on the atmosphere, and subsequent

effects on air and water quality and land use. It also assesses the effects of pollution on weather and climate, and develops mathematical models for relating pollution emissions to air quality and for forecasting potential air pollution crises.

ORD Office/Laboratory

Abbreviations

- CERI/CIN** Center for Environmental Research Information
Cincinnati, OH 45268
(513) 684-7394
- ECAO/CIN** Environmental Criteria and Assessment Office/
Cincinnati, OH 45268
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- ECAO/RTP** Environmental Criteria and Assessment Office/
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