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November 12, 2010

Ellen Porter
Virginia Coal and Energy Commission
910 Capital Street, 2nd Floor
Richmond, Virginia 23219

Subject: JFA Response to the Socioeconomic Study of the Impacts of Uranium Mining in Virginia

Dear Ms. Porter,

Jack Faucett Associates, Inc. (JFA), an economics and public policy consulting firm headquartered in Bethesda, Maryland, is pleased to lead a collaborative effort with Ronald Cohen, associate professor of environmental science and engineering at the Colorado School of Mines, and Sandler Occupational Medical Associates, Inc. (SOMA) to perform a socioeconomic impact study of uranium mining in Pittsylvania County, Virginia.

JFA will serve as the primary contractor in the JFA Team. The other team members will serve as subcontractors to JFA. The JFA Team is equipped with the necessary knowledge and resources to successfully complete this project under the resource and time constraints suggested in the RFP. Our team of subject area experts has extensive experience in performing socioeconomic impact analyses of uranium mining and milling.

JFA is well suited to lead this study effort. JFA has more than forty years of experience in supporting federal, state, and local agencies with socioeconomic impact analyses and led five major studies on the impacts of uranium mining and radioactive waste management. JFA has successfully completed more than 200 socioeconomic impact studies on a wide range of public policy programs and projects since our founding.

No portion of this proposal has proprietary or confidential information. Accordingly, "Attachment A: Proprietary / Confidential Information Identification" is not included in the proposal.

If you have any questions or need additional information, please do not hesitate to contact me at 301-961-8835 or lawrence@jfaucett.com.

Sincerely,



Michael F. Lawrence
President

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Socioeconomic Impacts of Uranium Mining in Virginia

Prepared For:



Prepared By:



In Collaboration with:

Ronald Cohen, Ph.D. Associate Professor of Environment Sciences and Engineering
at the Colorado School of Mines

Sandler Occupational Medicine Associates, Inc. (SOMA)

Point of Contact:

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1. Executive Summary

Jack Faucett Associates, Inc. (JFA), an economics and public policy consulting firm headquartered in Bethesda, MD, is pleased to lead a collaborative effort to perform a socioeconomic impact study of uranium mining and milling in Virginia for the Virginia Coal and Energy Commission. JFA will team with **Ronald Cohen**, Ph.D., associate professor of environmental sciences and engineering at the Colorado School of Mines and **Sandler Occupational Medicine Associates (SOMA)**, a consulting firm that specializes in industrial occupational safety and toxicology and that has offices in New York, Delaware, Maryland, and Florida.

JFA will serve as the primary contractor in the JFA Team. Ronald Cohen and SOMA will serve as subcontractors to JFA. The JFA Team is equipped with the necessary knowledge and resources to successfully complete this project under the resource and time constraints suggested in the RFP.

JFA is well suited to lead this study effort. JFA has more than forty years of experience in supporting federal, state, and local agencies with socioeconomic impact analyses and led five major studies on the impacts of uranium mining and radioactive waste management. JFA has successfully completed more than 200 socioeconomic impact studies on a wide range of public policy programs and projects since our founding.

JFA will lead the team's efforts to address the economic development, government services and regulation, and social impact analyses in this project. Dr. Ronald Cohen will lead the team's efforts to address the environmental impact analysis. SOMA will lead the team's efforts to address the public health impact analysis.

2. Introduction to the JFA Team

The JFA Team includes leading socioeconomic impact analysis professionals and independent consultants who together are fully capable of addressing the multifaceted aspects involved in analyzing the socioeconomic impacts of uranium mining in Virginia.

JFA has led numerous socioeconomic impact studies in collaboration with other organizations and independent consultants. The firm has the capacity and internal resources to direct and coordinate this project on time and on budget.

The remainder of this section of the proposal introduces the JFA Team members, identifies the roles of the team members, describes the team's approach to internal and client coordination, highlights the team's expertise and experience, demonstrates JFA's ability to lead the team, and outlines the team's organization and responsibility hierarchy.

JFA Team's Members

The JFA Team's members have the breadth, depth, and proven experience needed to conduct a socioeconomic analysis that examines the economic development, government services, regulatory, public health, environmental, and social impacts of uranium mining in Virginia. A description of each of the members of the JFA Team follows:

JFA

JFA is a veteran-owned small business established in 1963. In our more than 40-year history, JFA has developed a solid reputation in the fields of public policy, economics, modeling, and regulatory support and consulting. We have successfully completed over 700 contracts and 1,200 individual research task orders. Our consultants address a wide variety of economic issues related to transportation, energy, and the environment. JFA has a particularly strong practice in socioeconomic impact analysis. Our firm has successfully completed more than 200 socioeconomic impact studies, including major studies on the socioeconomic impacts of uranium mining and radioactive waste management.

Ronald Cohen, Ph.D.

Ronald Cohen is an associate professor of environment sciences and engineering at the Colorado School of Mines. He has worked on research, teaching, and consulting projects on transport and remediation of metals and acid from mining operations for more than two decades. Dr. Cohen has extensive international and national experience in mine audits. He has performed Mine-Environmental and Water Audits at three mines in Mali, West Africa, for the International Financial Corporation, World Bank, and AngloGold. He has also done extensive research and work on mitigating uranium contamination from uranium mining operations. Dr. Cohen has used his skills and knowledge to successfully develop and design treatment systems and reclamation procedures for mine impacted waters in Mali, South Africa, Brazil, and the U.S.

SOMA

Founded in 1983, Sandler Occupational Medicine Associates Inc., (SOMA), provides its clients with solutions to occupational medical and environmental health and safety concerns. SOMA serves clients in the following industries: mining, chemicals, manufacturing, transportation, health care, power and electric, and utilities. SOMA has extensive experience working for commercial clients and U.S. Government agencies such as the Occupational Safety and Health Administration (OSHA), National Institute for Occupational Safety and Health (NIOSH), Environmental Protection Agency (EPA), and Department of Defense (DOD). SOMA's staff includes certified industrial hygienists, certified safety professionals, certified health physicists with expertise in radiation issues, toxicologist, and engineers.

JFA Team's Member Roles

JFA is one of the leading socioeconomic analysis firms in the U.S. JFA will be the overall project team leader. JFA will lead the efforts to address the economic development, regulatory, infrastructure, and social impacts of uranium mining in Virginia and support the subconsultants as they work on the environmental protection and public health aspects of this project.

Ronald Cohen, Ph.D., is an associate professor of environment sciences and engineering at the Colorado School of Mines. He has worked on research, teaching and consulting projects on transportation and remediation of metals and acid from mining operations for more than two decades. Dr. Cohen will lead the team's efforts to address the environmental impact analysis.

SOMA is a consulting firm that specializes in industrial occupational safety and toxicology. SOMA will use their experience with the mining industry to lead our team's effort to address the public health impacts analysis in this project.

JFA Team's Approach to Internal and Client Coordination

The JFA Team's internal and client coordination efforts will be led by JFA's President, Michael Lawrence. Mr. Lawrence is an experienced project director. Coordination within the JFA Team will be facilitated by the establishment and documentation of project goals, time and budget parameters, work processes, detailed work assignments, and delineated responsibilities by firm and individual before the onset of the project. The guiding principles of the JFA Team are to professionally and successfully execute the contract in a manner that meets and exceeds the specific requirements detailed in the RPF and advances the mission of the Virginia Coal and Energy Commission.

The JFA Team will host weekly internal conference calls with all team members to stay up to date on our progress and address any challenges. The JFA Team also proposes periodic conference calls with the client to share information on our progress and address any outstanding issues. Depending on the preference of our client, these conference calls can be hosted weekly, biweekly, monthly, or within the framework of any other suitable period. Additionally, the JFA Team will provide monthly documented progress reports of activities, accomplishments, and

challenges experienced in the past month and expected in the upcoming month. The JFA Team will also compose the technical report in consecutive chapters and welcomes the Virginia Coal and Energy Commission to review drafts of completed chapters as they are completed.

JFA Team’s Expertise, Capabilities, and Experiences

JFA Team member expertise and skills levels are illustrated in the graphic below. The expertise, capabilities, and experiences of the JFA Team amply cover every aspect of work involved with this project.

Exhibit 1: Expertise and Skill Sets by Organization and Independent Consultant

	JFA	Ronald Cohen, Colorado School of Mines	SOMA
Socioeconomic Impact Analysis of Uranium Mining	★		
Economic Development Impact Analysis	★		
Government Services and Regulation Impact Analysis	★	★	★
Public Health Impacts of Mining and Radioactive Waste Management			★
Environmental Impact Analysis of Uranium Mining		★	
Stakeholder Outreach and Input Facilitation	★		★
Marketing Material Development (Brochures, Presentations, Websites)	★		★

JFA’s Ability to Lead and Complete the Project Successfully

Description of JFA's current and one-year out projected workload

JFA’s consulting practice is focused on the analysis of public policy decisions in the fields of transportation, energy, and the environment. Our staff conducts economic and financial analysis, develops models, prepares reports, and crafts presentations for clients. JFA’s current work load includes: evaluating the Ohio River Navigation Impact Model for the U.S. Army Corps of Engineers; evaluating risk allocation, project assessment techniques and the state of the practice in Public Private Partnerships (P3) for the US Department of Transportation; developing Climate Action Plans in several states, and studying highway construction contract procedures for the National Cooperative Highway Research Program, which is part of the National Academies of Science. Our staff is committed to these projects with varying completion dates over the next 12 months for about sixty five percent of their time. We are fully prepared with staff and other

resources to support the Virginia Coal and Energy Commission if we are selected for this engagement.

Description of JFA's ability to complete projects on time and on budget

JFA is owned by officers of the company. The company has developed management methods that are very well suited to a small consulting firm with contracts of many types from many clients. The following paragraphs outline the components of our project management approach.

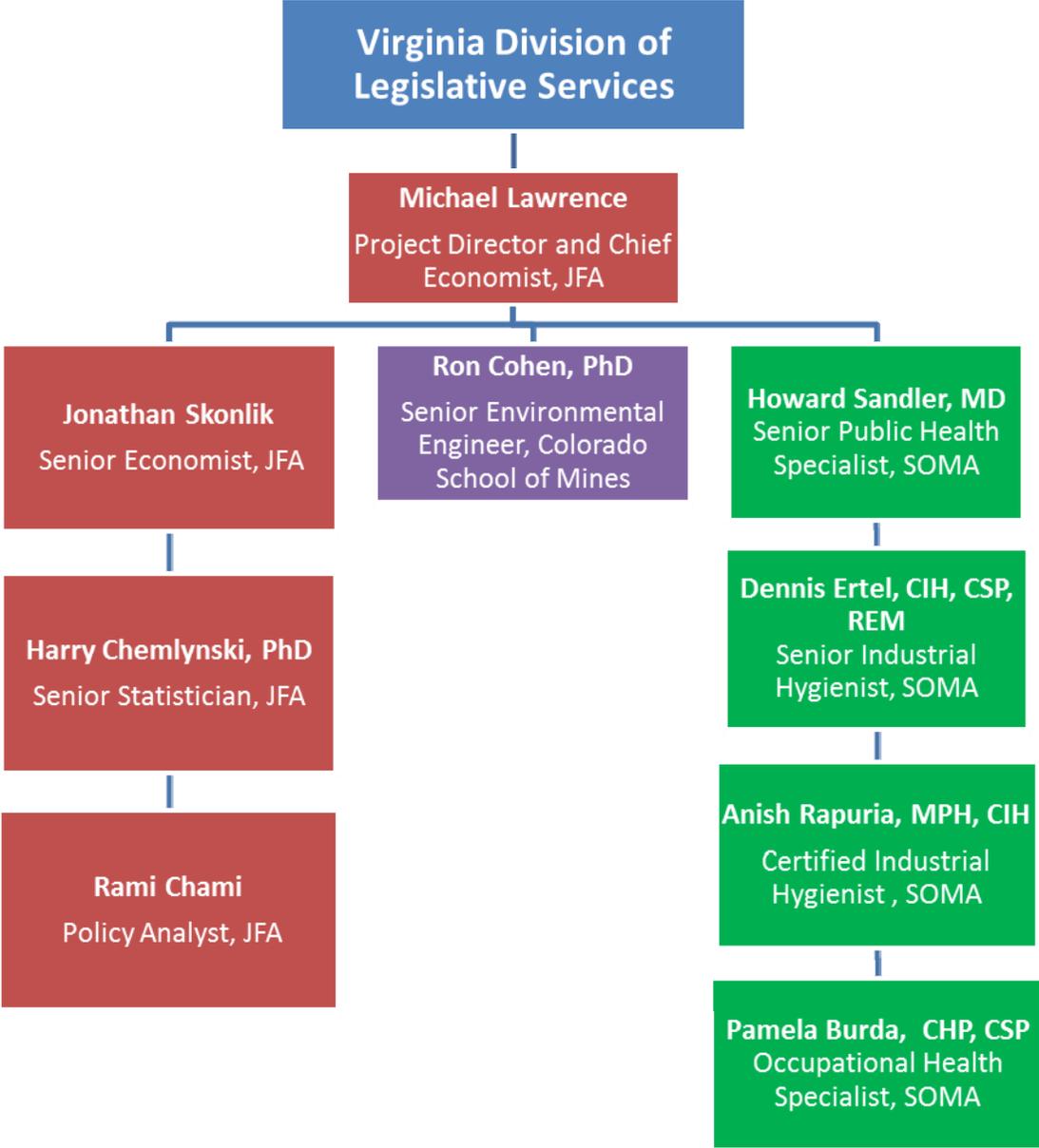
Quality Control - JFA considers quality control to be an essential upper management responsibility. Key to the internal technical quality of the proposed work effort will be progress reports prepared on a monthly basis. Included in these progress reports will be descriptions of work performed and challenges encountered.

Cost Control - Complete and final responsibility for all financial reports, accounting practice, and cost control lies with Mr. Lawrence, President of JFA and Project Director. To assure effective cost control, JFA has developed a computerized budget reporting system that provides timely analytic data on project costs throughout all phases of a project.

JFA Team's Organization and Responsibility Hierarchy

JFA is the primary contractor and team leader of the JFA Team. JFA President Michael Lawrence is the project director and is the primary point of contact. Mr. Lawrence will maintain continual communication with the Virginia Coal and Energy Commission to update them of the Team's progress. JFA is responsible for managing and directing the other team members. The JFA Team organizational hierarchy, with a delineated reporting and management channels, is provided in the following diagram.

Exhibit 2: Organizational and Functional Chart Reflecting Line of Management Responsibilities



3. Past Performance

The following section provides detailed descriptions of completed projects that demonstrate the JFA Team's history of successfully leading and completing relevant studies.

Past Performance: Jack Faucett Associates

Project: **Regulatory Impact Analysis of Radionuclides Emission Standards for Uranium Mills**

Client: **U.S. Environmental Protection Agency, Office of Radiation Programs**

Under this assignment, JFA prepared the U.S. EPA's Regulatory Impact Analysis for proposed emission standards for uranium mill tailings at active mill sites. The study consisted of four parts. First, the project team developed a detailed profile of the uranium milling industry, including characteristics of demand, supply, competitive products and processes, other economic characteristics, and outlook. Second, the current emissions characteristics of each uranium mill plant, risk levels associated with the emissions, and the cost and efficiency of each of seven technologies for controlling the emissions were evaluated. Third, a benefit-cost analysis of the standard was performed including identification of the least-cost control technologies for the mills that would be affected by the standard, description of the health benefits of controlling emissions, and comparison of costs and benefits. The final phase of the study was an evaluation of the costs to industry of compliance with the regulation, including an analysis of the current cost structure of the industry by plant, and an assessment of the economic effects of the regulation.

Project: **Economic Performance of the Uranium Mining Industry**

Client: **U.S. Environmental Protection Agency, Office of Radiation Programs**

JFA prepared economic profiles of the uranium mining for the U.S. EPA. The resultant report is divided into five chapters. Chapter 1 summarizes the results of the study. Chapter 2 describes the history and current status of sources of domestic uranium supply, including domestic production, inventories, and imports. Chapter 3 addresses demand for uranium, factors affecting demand, and uranium pricing. Chapter 4 presents financial information on uranium operations of each producer in the U.S. and an assessment of possible anti-competitive effects resulting from the EPA's regulation. Chapter 5 concludes the report with forecasts of domestic production, prices, and costs. An appendix, The Nuclear Fuel Cycle, explains the relationship between uranium mining and other activities in the production of nuclear fuel for utilities.

Project: Economic and Regulatory Support for Radioactive Waste, Mixed Waste, Emergency Response and Other Radiation Programs
Client: U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Policy and Emergency Response Branch

This project covered support to the U.S.EPA in radiological waste, Federal guidance, and radioactive emergency response programs and efforts directed at protecting human health. This encompassed radiation sources and radionuclide contamination involving Department of Energy facilities, Department of Defense facilities, Nuclear Regulatory Commission licensees and other Federal facilities, superfund sites with radioactive contamination (mixed waste), facilities/sites with residual radioactivity, radioactive waste disposal facilities, proposed waste repositories, and nuclear accident contaminated sites. Support included technical support, compliance support and other general support including public outreach efforts. Specific tasks completed by JFA under this contract include:

- Cost of providing alternate drinking water to a community following a nuclear contamination incident
- Cost analysis for Waste Isolation Pilot Plant (WIPP) engineered barriers and waste characterization
- Screening and evaluation of off-gas monitoring systems for incineration of low level radioactive and mixed waste
- Economic impact analysis of proposed criteria for the certification of the Waste Isolation Pilot Plant's (WIPP) compliance with environmental standards
- WIPP graphic displays
- Database of U.S. EPA comments on DOE/WIPP related documents
- Literature research for overland flow
- WIPP outreach: media translation
- Support for response to comments Document For 40 CFR 194
- Protective action guides workshops
- Technology guide for radioactively contaminated waste sites
- Radiation risk assessment methodology: technical transfer
- Incineration public outreach and involvement
- Technical support for development of alternative disposal options for very low level waste
- Leachability of radionuclides in iron and steel slags

Project: Support for Indoor Radon, Radionuclide National Emission Standards for Hazardous Air Pollutants and Electromagnetic Field Radiation Management
Client: U.S. Environmental Protection Agency, Office of Radiation and Indoor Air

This project included providing support to U.S. EPA's program activities in the following areas: 1) radon contamination of the interiors of houses and other structures; 2) emission of gaseous and other airborne radioactive materials to the environment; and 3) human exposure to unhealthful sources of electromagnetic radiation. The study examined public health risks from Department of Energy facilities, Nuclear Regulatory Commission licensees and non-DOE

Federal facilities, elemental phosphorus plants, uranium mines, phosphogypsum piles uranium mill tailings piles, and other sources of airborne radionuclides.

Specific tasks completed by JFA under this contract include:

- Support for draft radon control model standards
- Radon user fee program implementation
- Economic impacts of power lines on residential property values

Project: Regulatory Impact Analysis of U.S. EPA High-Level Waste Standard (40 CFR Part 191)

Client: U.S. Environmental Protection Agency, Office of Radiation Programs, Office of Air and Radiation

JFA conducted a regulatory impact analysis (RIA) in support of the High-Level Waste Standard, 40 CFR 191. These standards apply to the disposal of spent nuclear fuel, other high-level radioactive wastes (HLW), and transuranic (TRU) waste. The focus of the RIA was on proposed revisions to 40 CFR 191. As part of this analysis, JFA developed cost-benefit analyses of the available disposal options, including the use of various media such as tuff, basalt, salt, and granite, and various engineered barriers such as alternative waste forms and container types. JFA also prepared industry profiles of affected sources, including a general description of site activities, amounts of TRU and HLW waste produced and stored, and annual capital and operating budgets. JFA supplied technical expertise in the area of cost-benefit analysis to assist in developing a technical basis for decisions regarding possible disposal alternatives.

Project: Socioeconomic Impacts of the Deep Underground Science and Engineering Laboratory (DUSEL)

Client: South Dakota Governor's Office of Economic Development

JFA examined the socioeconomic impacts of the Deep Underground Science and Engineering Laboratory (DUSEL) in South Dakota. DUSEL is schedule to be completed in 2018 and will be the deepest underground research lab in the world. Underground research labs provide scientists with a unique opportunity to perform various biology, chemistry, and physics experiments without solar interference. The National Science Foundation and the Department of Energy will investment more than \$1 billion at DUSEL in the coming years. The socioeconomic impact included an assessment of the projects economic development and infrastructure impacts in southwest South Dakota.

Project: Lake Williamstown Economic and Recreation Alternatives Analysis

Client: Grant County and Pendleton County, Kentucky

The City of Williamstown, the City of Corinth, Grant County, and Pendleton County, Kentucky were evaluating options to enhance dam safety, water supply and recreational opportunities at Lake Williamstown. The economic impacts of the associated dam construction, operation, and maintenance, as well as expected new home construction, new resident spending, and new visitor

spending at the enlarged lake are significant and have several economic impacts on the local region and national economy. JFA utilized the IMPLAN Model to produce the impact estimates.

Project: **Developing Oil Industry Labor Factors for the Alaskan Manpower Model for MMS**
Client: **U.S. Department of Interior, Minerals Management Service**

Section 18 of the Outer Continental Shelf (OCS) Lands Act (43 U.S.C. 1344) requires the U.S. Interior Department to prepare a 5-year schedule of lease sales that considers “an equitable sharing of developmental benefits and environmental risks among the various regions.” The Minerals Management Service (MMS), the administrative agency responsible for leasing submerged Federal lands, previously used a custom spreadsheet model (the Manpower Model) to estimate the direct and indirect impacts of exploration and development (E&D) activities in Alaska. This model simply converted OCS activities levels (number of wells drilled, platforms installed, pipeline miles laid, etc.) into estimates of employment using ratios such as employees per mile of pipelines laid. MMS wanted to improve the accuracy of projections of direct Alaska OCS population and secondary employment so they could develop credible and valid economics sections of the EIS's, EAs and other NEPA actions. Specifically, MMS wanted to update the Manpower Model labor factors to more accurately reflect the number of workers needed to complete tasks associated with exploration, development and production on the OCS in the Alaska Arctic. Based on its successful Artic Model MMS, JFA was awarded a follow-on project to develop a similar model for the Sub-Arctic.

Project: **Economic Impact of a Proposed Ethanol Manufacturing Industry in California**
Client: **California Energy Commission**

Jack Faucett Associates estimated the economic impacts associated with a state-subsidized ethanol production industry. Four scenarios were considered. The analysis first estimated the direct impacts, which were defined in terms of differences from the base case scenario. Direct impacts that occur over the lives of the plants include reductions in the volumes of gasoline and ethanol imported into the state, increases in feedstock collection activities, increases in expenditures on fuel distribution and trade, changes in waste disposal costs and processing activities, growth in pentane output levels, and plant operating expenditures. Short terms impacts include plant construction activities and investments in truck fleets for feedstock collection and fuel distribution. Parts of the investments were assumed to displace investments that otherwise would have occurred in the state. In all scenarios, the direct economic impacts were fed into an IMPLAN input-output model of the California economy to estimate the indirect and induced effects. Impacts were estimated for each year a plant was expected to be operating. The impacts were then compared with projected government outlays; a net present value analysis produced a set of benefit-cost ratios that could be used to evaluate different alternatives.

Project: Macroeconomic Impacts of Methanol Fuel Initiatives
Client: U.S. Environmental Protection Agency

In this study, the macroeconomic impacts of three programs designed to provide incentives for the production and use of fuel methanol in motor vehicles were estimated. OMS is interested in fuel methanol since its use as an alternative transportation fuel could provide emission benefits as compared to gasoline or diesel fuel. The initiatives included a tax on imported oil, a tax credit for the purchase of a methanol vehicle, and fuel methanol retail and wholesale price guarantees. For each of these initiatives, changes from forecasted baseline levels were projected for key macroeconomic variables (i.e., real gross national product, the consumer price index, the GNP deflator and the unemployment rate). Each initiative was analyzed independently and in combination with the other initiatives under several alternative scenarios.

Project: Effects of a Transition to a Hydrogen Economy on Employment in the U.S.
Client: U.S. Department of Energy

JFA was responsible for the development of regional and national economic models that would provide estimates of losses in employment by sector for traditional auto and gasoline producing sectors (steel, engines, transmissions, electrical equipment, refineries, etc.) and the growth in employment for sectors associated with the production of hydrogen fuel and vehicles (chemicals, compressors, electrical equipment, assembly, pressurized containers, etc.). Several potential future conditions were hypothesized and run through the models to develop employment changes. In addition, JFA authored the sections of the report that described the employment modeling process.

Project: Economic Impacts of California’s Self-Generation Incentive Program
Client: California Energy Commission

JFA performed a macro-economic analysis of California’s Self-Generation Incentive Program (SGIP) between 2001 and 2008 for the California Energy Commission (CEC). The analysis was performed to develop estimates of employment and other economic benefits associated with the SGIP. The specific effects that were estimated in this analysis are impacts associated with the installation, construction, operation, and maintenance of renewable energy infrastructure. JFA used the IMPLAN economic model to estimate economic impacts associated with program expenditures. JFA collected and used data from California utility companies such as San Diego Gas & Electric (SDG&E), Pacific Gas & Electric (PG&E), Southern California Edison (SCE), and Southern California Gas to develop the necessary IMPLAN inputs.

Project: Economic Impact of Low Carbon Fuel Standard
Client: Oregon Department of Environmental Quality

The Oregon Department of Environmental Quality (DEQ) retained JFA to provide information that will be used to inform DEQ, the public, and the Environmental Quality Commission about the potential economic effects of implementing a low carbon fuel standard in Oregon. The project included the following tasks:

- Conduct an economic analysis of the low carbon fuel standard in Oregon.
- Estimate net costs of producing petroleum fuels that are supplied to Oregon.
- Estimate net costs of producing alternative, low carbon fuels that are supplied to Oregon
- Present results to DEQ's Low Carbon Fuel Advisory Committee.
- Estimate costs of various compliance scenarios Estimate the compliance cost and potential savings for Oregon consumers, including businesses.

The 2009 Oregon Legislature authorized DEQ to develop a Low Carbon Fuel Standard (LCFS) in order to reduce greenhouse gas emissions from motor vehicles and help reduce Oregon's contribution to global climate change. A LCFS sets a performance standard for emissions from transportation fuels, without mandating the use of any specific fuel. Oregon's LCFS requires a 10 percent reduction in greenhouse gas emissions from gasoline, diesel and their substitutes by the year 2020. JFA analyzed carbon emissions attributed to a fuel throughout its lifecycle, including the fuel's production, storage, transport and use, and changes in land use associated with the fuel. JFA also looked into how biofuels such as ethanol and biodiesel, as well as alternative fuels such as hydrogen, electricity, compressed natural gas, and biogas can help Oregon meet this standard.

Project: Official State Climate Action Plans for Eight States
Client: Center for Climate Strategies

JFA developed major sections of several official state Climate Action Plans to mitigate GHG emissions. Climate Action Plans outline state strategies for mitigating greenhouse gas emissions and preparing for climate change. JFA's research focused on identifying best practices and technologies related to transportation and land use planning to reduce GHG emissions. JFA worked on Climate Action Plans for Arkansas, Colorado, Florida, Iowa, Montana, New Mexico, North Carolina, and South Carolina.

Project: Economic Impact Analysis of Transportation Infrastructure Investments
Client: Ohio Department of Transportation

JFA completed a major study of commodity flows and economic development opportunities in Ohio addressing highway, railway, airway, and waterway freight movements. The project included: 1) development of comprehensive freight movement statistics; 2) evaluation of transportation infrastructure and the need for new investments; and 3) assessment of the potential for future industrial growth resulting from transportation infrastructure investments. JFA used the IMPLAN model to estimate the employment impacts of these proposed investments.

Project: Economic Impacts of the GLTC Transit System
Client: Greater Lynchburg Transit Company (GLTC), Lynchburg, Virginia

The Greater Lynchburg Transit Company (GLTC), a publicly funded city transit service in Lynchburg, Virginia needed to market itself to local decision makers as a regional economic resource and asset. JFA was contracted to conduct a regional economic impact analysis of the operations of GLTC. The economic impact analysis was based on review of available demographic, financial, and statistical data on the Lynchburg region and GLTC's ridership. The

bulk of the data used in the development of the economic impact analysis came from three statistically valid surveys administered by JFA of GLTC stakeholders. These surveys targeted GLTC's paratransit and fixed route service riders, GLTC's employees, and regional businesses.

After completing the surveys and a review of other data on the region, JFA provided GLTC with 1) an estimate of the direct and indirect economic value of transit to regional residents, businesses, schools, medical facilities, nonprofit organizations, and municipalities; 2) a description of the direct and indirect economic value of supplies and services purchased to maintain transit operations and services; 3) a measurement of the number of jobs created directly and indirectly by transit activities; and 4) an estimate of the impacts a cessation of transit services would have due to reduced mobility and job opportunities for local residents.

Project: Economic Impacts of Low-Emission Vehicle Standards for Heavy Duty Vehicles

Client: California Air Resources Board

Jack Faucett Associates (JFA) performed an analysis of the indirect economic impacts of proposed low-emission standards for heavy-duty vehicles (HDVs) for the California Air Resources Board (ARB). This project addressed the ARB's concern that these proposed regulations could result in motor carrier operators registering new vehicles outside of California causing a potential negative impact on California's economy and frustrating efforts to reduce emissions. This assignment analyzed both the level of relocation but also involved the development of potential incentives to reduce the likelihood that HDV operators will relocate. Rules for registering HDV's are set by the International Registration Planning (IRP) which determines where HDV fleets can be registered by using a three-step test requiring an established place of business, fleet mileage accrual, and maintenance of operational records.

Past Performance: Ronald Cohen, Ph.D.

Project: Uranium Remediation in the Wonderfonteinspruit, Carletonville, South Africa

Client: Department of Water Affairs and the National Nuclear Regulators, South Africa

Dr. Cohen has worked at least one month each year in South Africa on site characterization and remediation planning for uranium contamination in the Wonderfontein catchment as well as other mining impacted sites in that country since 1999. For more than 100 years, mining operations southwest of Johannesburg have been dewatering the "Dolomites," a shallow aquifer, to maintain a dry mining environment. That water is utilized in mineral beneficiation at the mine site. The ore is not only high in gold, it also carries significant reserves of uranium. The discharged waters flow into the Wonderfontein Spruit (stream) and have deposited major masses of uranium throughout the basin. Dr. Cohen has been a member of the Remedial Action Plan (RAP) committee and has written major sections of the RAP.

Project: **Coexistence of Metals Processing and Mining with a Healthy Environment: The Use of Municipal Biosolids and Microbes to Reduce the Cost of Metal, Uranium and Acidity Removal**

Client: **U.S. Environmental Protection Agency**

This project was focused on using anaerobic bacteria to precipitate metals and radionuclides, particularly uranium, with an organic substrate of composted municipal waste. Most metals and radionuclides were reduced to below detection limits.

Project: **Treatment of Uranium from the Fair Day Uranium Mine Near Boulder, Colorado**

Client: **U.S. Department of the Interior, Bureau of Reclamation**

Uranium mining ceased at the Fair Day Mine in the late 1960s, but acid mine drainage continued to spill from the adit until the present. Dr. Cohen designed and built a series of pilot-scale anaerobic bioreactors to treat the uranium and other metals from the waste stream from the mine adit. Treatment was considered a success and was incorporated into the reclamation of the site by the U.S. Department of the Interior's Bureau of Reclamation.

Project: **Evaluation of Selenium Leaching and the Design of Phosphate Mining Waste Rock Dumps in Southeast Idaho**

Client: **U.S. Department of Agriculture, Forest Service**

Dr. Cohen is the prime technical consultant on the design and operation of waste rock dumps in the southeast Idaho region that contains the rich Phosphoria deposits of phosphate rocks. A low-grade stratum is made of the "Middle Waste Shale" and is subject to leaching of heavy metals and, particularly, selenium. Scores of livestock grazing on the dumps have suffered from selenium poisoning and many have died. The existing waste rock dumps were constructed with little consideration of the susceptibility of leaching. Dr. Cohen has examined the site and data pertaining to the site and has offered advice on designs and modifications of the waste dumps to minimize the leaching potential of selenium.

Project: **Geochemistry of Mine Drainage Generation and Metal Transport at the Mary Murphy Mine and Golf Tunnel, St. Elmo, Colorado (project combined with the biogeochemistry and optimization of a wet substrate passive mine drainage treatment system for circum-neutral waters of the Mary Murphy mine at Chalk Creek, Colorado)**

Client: **U.S. Environmental Protection Agency Headwaters Program**

Dr. Cohen and his team defined the routes of mine drainage transport over the surface and through the subsurface to Chalk Creek. Once the transport characteristics were defined, an anaerobic bioreactor was designed to treat the mine-influenced waters prior to entry into the Creek.

Past Performance: SOMA

Project: **Silica, Noise and Diesel Particulate Matter Project (Aggregates Industry)**
Client: **Martin Marietta Materials**

A project spanning several years to identify exposures, and work to reduce exposures, at a large Aggregates Mining Company. As part of this project, SOMA developed the industrial hygiene sampling strategy, collected over 12,000 air monitoring samples of a wide range of substances, and currently manages the sampling schedule, conducts the sampling throughout the year at sites located all over the United States, makes observations and records the findings during the sampling visits and maintains the data in a “client-friendly” database. Additionally, where required, recommendations are provided to mitigate the exposures at the various sites. The extensive exposure data collected is further analyzed to develop an exposure model that would determine the employees’ “day-in, day-out” exposure to the contaminant under consideration. Since they maintained limited railroad operations on their own facilities SOMA have monitored locomotive engineers, railroad switch operators, and dispatchers for noise, dust, and diesel particulate matter exposure. SOMA have also interfaced with MSHA for exposure-driven concerns and developed and managed a state-of-the- art, Mine Safety and Health Administration acceptable exposure testing program.

Project: **Analysis of the Community Dust Exposure in Fairborn, OH**
Client: **Martin Marietta Materials**

SOMA performed an analysis of the potential for silica and dust exposure, noise and vibration to the community at a new underground mine site in the Anderson Township area of Cincinnati, Ohio for an aggregates producer. This evaluation included perimeter air monitoring at a similar site operated by the same company in Indianapolis, IN, and a review of data previously collected by SOMA on behalf of the company at similar locations. The written analysis was submitted to the board of zoning appeals, as part of the zoning permit to the county, and SOMA testified at subsequent board hearings.

Project: **Characterization of the Elemental Composition and Size Distribution of Dust found in Portland Cement Manufacturing Plants**
Client: **Portland Cement Association**

This was a two part research effort. The first step involved a qualitative evaluation that included reviewing available literature, site history, data for each site and discussions with designated site personnel to understand the Portland cement manufacturing process. The second step of the evaluation included the collection of baseline data related to the design, operation and maintenance of the representative facilities and specifically included one site with wet operating methods and one site with dry methods. The initial efforts included a site visit consisting of a review of the facility layouts, raw material type and usage, engineering controls for each facility, and observations to further understand the processes and job classifications and historical industrial hygiene and particulate sampling data. The report presented the outcomes of a sampling strategy and industrial hygiene study specifically designed to characterize the

elemental composition and size distribution of dust found in Portland cement manufacturing plants.

Project: Site Dust Exposure Evaluation
Client: Shamrock Materials

SOMA performed an analysis of the potential for dust exposure to the community via a proposed expansion of the Sand and Gravel Operation operated by an aggregates producer Shamrock Materials in Trenton, Ohio. This evaluation included onsite air monitoring and soil sample analysis, and a review of data collected by SOMA on behalf of other aggregates companies at similar locations. The written analysis was submitted as part of the zoning permit to the county and SOMA testified at subsequent board hearings.

Project: Site Dust Exposure Evaluation
Client: Cemex

SOMA performed an analysis of the potential for dust exposure to the community via a proposed expansion of the mining portion of a ready-mix cement operation in Fairborn, Ohio. This evaluation included onsite inspections and soil sample analysis, and a review of data collected by SOMA on behalf of other aggregates companies at similar locations. SOMA written analysis was submitted as part of the zoning permit to the county and SOMA testified at board hearings.

Project: Surface Sampling for Arsenic
Client: FMC – Middleport, NY

An FMC Corporation (FMC) agricultural facility located in Middleport, NY previously used arsenic compounds. The study was undertaken due to public concerns regarding arsenic exposures in the Middleport community. The purpose of this study was to quantify residual arsenic on floor surfaces in residences in Middleport. The information presented by SOMA was incorporated into a larger study performed by another contractor. Outreach activities were performed by another contractor to identify residents that were willing to allow surface (dust) samples to be collected in their residences. They provided names and telephone numbers of willing residents to SOMA. After receiving the list of participants, SOMA sampled at 166 residences.

4. Proposed Study Methodology

This section highlights the JFA Team’s study goals and approach. The study goals will guide the Team’s interactions, communication, data collection efforts, economic analysis, and development of the final deliverables.

Study Goals

The JFA Team will professionally execute the contract on time and on budget in a manner that meets or exceeds the specific requirements detailed in the RFP. Specific goals of the JFA Team are to:

- Achieve seamless communication and coordination with the client and team partners
- Accurately measure the socioeconomic impacts of uranium mining in Virginia
- Establish relationships with relevant local officials, commercial entities, community organizations, and other stakeholders and get their buy-in to advance this project
- Produce simple-to-follow, yet sophisticated, sets of deliverables that clearly and powerfully communicate the socioeconomic impacts measured in the study

Study Approach

The JFA Team will divide the study effort into five phases. The first phase will be the kickoff meeting and follow on meetings with the client and relevant stakeholders to define and guide our research efforts. The second phase is the information and data collection phase. During this phase, the JFA Team will utilize primary data, interviews, and secondary sources to collect information about the socio-economic impacts expected during the operational life and post closure period of the mines until rehabilitation and remediation of existing and potential fugitive uranium is ensured. The third phase will be the development of an interim findings report. This report will summarize the findings of our Phase 2 data collection efforts. The fourth phase will be the development of qualitative and quantitative assessments of the impacts of uranium mining in Virginia. The fifth phase will be the development of a draft and final report. We encourage the Virginia Coal and Energy Commission to review and comment on the draft report. After review, the draft report will be converted into a final report for submission to the client. This phase will also include the development of a brochure and PowerPoint slide show that summarize the findings of the final report.

Phase 1 - Meetings

The kickoff meeting will be scheduled shortly after the contract award. We welcome follow-on conference call meetings with the client to discuss our progress on a biweekly basis for the duration of the project. Progress meetings can be scheduled more or less frequently if the Virginia Coal and Energy Commission prefers.

Phase 2 – Information and Data Collection

The information and data collection phase will be one of the most labor-intensive phases of the project. This phase will begin immediately after the project kick off. During this phase, the JFA Team will utilize primary data, interviews, and secondary sources to collect information about the socio-economic impacts expected during the operational life and post closure treatment of the mines. This phase will include collection of information about the following:

Economic Development

- The number of mines in Virginia could support and the timeline for when these mines may become operational
- The average number of employees per uranium mine by mine size and labor category
- The capital and operating costs of uranium mining, milling, and post closure mine treatment
- The quantity of uranium expected to be mined and milled by year
- The current and projected composition of the local economy and labor force
- The size and geography of low income, high poverty, and minority communities in the region
- Local and state tax revenues
- The current and projected state of the local real estate, construction, and tourism industry

Government Services and Regulation

- Local and state government regulation and monitoring of mining, milling, tailings management, and mine closure and aftercare
- Infrastructure and services upgrade plans and needs
- The state and condition of public schools, including funding and educational opportunities for local residents
- The state and condition of local and state contingency planning and disaster preparedness

Public Health and Environment

- The ability of medical institutions and facilities in the region to deal with the potential health care impacts of uranium mining and milling
- The environmental, recreational, and residential resources in the region that may be affected by uranium mining and milling
- Plans for worker and public health and environmental protection during the operational and post operational phases of the mining projects

Social Impacts

- Stakeholder opinion about the livability and vital of the region
- Stakeholder confidence in the government and mining industry to control adverse effects of uranium mining

- Private schools and local institutions in the region
- Quality of life issues affecting the region

Phase 3 – Initial Findings Report

In the third phase of the project, the JFA Team will develop an initial findings report on the data collected in Phase 2. The project team and the Virginia Coal and Energy Commission may use the document to develop an initially understanding of socioeconomic impacts of uranium mining in Virginia.

Phase 4 – Qualitative and Quantitative Assessment of the Impacts of Uranium Mining

In the fourth phase of the project, the JFA Team will use the data collected in Phase 2 and summarized in Phase 3 to estimate qualitative and quantitative impacts of uranium mining in Virginia. In accordance with the RFP, this phase will at minimum include the following assessments:

I. Economic Development

- A. The number and types of jobs created directly by the mining and milling operation and the associated payrolls.
- B. The number, types, and geographic locations of jobs created indirectly by the mining and milling operation in all sectors including retail and wholesale trades, the construction industry, and government.
- C. The number and types of all such jobs likely to be filled by current residents and those likely to be filled by outside workers.
- D. The number and types of jobs that might be lost due to contraction or closure of existing businesses.
- E. Revenue generated from spending and capital investment made directly and indirectly by the uranium mining and milling operation.
- F. The impact on local and state tax revenues.
- G. The impact on real estate values, land use potential, the housing market, and the construction industry, including any loss of value to those properties downstream or downwind from the mining operation.
- H. The impact on both direct and indirect employment levels and revenue generation after the cessation of active mining and milling operations.

II. Government Services and Regulation

- A. The local and state government costs for regulation and monitoring of mining, milling, tailings management, closure and aftercare, and any associated liabilities.
- B. The impact of increased use and costs for any infrastructure and services upgrade.
- C. The impact on public schools including funding and educational opportunities.
- D. The local and state government costs for contingency planning and disaster preparedness.
- E. A review of the potential costs to upstream and downstream localities resulting from the mining and milling operation.

- F. A review of the potential costs and determination of the parties responsible for remediating any potential environmental damage.
- G. A review of potential sources of funding to offset the costs identified above.

III. Public Health and Environment

- A. The costs of health care and illness due to potential negative impacts from the uranium mining and milling operation.
- B. A review of the quality of life impacts from health risks attributable to the mining and milling operation for employees and residents.
- C. The impact on quality of life from detrimental environmental consequences.
- D. The impact on natural landscapes, scenic appeal, recreation, and tourism including wildlife and hunting, fishing, boating, and places of historical interest.
- E. A review of any environmental justice impacts.
- F. A review of post-closure procedures to ensure public health and safety.

IV. Social Impacts

- A. The effects on internal and external image of the region, i.e., belief that area remains a safe place to live, work, and invest.
- B. Stakeholder confidence in the government and mining industry to control adverse effects of uranium mining.
- C. The impacts on private schools and local institutions.
- D. The impact on aesthetics and overall quality of life issues.

Economic Development Impacts

The economic development assessment requires the use of a specialized economic analysis software program. This assessment will be performed using the IMPLAN economic impact modeling tool to estimate the direct, indirect, induced, tax, and employment impacts of uranium mining in Virginia on an average annual basis during the expected period of uranium mining operations and mine post closure treatment.

JFA is very familiar with using IMPLAN. JFA has completed more than 150 studies using the software tool. JFA owns the software and the Virginia multipliers dataset.

The “direct” impact measures determined during the Phase 2 information collection efforts will be assigned to economic sectors and analyzed using the IMPLAN economic input-output modeling tool to derive “indirect” and “induced” economic impacts. The tally of direct, indirect, and induced economic impacts equal the total economic impacts of the labs.

The definition of direct, indirect, induced, and total economic impacts are provided below:

- **Direct impacts** refer to impacts from the economic activities associated with uranium mining

- **Indirect impacts** measure output (gross sales), jobs, and labor income associated with companies and organizations that support direct activities
- **Induced impacts** accrue when workers in the direct and indirect industries spend their wages on local goods and services. These expenditures in turn stimulate other sectors in the local economy
- **Total impacts** are the sum of direct, indirect, and induced impacts. These represent all transactions attributable, either directly or indirectly, to uranium mining in Virginia.

The JFA Team's analysis will produce quantified measures and impacts, including: jobs created, wages generated, state and local taxes generated, industrial output, and value added to the local economy.

Phase 4 – Report Writing

The fourth phase of the project will involve writing an initial draft of the report and various marketing materials, which we encourage the Virginia Coal and Energy Commission to review and comment on. After the draft report is reviewed and commented on, it will be converted into a final report for submission to the client. In addition to the draft and final report, the JFA Team will prepare a Microsoft PowerPoint slide show and a handout brochure summarizing the study findings. The full set of services and deliverables the JFA Team will provide are listed below.

Services and Deliverables

JFA will provide the following services and deliverables:

- Site visits to client and relevant stakeholders
- A comprehensive and simple-to-follow technical report on the economic impacts of uranium mining in Virginia
- A stand-alone executive summary report tailored to a nontechnical audience.
- A single-sheet brochure of the study's findings
- A Microsoft PowerPoint slide show and related handout sheet summarizing the study's findings

All document deliverables will be submitted in hardcopy and electronically by CD and through online file downloading links to enable easy distribution of the materials. The technical report will contain the following components:

- An executive summary
- An introduction to the report and its purpose
- A discussion of the socioeconomic impact analysis methodology
- A detailed description of the socioeconomic impacts of uranium mining in Virginia
- Summary of the report

5. Cost Proposal

JFA proposes to perform the work requested in the RFP for \$179,812. Our cost proposal breakdown is provided on the next page.

Exhibit 3: Cost Proposal

Cost Categories	Organization	Rate	Task 1		Task 2		Task 3		Task 4		Task 5		Grand Total (All tasks)	
			Kickoff and Other Client Meetings		Information & Data Collection		Development of Interim Deliverables		Qualitative and Quantitative Analysis		Development of Final Deliverables		Hours	Amount
			Hours	Amount	Hours	Amount	Hours	Amount			Hours	Amount		
Direct Labor Classification(s):														
Michael Lawrence	JFA	\$70	15	\$1,050	30	\$2,100	16	\$1,120	30	\$2,100	30	\$2,100	91	\$6,370
Jonathan Skolnik	JFA	\$62	20	\$1,240	80	\$4,960	80	\$4,960	45	\$2,790	60	\$3,720	240	\$14,880
Harry Chmelynski	JFA	\$28	8	\$223	20	\$557	22	\$613	30	\$836	20	\$557	70	\$1,950
Rami Chami	JFA	\$28	35	\$980	220	\$6,160	100	\$2,800	50	\$1,400	250	\$7,000	605	\$16,940
Ronald Cohen	Colorado School of Mines	\$140	10	\$1,400	40	\$5,600	40	\$5,600	40	\$5,600	40	\$5,600	130	\$18,200
Howard Sandler	SOMA	\$250	8	\$2,000	15	\$3,750	15	\$3,750	15	\$3,750	15	\$3,750	53	\$13,250
Dennis Ertel	SOMA	\$160	8	\$1,280	15	\$2,400	15	\$2,400	15	\$2,400	15	\$2,400	53	\$8,480
Anish Rapuria	SOMA	\$160	8	\$1,280	15	\$2,400	15	\$2,400	15	\$2,400	15	\$2,400	53	\$8,480
Pamela Burda	SOMA	\$110	8	\$880	10	\$1,100	11	\$1,210	11	\$1,210	12	\$1,320	41	\$4,510
Subtotal: Direct Labor JFA Only			78	\$3,493	350	\$13,777	218	\$9,493	155	\$7,126	360	\$13,377	1,006	\$40,140
Subtotal: Direct Labor			120	\$10,333	445	\$29,027	314	\$24,853	251	\$22,486	457	\$28,847	1,336	\$93,060
Overhead:		130%		\$4,541		\$17,910		\$12,341		\$9,264		\$17,390		\$52,182
Labor Subtotal: Direct Labor and Overhead:				\$14,874		\$46,938		\$37,194		\$31,749		\$46,238		\$145,242
Additional Costs:														
Travel to Client Site				\$0		\$1,000		\$0		\$0		\$0		\$1,000
Per-Diem		\$121		\$0		\$968								\$304
Total additional Costs:				\$0		\$1,968		\$0				\$0		\$1,304
Computer Costs		\$0.75	78	\$59	350	\$263	218	\$164	155	\$116	360	\$270	1,006	\$755
Subtotal: Labor, Overhead & Costs				\$14,932		\$49,168		\$37,357		\$31,866		\$46,508		\$148,605
General and Administrative:		10%		\$1,493		\$4,917		\$3,736		\$3,187		\$4,651		\$14,860
(applied to all above costs)														
Subtotal: Labor, Overhead, Costs & G&A				\$16,425		\$54,085		\$41,093		\$35,052		\$51,158		\$163,465
Fixed Fee:		10%		\$1,643		\$5,408		\$4,109		\$3,505		\$5,116		\$16,347
Grand Total:				18,068		\$59,493		\$45,202		\$38,557		\$56,274		\$179,812

6. Schedule

The JFA Team proposes to complete the project following the schedule illustrated below. The JFA Team will submit an interim report of our findings from the information and data collection phase (Phase 2) in the first week of July 2011. A draft report with our final findings and draft information dissemination materials including a PowerPoint slide show and a brochure will be submitted to the client in the first week of November 2011. After feedback from on the draft report and marketing materials, the final deliverables will be submitted to the client in the third week of November 2011.

Exhibit 4: Proposed Schedule

Month	1	2	3	4	5	6	7	8	9	10
Task 1: Kick-Off Meeting	■									
Task 2: Info & Data Collection	■	■	■	■	■					
Task 3: Interim Deliverables Development					■	■				
Task 4: Qualitative & Quantitative Assessments					■	■	■	■	■	■
Task 5: Final Deliverables Development										■
Progress Reports		■		■		■		■		■
Conference call with Client	■	■	■	■	■	■	■	■	■	■

- JFA Team Work
- Deliverable Submission
- Client Participation / Review

7. References

The JFA Team is proud of its past performance and encourages reviewers to contact our references to learn more about the quality of work, professionalism, and commitment with which we have served past clients. Our references are provided below:

JFA

Donald Jones, Ph.D.

Vice President and Senior Economist
RCF Economic & Financial Consulting, Inc.
333 North Michigan Ave
Suite 804
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Ronald Cohen, Ph.D.

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SOMA

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Brahm & Cunningham, LLC
145 East Rich Street, Suite 400
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8. Resumes

A list with brief descriptions of all the individual members of the JFA Team is provided below. Resumes of the Team's members are provided afterward. The highly-skilled team presented here was selected to fulfill the skill sets needed to undertake each task area identified in the RFQ. The JFA Team offers the breadth, depth, and proven experience needed to support the Virginia Coal and Energy Commission in this project effort.

JFA

Michael Lawrence is the President of JFA and chief economist at the firm. He is a frequently sought expert on socioeconomic impact analysis for programs and projects. He will serve as Project Director.

Jonathan Skolnik is the Vice President of JFA and a senior economist.

Harry Chmelynski, Ph.D., is an applied statistician, programmer, and modeler.

Rami Chami is a Policy Analyst and a specialist in economic impact analysis.

Independent Consultant

Ronald Cohen, Ph.D., is an Associate Professor of Environment Sciences and Engineering at the Colorado School of Mines and a consultant engaged in uranium mining environmental impact mitigation.

SOMA

Howard Sandler, MD, is the President of SOMA and a senior public health specialist. He formerly served as a Medical Officer with the National Institute for Occupational Safety and Health (NIOSH).

Dennis Ertel is the Director of SOMA's Industrial Hygiene and Toxicology Division and a Certified Industrial Hygienist.

Anish Ranpuria is a Certified Industrial Hygienist. He serves on the Safety Committee of the Industrial Minerals Association and on the American Industrial Hygiene Association's Occupational and Environmental Medicine Committee.

Pamela Burda is a Certified Health Physicist with a master's degree in nuclear engineering from the University of Arizona.

Michael Lawrence – President / Senior Economist, JFA

Years of Relevant Experience:

35

Education

M.B.A., Finance/Applied Economics, 1975, University of California – Berkeley

B.A., Economics, 1973, University of California – Berkeley

Areas of Relevant Experience

Regulatory Analysis

Economic Impact Analysis

Energy Policy

Labor Economics

Mr. Lawrence has directed Jack Faucett Associates' policy analysis efforts for various federal agencies for more than 20 years. He is a frequently sought expert on socioeconomic impact analysis. He has directed over 100 projects designed to estimate the economic impact and employment effects of government investments. These projects have focused on mining, transportation, energy, flood control, and environmental issues.

Relevant Project Experience

Costs and Benefits Analysis of Proposed Radionuclide Emission Standards. Examined radionuclide emission standards for uranium mill tailings impoundments and elemental phosphorus plants. Prepared parts of the Regulatory Impact Analysis for Clean Air Act standards for radionuclides, applying present-value techniques to compare the levelized costs and benefits of alternative proposed control technologies for EPA's Office of Radiation Programs.

Nuclear Waste Disposal Uncertainty Analysis. Provided support to the EPA in quantifying the uncertainties surrounding long-range risk projections for the Yucca Mountain nuclear waste disposal facility. Containment performance profiles over a 1,000,000-year time periods are considered in the license application procedure.

Economic Impacts of Transportation Infrastructure Investments on Rural Economies. Directed a study of the economic development impacts of interstate highway investments on rural economies in nine states including land values, business development, job creation, local and state tax receipts and regional economic growth – for the Federal Highway Administration, USDOT.

Economic Impacts of Multi-Modal Infrastructure Investments. Directed analysis of alternative multi-modal facilities (rail, highway, water) located on the Ohio River in West Virginia, considered alternatives sites, conducted industry surveys and case studies, conducted industry studies and prepared preliminary designs for three separate facilities and estimated the economic impacts with the IMPLAN I-O Model—Corps of Engineers and West Virginia DOT.

Benefit Cost and Employment Analysis of Vessel Traffic Systems. Directed an analysis of the potential costs and benefits of vessel traffic systems (VTS) for 23 major U.S. ports. Analyses included development of data system, risk model, casualty analysis, safety impacts, environmental damage, recreational losses and other information – for Volpe National Transportation System Center and the U.S. Coast Guard.

Highway Cost Allocation. Directed the development of a highway user cost allocation study for the state of Oregon. Directed a study assessing the fairness of highway user taxes with respect to the cost responsibility of different vehicle classes. Included coordination of an advisory committee and an analysis of an alternative model of true social cost pricing – for the Oregon Department of Administrative Services.

Jonathan Skolnik – Vice President / Economist, JFA

Years of Relevant Experience:

30

Education

B.A., Economics/Political Science, 1978, University of Wisconsin - Madison
M.P.P., Master of Public Policy, 1992, Georgetown University

Professional Affiliations and Awards:

Member of TRB Transportation Economics Committee National Academy of Sciences
Honored member, Strathmore's Who's Who Millennium Edition 2000-2001

Areas of Relevant Experience

Input-Output Modeling
Energy Economics
Data Development

Mr. Skolnik, the Vice President of JFA, is an economic policy analyst with 30 years of specialized experience in the development of economic data and models used in federal policy analysis.

Relevant Project Experience

Nuclear Waste Disposal Uncertainty Analysis. Provided support to the EPA in quantifying the uncertainties surrounding long-range risk projections for the Yucca Mountain nuclear waste disposal facility. Containment performance profiles over a 1,000,000-year time periods are considered in the license application procedure.

Employment Benefits of a Hydrogen Economy. Directed the development of an employment analysis tool to estimate the positive and negative employment impacts of a Hydrogen Economy by 2050. Model combined the IMPLAN and REMI models to measure the change in employment for a hydrogen verses a petroleum economy for the US DOE.

California Electrical Power Self-Generation Incentive Program. Developed benefits and costs estimates for the California Electrical Commission's Self-Generation Incentive Program. The program's objective is to encourage electrical energy self-generation among businesses so they generate their own energy supply and sell excess energy production to state utility companies.

I-81 Rail Highway Freight Mode and Toll Shift Study. Reviewed existing freight models (Mode, route and demand) and developed a new freight modeling system to evaluate the impacts of alternative transportation infrastructure investments and highway tolling strategies. Developed forecasts of rail divergence. Data were developed using input-output models and model results - For the Virginia Department of Transportation and VHB, Inc

Sub-Arctic Impact Model for Petroleum in Alaska (Sub-Arctic IMPAK). The model is an input vector I-O model designed to develop first order economic impacts. These impacts are then used in conjunction with IMPLAN multipliers to estimate the local and region impact of offshore oil and gas development in the sub-arctic areas of Alaska - for the U.S. Department of Interior, Minerals Management Service.

Employment and the Airline Industry. Analyzed the nature and competitive effects of post deregulation employment and labor trends in the airline industry – for the Office of the Secretary, U.S. Department of Transportation.

Harry Chmelynski, Senior Statistician, Ph.D., JFA

Years of Relevant Experience:

28

Education

Ph.D. Statistics, Carnegie Mellon University, 1982

M.S. Statistics, Carnegie Mellon University, 1978

M.A. Physics, University of California at Berkeley, 1972

B.S. Physics/Chemistry, Rensselaer Polytechnic Institute, 1967

Areas of Relevant Experience

Input-Output Modeling
Statistical Analysis

Dr. Chmelynski is a statistical analyst with extensive experience working with energy, economic, and environmental data. He has been involved with nuclear waste disposal uncertainty analysis and nuclear waste health impact analysis.

Relevant Project Experience

Nuclear Waste Disposal Uncertainty Analysis. Provided support to the EPA in quantifying the uncertainties surrounding long-range risk projections for the Yucca Mountain nuclear waste disposal facility. Containment performance profiles over a 1,000,000-year time periods are considered in the license application procedure.

Nuclear Waste Health Impacts. Supported the Nuclear Regulatory Commission in modeling the probable health impacts of proposed release standards for recycling and reuse of clean waste metals recovered from decommissioned nuclear power facilities.

Costs and Benefits Analysis of Proposed Radionuclide Emission Standards. Examined radionuclide emission standards for uranium mill tailings impoundments and elemental phosphorus plants. Prepared parts of the Regulatory Impact Analysis for Clean Air Act standards for radionuclides, applying

present-value techniques to compare the levelized costs and benefits of alternative proposed control technologies for EPA's Office of Radiation Programs.

Sub-Arctic Impact Model for Petroleum in Alaska (Sub-Arctic IMPAK). Developed model that is an input vector I-O model designed to measure first order economic impacts. These impacts are then used in conjunction with IMPLAN multipliers to estimate the local and region impact of offshore oil and gas development in the sub-arctic areas of Alaska - for the U.S. Department of Interior, Minerals Management Service.

Cost - Benefit Analyses Radioactive Waste Treatment Regulation. Performed analysis on two regulations for Low Level Waste disposal facilities proposed by the Nuclear Regulatory Commission and the Environmental Protection Agency. Costs and health benefits of a variety of proposed disposal technologies and institutional requirements were examined.

Williamstown Lake Dam Cost-Benefit Analysis. Performed cost-benefit analysis on 32 construction project alternatives for a dam at Williamstown Lake in Grant County, KY. The analysis involved using engineering estimates for the costs of dam construction and operation over a 50 year time period. The report will be used by our client to seek support for the project from the U.S. Army Corps of Engineers.

Rami Chami, Research Analyst, JFA

Years of Relevant Experience:

4

Education

Master of Public Administration,
2007, Cornell University

B.A., 2005, Economics, Indiana
University

Areas of Relevant Experience

Input-Output Modeling
Socio-Economic Analysis
Statistics

Rami Chami is a Research Analyst at JFA. Chami is a specialist in socio-economic and quantitative analysis. His most recent assignments include: analyzing greenhouse gas emission strategies all 50 U.S. States; performing a cost-benefit analysis of a dam construction project at Williamstown Lake, Kentucky; measuring the economic impact of truck weight limits on New York City bridges; and developing an online database for intermodal connectors in the National Highway System for the Federal Highway Administration.

Relevant Project Experience

Socioeconomic Impacts of the Deep Underground Science and Engineering Laboratory (DUSEL). Examined the regional socioeconomic impacts the development of the deepest underground research lab in the world would have on southwestern South Dakota.

Economic Impacts of Greenhouse Gas Reduction Policies. Analyzed the benefits and costs of transportation efficiency improvement programs for the freight and transit sectors for all 50 U.S. States. Used state transportation energy consumption forecasts and Energy Information Administration data to synchronize baseline state vehicle fleet and vehicle miles traveled forecasts with greenhouse gas emissions forecasts.

California Electrical Power Self-Generation Incentive Program. Developed benefits and costs estimates for the California Electrical Commission’s electrical energy self-generation incentive program for businesses to generate their own energy supply and sell excess energy production to state utility companies.

Williamstown Lake Dam Cost-Benefit Analysis. Performed cost-benefit analysis on 32 construction project alternatives for a dam at Williamstown Lake in Grant County, KY. The analysis involved using engineering estimates for the costs of dam construction and operation over a 50 year time period. The report will be used by our client to seek support for the project from the U.S. Army Corps of Engineers.

Economic Benefit Impact Analysis of an Inland Port in Charleston, WV. Performed a cost-benefit analysis on two scenarios for an inland port in Charleston, WV. The two scenarios considered the economic and financial impacts of different development options for two sites on the Kanawha River, a major tributary of the Mississippi River.

RONALD COHEN, PH.D.
Senior Environmental Engineer



Associate Professor

Colorado School of Mines
Division of Environmental Sciences and Engineering
303-273-3613 Fax: 273-3413

EDUCATION

TEMPLE UNIVERSITY, Philadelphia, PA, B.A. in Biophysics, 1971
UNIVERSITY OF VIRGINIA, Charlottesville, VA, Ph.D. in Environmental Sciences and Engineering; Water Quality, May 1979

BACKGROUND SUMMARY

- Shared in the 1991 **First Prize** for Environmental Projects from the American Consulting Engineers Council for development of treatment systems for pyritic material induced acid mine drainage.
- Recipient of a **Certificate of Special Recognition from the U.S. Congress** for environmental work associated with transport and fate of organic chemicals and radionuclides at the Dept. of Energy Nuclear Weapons Plants.
- Selected to review the National Five Year Plan for Environmental Remediation of the Weapons Plants.
- Twice received the **Outstanding Professor of the Year** award from Minority Engineering Program.
- Received graduating class **Outstanding Professor of the Year award for the 1996 through May 2009 academic years**, both from undergraduate and graduate students.
- Extensive research and work on mitigating uranium contamination from uranium mining operations, both from the past and present.
- Appointment as visiting professor of mining engineering, University of the Witwatersrand, Johannesburg, South Africa.
- Contracted by the National Nuclear Regulator (NNR) of South African Government to characterize and evaluate uranium and daughter product contamination in the gold mining regions of the Far West Rand and recommend remediation strategies for the mitigation of the contamination (2007, 2008, and 2009).
- Short courses taught at U. of the Witwatersrand, Johannesburg: Radiation, Mining and Environment; Metals, Mining Environment.
- Demonstrated use of methods to immobilize uranium from soil and water using sulphate reducing bacteria and reducing conditions.
- Technical advisor for national committee on the mitigation of uranium pollution from mill tailings at sites in Colorado and Utah.
- Successfully developed and designed treatment systems and reclamation procedures for mine impacted waters in West Africa, South Africa, United States, and Brazil.
- Advised Tennessee Departments of Transportation and Environment on managing pyritic materials during road construction, 2006-7.

- Evaluated passivation technologies for minimizing leaching of contaminants, for U.S. governmental agency, 2007.
- For over a decade, worked on research, teaching and consulting projects on transport, fate and remediation of metals and acid from mining operations. The sites include: Eagle Mine, CO; several Leadville, CO sites including Yak Tunnel, California Gulch, Asarco properties; Idarado and Red Cliff Mines, Telluride, CO; Black Cloud Mine, CO; Blackbird Mine, Idaho; Berkeley Pit, Montana; Penn Mine, CA; Leviathan Mine, CA; Iron Mountain, CA; gold mining pits in Nevada; mines in British Columbia, Canada.; Western Deeps, South Africa; Morila Gold Mine, AngloGold, Mali; Yatela Gold Mine, AngloGold, Mali; Sadiola Gold Mine, AngloGold, Mali.
- Worked on arsenic transport, remediation and treatment in Nepal, December 2003.
- Performed Mine-Environmental and Water Audits at three mines in Mali, West Africa, for the International Financial Corporation, World Bank, and AngloGold in July 2002, 2003.
- Presented workshop on transport and fate of tailings and biological treatment of mine wastes in New Delhi, India, February 2003.
- Mining and metals expertise and advice has been requested and utilized by the Republic of South Africa; State of Colorado; advisor to State of California for remediation of mine sites; Newmont Mining Corp., Amax (now Cyprus-Amax); Arco; Paramount Communications; the lead-acid battery recycling association; the Galvanizing industry association; US EPA; National Park Service; US Bureau of Reclamation; US Bureau of Land Management; the Russian Gold Association; several Republics of the former Soviet Union; Brazil; Chile; Venezuela; the United Kingdom and many others.
- Offered several well-received short courses on Mining and the Environment in Africa and India. Worked on transport and fate of contaminants associated with oil and gas production in the Upper Colorado River Basin.
- Successfully developed and designed treatment systems and reclamation procedures for produced waters from petroleum operations – BTEX, phenolics, radium, H₂S.
- Reviewer for the National Research Council and the MacArthur Foundation. He has many tens of publications in Journals such as Water Resources Research; Water, Environment and Technology; Journal of the American Society of Civil Engineers; Limnology and Oceanography; Journal of Environmental Quality and others.
- Has worked in the Great Lakes; Charlotte Harbor, Florida; Chesapeake Bay; San Francisco Bay; Potomac River; Clear Creek, Eagle River, Colorado.
- Teaches courses on Mining, Sustainability and Environment, Water Quality, Mathematical Modeling of Contaminant Transport and Fate, and Hydrology.

FUNDING RELATED TO METALS IN THE ENVIRONMENT

- The Impact of the Asiatic Clam (*Corbicula fluminea*) on Metals Cycling in Southwest American Streams. CSM Proposal 9565. U.S. Fish and Wildlife Service, Asst. Regional Director, Fisheries, Region 6, Invasive Species Program. Approved, funded February 2010.
- Coexistence of Metals Processing and Mining with a healthy environment: The use of municipal biosolids and microbes to reduce the cost of metal and acidity removal. CSM Proposal #5359; 16 months, \$97,636 EPA.

- Competition between sulfate reducing bacteria and methanogens in anaerobic packed tower bioreactors. Project #4-41695. EPA. \$52,631. Awarded on 10/1/96 for period 1/2/97 to 5/7/98.
- Competition between sulfate reducing bacteria and methanogens in anaerobic packed tower bioreactors. EPA. \$52,631. Awarded 10/1/96 to 5/7/98.
- Chalk Creek: Continuation of research on the geochemistry of mine drainage and the applicability of in-adit treatment of mine drainage from the circum-neutral waters of the Mary Murphy Mine at Chalk Creek, CO. EPA. \$51,500. Renewal to 12/31/96.
- Biogeochemistry and optimization of a wet substrate passive mine drainage treatment system for circum-neutral waters of the Mary Murphy mine, CO; EPA Headwaters Program. 1995. \$78,613

SELECTED PUBLICATIONS

- Darling, P. and R.R.H.Cohen. 2010. Co-Editor of SME (Society for Mining, Metallurgy and Exploration) Mining Handbook. Considered by many to be the ultimate mining handbook (used as THE textbook in almost every North American mining school, polytechnic, academy and university, as well as the underground text book in many engineering establishments).
- Mohan B. Dangi; *Ronald R. H. Cohen; Michael A. Urynowicz; Khem N. Poudyal. 2008. Searching for a Way to Sustainability - Technical and Policy Analyses for Solid Waste Issues in Kathmandu. Waste Management and Research. Manuscript No. 1282-1
- Ronald R.H. Cohen (2006) "Use of microbes for cost reduction of metal removal from metals and mining industry waste streams", *Journal of Cleaner Production*, 14(12-13): 1146-1157
- S. Willscher, T.R. Clark R.H. Cohen. 2005 "Biogeochemical Studies of the Environmental Impacts of Mining on Ground and Surface Waters", in "Biogeochemical Studies about the Environmental Impacts of Mining on Ground and Surface Waters" in the Journal of Geochemical Exploration, Elsevier Sciences.
- Willow, M. and R.R.H.Cohen. 2003. pH & D.O. control treatment Efficiency in wet substrate Bioreactor dominated by Sulfate Reducing Bacteria, July-August 2003, J. Envir. Quality
- Biogeochemistry of Arsenic and Chromium in a Wet Substrate Anaerobic Bioreactor Using Anaerobic Bioreactor Using Bacterial Sulfate Reduction, submitted accepted December 2002, J. Envir. Quality
- Cohen, R.R.H., 1999. Conjunction of geochemical modeling and pilot scale experiments for testing bioreactor removal of chromium and Arsenic, BioY2K, for year 2000 meeting, Grahamstown, South Africa.
- Final project report to EPA Region VIII concerning progress for the project "Coexistence of metals processing and mining with a healthy environment: Use of municipal biosolids and microbes to reduce the cost of metal and acidity removal from metal processing and mining industry waste streams and soils".
- Santos, M.C.F.V., Zieman, J.C. and Cohen, R.R.H. 1997. Interpreting the Upper Mid-littoral zonation patterns of Mangroves in Maranhao (Brazil) in response to microtopography and hydrology. In Mangrove Ecosystem Studies in Latin America and Africa, ed. by Kjerfve, et al. UNESCO, International Society for Mangrove Ecosystems, U.S. Forest Service.

- Cohen, R.R. 1996. Water quality and transport of metal salts in surface and groundwater. Invited Keynote Address for the TMS Minerals, Metals and Materials Society, International Symposium, Scottsdale, Arizona.
- Cohen, R.R. 1996. Invited Paper, Handbook of Mechanical Engineering, Advances in Environmental Engineering and Water Quality, F. Kreith, ed.
- Cohen, R.R. 1995. Developments in environmental engineering- water quality and transport. Spring 1995; Engineering Horizons.
- Lanphear, M., Cohen, R.R. and Klusman, R.W. 1995. Characterization of mine drainage sources in the Chalk Creek District, Colorado. Proceedings American Society for Surface Mining and Reclamation.
- Cohen, R.R.H. and Staub, M.W. 1992. Technical manual for the design and operation of a Passive Mine Drainage Treatment System. Publication of the U.S. Bureau of Reclamation.
- Cohen, R.R.H. and John Gorman. 1991. Nonpoint source pollution as a result of mining related land uses. Water, Environment and Technology, June, volume 3, no. 6, pp 55-59.
- Cohen, R.R.H. 1989. Mineral resources extraction, environmental protection and land use planning in the industrial and developing countries -- a review. Resources Policy, 15: 188-189.

COURSES DEVELOPED AND TAUGHT

- Mining, Sustainability, and the Environment
- Characteristics, Fate, and Transport of Contaminants in the Environment
- Hazardous Waste Training Program
- Industrial Water Quality
- Water Quality and Water Treatment
- Water Quality Theory and Modeling
- Environmental Sciences and Engineering
- Field Practices in Applied Hydrology
- Environmental Chemistry

SERVICE

Regional, National and International Committees

EPA Session Chair: Workshop Committee on advances in biological treatment of mine wastes, Nonpoint source committee, Colorado, Reviewer for EPA on national projects for mine drainage treatment, Colorado Council on Rocky Flats, Reviewer for the Passive Treatment System: Vryheid Coronation Colliery, Kwa-Zulu-Natal, South Africa; Appointed as a reviewer to PIRAMID, a European (center in the U.K.), passive AMD treatment consortium, External Reviewer for another project ("Environmental Regulation of Mine Waters in the EU" (ERMITE)) which is being submitted to the European Commission on 15-2-2000.

Societies and Institutes

Water Environment Federation, Water Pollution Control Federation Foundation, Nonpoint Source Committee, American Chemical Society, American Geophysical Union, Universities Council on Water Resources, New York Academy of Science, American Society of Limnology and Oceanography, American Association for the Advancement of Science, Society of the Sigma Xi, Institute for Groundwater Research and Education, Colorado School of Mines.



Howard Sandler, M.D. **Senior Public Health Specialist**

Howard Sandler, MD, has a long and distinguished career in regulation, health care delivery systems, research and problem solving in occupational and environmental health. Dr. Sandler founded Sandler Occupational Medicine Associates, Inc. (SOMA) as a response to business', labor's and government's need for quality, service-oriented approaches to address the many scientific, programmatic and regulatory issues across a broad range of problems in occupational and environmental health. Dr. Sandler has served as a Medical Officer with the National Institute for Occupational Safety and Health (NIOSH). He has also consulted extensively with the EPA, OSHA, NIOSH and the Consumer Products Safety Commission, as well as state and local governmental agencies.

EDUCATION AND TRAINING:

M.D., University of Maryland, School of Medicine, Baltimore, Maryland, 1977

B.S. (cum laude), University of Maryland, College Park, Maryland, 1973

EXPERIENCE:

1983 - Present	President Sandler Occupational Medicine Associates, Inc. Melville, NY
1982 - 1983	Vice President Corporate Medical Health Director Occupational Health Services, Inc. New York, NY
1981 - 1982	Corporate Medical Director Executive Vice President Industrial Health and Hygiene Group McLean, VA
1981	Medical Officer Office of Extramural Coordination and Special Projects National Institute for Occupational Safety and Health Rockville, MD
1980 - 1981	Medical Officer

Office of Program Planning and Evaluation
National Institute for Occupational Safety and Health
Rockville, MD

1979 - 1980 Consulting Occupational Physician
JRB Associates, Inc.
McLean, VA

1978 - 1979 Consulting Occupational Physician
Equitable Environmental Health, Inc.
Rockville, MD

1973 - 1975 Research Assistant/Medical School
Heart, Lung and Blood Institute
National Institute of Health
Bethesda, MD

CERTIFICATION/LICENSURE:

Licensed Medical Practitioner, State of Maryland, 1978 - Present

PROFESSIONAL SOCIETIES AND MEMBERSHIPS (Past and Present):

Safety Executives of New York

Co-Chairman - Committee on Medical Standards: Disability and Fitness-for-Duty Section,
American College of Occupational and Environmental Medicine

Co-Chairman - Committee on Developing a Generic Consensus Medical Surveillance &
Monitoring Standard, American Society for Testing Materials

American College of Occupational and Environmental Medicine

American Medical Association

Society for Occupational and Environmental Health

American Industrial Hygiene Association

Medical and Chirurgical Faculty of the State of Maryland

Prince George's Medical Society

Hazardous Material and Waste Management (past contributing editor)

Occupational Hazards Magazine (contributing editor)

Workers' Compensation Cost Control (editorial board)

Society for Chemical Hazard Communication

HONORS/AWARDS:

Phi Beta Kappa

Phi Sigma

Phi Beta Sigma

TEACHING/LECTURES/APPOINTMENTS/TESTIMONIES:

Pennsylvania Association of Occupational Health Nurses Conference – Invited Presenter
FMLA Update: Practical Medical Approaches to Intermittent Leave
December 4, 2008

American Society of Safety Engineers Region IV Central Florida – Invited Presenter
New Millennium Challenges for Occupational Respiratory Exposures/Disorders
Are Medical Examinations Worth Doing?
October 6, 2008

American Bakers Association – Invited Presenter
Medical Examinations and the Workplace: When are they Legal, Medically-Correct and Worth
While for the Company and the Workers?
July 22, 2008

National Council of Self Insurers – Invited Presenter
Are Medical Examinations Worth Doing?
June 3, 2008

American Association of Occupational Health Nurses – Webcast – Invited Presenter
FMLA Update: Practical Approaches to Intermittent Leave
March 5, 2008

Organization Resource Council – Invited Presenter
Breathless in the Workplace: New Millennium Changes for Occupational Respiratory Disorders
February 7, 2008

Invited Presenter at Medical Certification and Verification Process with FMLA: A
Discussion with Stakeholders US DOL, Employment Standards Administration, Washington,
DC, September 2007

George Washington University School of Public Health – Invited Lecturer
Silica Exposure and Health Effects, March 2007

Franklin Square Hospital, Grand Rounds – Department of Gastroenterology
Occupational Medical Aspects of Gastroenterology, August 2003

American Industrial Hygiene Association
Indoor Environmental Quality Task Force, November 2002 – Present

American Industrial Hygiene Association/American Society of Safety Engineers
Professional Development Course
Musculoskeletal Disorders, March 2000

American Industrial Hygiene Association/American Society of Safety Engineers
Professional Development Course
Causation Determination in Occupational Health, November 1999

Program of Ergonomics and Biomechanics, New York University
Occupational and Industrial Orthopaedic Center
Hospital for Joint Diseases Orthopaedic Institute
Seminar – Occupational Health and Managed Care, May 1999

National Occupational Research Agenda Meeting
National Institute for Occupational Safety and Health
Work-Related Musculoskeletal Disorders, Invited Participant, Spring, 1999

American Industrial Hygiene Association/American Society of Safety Engineers
Professional Development Course
Musculoskeletal Disorders, February 1999

Epidemiology of Physical Factors
Invited Participant and Presenter for the Workshop on Work-Related Musculoskeletal Injuries:
Examining the Research Base
National Research Council/National Academy of Sciences, August 1998

Occupational Medicine Residency Program
Occupational Health Division
Environmental and Occupational Health Sciences Institute
University of Medicine and Dentistry of New Jersey
Seminar Series – Causation Determination, March 1998

Northeastern Industrial Hygiene Conference
Professional Development Course
Reproductive Hazards in the Workplace, October 1996

Occupational Medicine Section, Fundamental Aspects of Industrial Hygiene - Introductory Course of the American Industrial Hygiene Association, 1980's

Testimony before the California Legislative Assembly Insurance Committee Informational Hearing: "Water Damage Claims and Mold: Impact on Consumers and the Insurance Industry" – February 2003

Testimony before the Oversight and Investigation Subcommittee Community Opportunity Subcommittee of the One Hundred Seventh U.S. Congress, House of Representatives, Committee on Financial Services:

"Mold: A Growing Problem" – July 2002

Testimony before the New York State Senate Standing Committees on Environmental Conservation and Health: "Is Toxic Mold the Next Asbestos?" – May 2002

Testimony before the Subcommittee on Workforce Protections of the Committee on Education and the Workforce House of Representatives. One Hundred Fifth Congress: "Work-Related Musculoskeletal Disorders Medical and Ergonomic State of the Art" – May 1997

Testimony before the House Subcommittee on National Economic Growth, Natural Resources and Regulatory Affairs: "OSHA's Ergonomics Regulatory Efforts" – July 1995

PUBLISHED AND SUBMITTED ARTICLES AND REPORTS:

Sandler, H.M. "With New Effort, Employers Can Get Through Challenging FMLA Issues" Family and Medical Leave Handbook, Thompson Publishing Group, January 2008

Sandler, H.M. "Occupational Safety and Human Factors" in Environmental and Occupational Medicine, 2007

4th Edition Rom W.M. (ed).

Sandler, H.M. "Complex Regional Pain Syndrome" Journal of Controversial Medical Claims, August 2003, Volume 10, Number 3

Sandler, H.M. "Medical Management of MSDs is Necessary" Occupational Hazards Magazine, April 2001

Sandler, H.M. "Managing the Latest Sick Building Claim: Mold and Microbiologics at Work" The Journal of Workers Compensation, Winter 2001

Sandler, H.M. "Regulating Allergies in the Workplace" Occupational Hazards Magazine, October 2000

Sandler, H.M. “Redefining Exposure for the Occupational Health Care Professional” Occupational Hazards Website, August 2000

Sandler, H.M. “Is It the Little Things? Microbiotics in the Workplace” Occupational Hazards Magazine, May 2000

Sandler, H.M. “Alternative Medicine and the Workplace” Occupational Hazards Website, March 2000

Sandler, H.M. and Blume, R.S. “Analysis of the Scientific Approach in Assessing Epidemiological Evidence for the Relationship Between Work and Musculoskeletal Disorders” Work-Related Musculoskeletal Disorders: Report, Workshop Summary, and Workshop Papers National Academy Press Washington, DC 1999

Sandler, H.M. “Medical Mismanagement: Should OSHA Dictate How to Practice Occupational Health?” Occupational Hazards Magazine, November 1999

Sandler, H.M. “The Internet: Opportunities for Truly Managed Occupational Health” Journal of Worker’s Compensation, Fall 1999

Sandler, H.M. “Medical Management of Occupational Disease” Occupational Hazards Magazine, April 1999

Sandler, H.M. “Evaluating the Science of Ergonomics” Occupational Hazards Magazine, November 1998

Sandler, H.M. “Occupational Causation: Did My Job Make Me Sick?” Occupational Hazards Magazine, September 1998



Dennis Ertel, CIH, CSP, REM
Senior Industrial Hygienist

Dennis Ertel, CIH, REM, CSP, was appointed the Chief Operating Officer of Sandler Occupational Medicine Associates (SOMA) in June 2006. Prior to that assignment, he was the Director of SOMA's Industrial Hygiene and Toxicology Division, since August 2000. Mr. Ertel is a Certified Industrial Hygienist with over 20 years experience in evaluating and controlling a wide range of health hazards in the workplace. Mr. Ertel operates from SOMA's Washington DC Area office and manages industrial hygiene projects and programs, performs training, research, and general consultation for environmental, health and safety issues.

EDUCATION AND TRAINING:

Master of Public Health, Environmental and Occupational Health track, George Washington University, Washington DC, final project on hold.

All required coursework complete. Final project underway. Coursework Includes: Toxicology, Epidemiology, Biostatistics, Biological Monitoring, Risk Assessment, Risk Communications, Environmental and Occupational Health Policy and Public Health Leadership.

Graduate (Master's) Courses in Environmental Science and Policy Program, George Mason University, Fairfax, Virginia (17 hours)

Bachelor of Arts in Environmental Science, Minor in Archaeology, University of Virginia, Charlottesville, Virginia, 1989

CONTINUING EDUCATION:

Particle Size-Selective (Inhalable, Respirable, Thoracic) Aerosol Sampling Seminar, June 2009.

Introduction to Risk Assessment for the Industrial Hygienist, June 2007.

Reconstructing Exposure and Dose: Utility for the Practicing Industrial Hygienist, May 2004

Environmental Mold: Legal, Insurance, Legislative and Regulatory Impacts, February 2004

Noise Control Engineering: Principals and Application, September 2003

Applied Ergonomics, AIHA Professional Development Course, April 2000

IAQ Diagnostics: Hands-on Assessment of Building Ventilation and Pollutant Transport, February 1999

Building Tune-up for Energy Efficiency and Improved Indoor Air Quality, May 1997

Investigating and Mitigating Microbiological Contamination in Buildings, December 1997

HVAC and Indoor Air Quality for Non-Engineers, November 1995

40 Hour Hazardous Waste Operations and Emergency Response (Initial and Refresher) since 1995

Environmental Protection Agency approved AHERA Asbestos Inspector Course (Initial and Refresher) from 1993 to 2007

Environmental Protection Agency approved AHERA Asbestos Management Planner Course (Initial and Refresher) from 1993 to 2007

Environmental Protection Agency approved AHERA Asbestos Designer Course (Initial and Refresher) since 1995

Environmental Protection Agency approved AHERA Asbestos Supervisor Course (Initial and Refresher) from 1993 to 2000

Environmental Protection Agency approved AHERA Asbestos Project Monitor Course (Initial and Refresher) from 1994 to 2000

Lead Inspector Technician/Risk Assessor Course (Initial and Refresher) from 1993 to 2006

EXPERIENCE:

2000 - Present Senior Industrial Hygienist and Chief Operating Officer
(formerly Director, Industrial Hygiene and Toxicology Division)
Sandler Occupational Medicine Associates, Inc. (SOMA)
Gaithersburg, MD

- Manages operations at SOMA. Manages budgets, directs staff (both full-time professional and administrative staff as well as part-time consultants to the company), and develops marketing strategies for operations.
- Manages SOMA industrial hygiene and toxicology projects including indoor air quality evaluations, lead and asbestos exposure and remediation projects, chemical risk assessments and recommended controls, worker right-to-know, hazardous waste evaluation and remediation projects, and respirator programs including selection, fit testing, and program design; in-plant evaluations to identify, quantify and control health hazards; and

- provide expert witness services. Expert witness services include product liability, workers' compensation, and exposure modeling.
- Provides occupational health training to governmental agencies, private companies and professional associations. Prepares Material Safety Data Sheets (MSDSs) and warning labels for products. Periodically assists governmental agencies in support of their occupational health programs and research programs. Identifies exposure profiles by reconstruction of historical records and other data evaluation for dose reconstruction or epidemiology studies.
- Manages budgets, directs staff (both full-time professional and administrative staff as well as part-time consultants to the company), and develops marketing strategies for industrial hygiene operations.
- Oversees SOMA's exposure testing operations and instrument laboratory.
- Conducts exposure modeling and simulated exposure experiments to evaluate exposures to many potential toxicants and exposure scenarios include evaluation of chemical applications and disturbance of asbestos-containing materials.
- Manages large multi-site exposure evaluation and modeling project for aggregates mining industry. Oversees implementation of report recommendations and response actions.
- Conducted a large multi-site noise exposure evaluation for residential construction building trades and is currently involved in a current project to assess the silica and dust exposure of residential construction building trades.
- Course Instructor within the George Washington University's School of Public Health as needed. Served as a co-instructor for Introduction to Health and Safety in Museums. Serves as a Small Group Instructor for Environmental and Occupational Health.

1993 – 2000

Project Manager / Senior Scientist

Law Engineering and Environmental Services, Inc.
Washington D.C. Office (Sterling, VA)

- Manager of Environmental Health and Safety Group, supervising a staff of ten professionals; and providing environmental consulting services to government and commercial clients.
- Managed projects and provided technical expertise in broad range of industrial hygiene to include asbestos, lead, indoor air quality, noise, personal protective equipment, health and safety plans, as well as environmental concerns for employee protection during remediation and renovation projects. Includes:
 - Collection of several thousand bulk and air samples for asbestos analysis.
 - Collection of several hundred bulk, paint, soil and air samples for lead analysis.
 - Evaluation of residual asbestos content in brake manufacturing facilities.

- Sampling of outdoor air in the vicinity of naturally occurring asbestos deposits during disturbance.
- Sampling during removal of many asbestos-containing compounds to include floor tile, roofing materials, drywall joint compound, transite materials and many friable asbestos-containing materials.
- Managed and oversaw large multi-site survey projects for Phase I Environmental Site Assessments, Asbestos-Containing Material Surveys and Lead-Based Paint Surveys.
- Managed and served as primary client contact and technical expert on a long-term, multi-site, multi-task contract for environmental safety and health services for the Smithsonian Institution.
- Provided training services for internal and external customers, including asbestos awareness, respiratory protection, hazard communications and hazardous waste operations.
- Oversaw and managed an asbestos analysis laboratory.
- Safety Officer for Branch Office of 70 employees – managing regulatory required programs and conducting training.

1991 – 1993

Environmental Operations Officer
Nuremberg Military Community, US Army
Germany

- Recommended, planned and budgeted projects, working with consultants to execute projects, and managed public affairs for the Army Environmental Office.
- Planned, budgeted and conducted environmental compliance activities for military bases.
- Served as the asbestos coordinator for all facilities within the community.
- Formulated and implemented policies and contracts for separation and disposal of solid and hazardous wastes, in all army communities in the German state of Bavaria.
- Conducted recycling and environmental awareness campaign for an audience of 52,000 – which included preparing "how-to" manuals, newspaper articles, press releases, townhall meetings, and a recycling videotape.

1989 - 1991

Engineer Platoon Leader
2nd Armored Cavalry Regiment, US Army
Germany

- Supervised, trained, developed and provided welfare for 32 combat engineer soldiers – specializing in engineering construction and explosive demolitions.

- Trained and led unit through a five month deployment to the Middle East for Operations Desert Shield and Desert Storm.
- Served as Health and Safety Officer for Company of 200 soldiers.

CERTIFICATION/LICENSURE:

Certified Industrial Hygienist (CIH), American Board of Industrial Hygiene (ABIH), 2000

Certified Safety Professional. (CSP), Board of Certified Safety Professionals (BCSP), 2009.

Registered Environmental Manager (REM), National Registry of Environmental Professionals (NREP), 1999

Virginia Lead Inspector/Risk Assessor, 1999-2006

Virginia Asbestos Project Designer, 1994-2004

Virginia Asbestos Inspector and Management Planner, 1993-2004

PROFESSIONAL SOCIETIES AND MEMBERSHIPS (Past and Present):

American Industrial Hygiene Association, Member (1995-Present)

Potomac Local Section, AIHA, Member (1995-Present)

- Section Director (June 2005-Present)

Academy of Industrial Hygiene, Diplomate Member (2000-Present)

International Society of Indoor Air Quality and Climate (ISIAQ) Member (1998-Present)

The American Institute for Conservation of Historic & Artistic Works (AIC), Member (2001-2009)

- Member of Health and Safety Committee (2001-2009)
- Member of Subcommittee on Curriculum/Special Publication Editorial Subcommittee (2003-Present)

TEACHING/LECTURES/APPOINTMENTS/TESTIMONIES:

November 2009: Why and How to Merge IH and OH Programs in Times of Economic Uncertainty, Southeastern US Mine Safety and Health Conference, Birmingham, AL.

October 2009: OSHA's Proposed Silica Standard and the Epidemiology and Management of Silica Exposures, The Edison Electric Institute Annual Meeting, Henderson, NV.

February 2008. Breathless in the Workplace: New Millennium Changes for Occupational Respiratory Diseases, ORC Worldwide Occupational Safety and Health Group Meeting, Washington, DC.

June 2006. Health and Safety for Conservation Rapid Responders, part of a Disaster Assessment and Management Workshop, at the Annual Meeting for the American Institute for Conservation of Historic and Artistic Works, Providence, Rhode Island.

Safety in the Decontamination of Cultural Property: Mold, Presentation on Risk Assessment and Project Management, Annual Meeting for the American Institute for Conservation of Historic and Artistic Works, Portland, Oregon, June 2004

Small Group Instructor for Public Health 221: Environmental and Occupational Health (Master's Level), George Washington University, Washington, DC, Fall 2003

Exposure Monitoring and Air Sampling, Health and Safety Lecture for the American Institute for Conservation of Historic and Artistic Works, Washington, DC, May 2003

Co-Instructor for Public Health 290, Introduction to Health and Safety in Museums, (Master's Level), George Washington University, Washington, DC, Summer 2002

Safety in the Decontamination of Cultural Property, Presentation on Risk Assessment, Sampling Strategies and Project Completion, Annual Meeting for the American Institute for Conservation of Historic and Artistic Works, Miami, Florida, June 2002

Industrial Hygiene Considerations for Laboratory Safety, part of a Laboratory Safety Seminar presented by the Maryland Archaeological Conservation Laboratory, Saint Leonard, Maryland, March 2002

Hazardous Building Materials, Presentation as part of Reengineering America's Architecture for the American Institute of Architecture, Washington, DC, February 1996

PUBLISHED AND SUBMITTED ARTICLES AND REPORTS:

Health and Safety for Museum Professionals, published by SPNHC, co-editor and co-author (two chapters), slated for publication in 2010

Characterizing the Airborne Particulate in Portland Cement Plants, PCA R&D Serial No. SN3117, Ranpuria A., Ertel D. and Blackman N., Portland Cement Association, Skokie IL. 2009.

Fundamentals of Health and Safety: A New Approach, AIC News, Vol. 33, No. 5, 2008

Dress for Disasters, AIC News, Vol. 32, No. 5, 2007

Mold: Evaluation of Risk and Decontamination, AIC News, Vol. 29, No. 5, 2004

Health and Safety News: Is Your Old Dust Mask the Respirator You Thought It Was?, AIC News, Vol. 29, No. 2, 2004

Air Monitoring Guide, AIC News, Vol. 28, No. 6, 2003

Health and Safety News: A Summary of Two OSHA Inspections in Museums, AIC News, Vol. 28, No. 2, 2003

Decontamination in Conservation, AIC News, Vol. 27, No. 5, 2002



Anish Ranpuria, MPH, CIH, COHC Certified Industrial Hygienist

Anish Ranpuria, MPH, CIH, is Sandler Occupational Medicine Associates, Inc. (SOMA) Director of Business Development. Mr. Ranpuria is a Certified Industrial Hygienist with over 16 years experience in recognizing, evaluating and controlling a wide range of health hazards in the workplace. Mr. Ranpuria operates from SOMA's Washington DC area office and supports industrial hygiene projects and programs, occupational health programs, performs training, research, and general consultation for environmental, occupational, health and safety issues. Mr. Ranpuria serves on the AIHA Occupational and Environmental Medicine Committee, the Safety Committee for the Industrial Minerals Association, and has served on the local section of the AIHA's Board as Secretary and Treasurer.

EDUCATION:

Master of Public Health, Concentration in Environmental/Occupational Health, George Washington University, 1995

Bachelor of Arts in Biology, Concentration in Biochemistry, Cornell University, College of Arts and Sciences, 1993

CERTIFICATIONS:

American Board of Industrial Hygiene. Comprehensive Practice Certification # 9235
Certified in Hazardous Waste Operations and Emergency Response (HazWOPER), 2001
Council on the Accreditation of Occupational Hearing Conservation Certified Technician, 1998
Trained in OSHA Qualitative Respirator Fit Testing, 1998

EXPERIENCE:

2008 – Current Director, Business Development
Sandler Occupational Medicine Associates, Inc.
Gaithersburg, MD

2007 Senior Project Manager

He manages and conducts industrial hygiene surveys including air sampling, program evaluation and review of MSDSs to determine work place health hazards and also manages corporate occupational health programs. Specific assignments include:

- Serves as Corporate Industrial Hygienist for a multinational cosmetic manufacturer

- Performed a research study to characterize the concentration and size of Portland cement dust at cement plants
- Managed a long term epidemiology study to study the health effects of long term silica exposure on workers in the aggregates industry.
- Conducting Indoor Air Quality (IAQ) evaluations including microbiological contamination, temperature and relative humidity measurements.
- Reviewing field data collected, interpreted the laboratory results and generated reports for clients.
- Conducting field sampling, including air samples, wipe samples and direct instrument measurements in industrial sites, construction sites, quarries, mines, cement plants, block plants, rail yards, residential sites, laboratories and office buildings. Specific chemical and physical hazards have included: silica, diesel particulate matter, asbestos, toxic gases, welding fumes, VOCs, asphalt fumes, and noise. The employees sampled included those working with heavy equipment such as front end loaders, drills, haul trucks, pavers, employees performing maintenance work, locomotive operators, rail switch operators, etc.
- Gas sampling using direct reading instrumentation to determine the concentration of relevant gases at the worksite.
- Performing toxicological safety reviews and air monitoring to assess the exposure to chemicals used by the employees in a laboratory.

2000 - 2006 EOH Consultant/President
 Scimitar Solutions, Inc.
 Fairfax, VA

Provided a broad range of technical support and training in the field of environmental and occupational health including the establishment of medical surveillance and biomonitoring programs, industrial hygiene surveys, indoor environmental quality assessments, guidance on OSHA regulations, literature reviews, technical proposal preparation, and technical consultation for litigation cases. Assist clients internationally seeking EPA/FDA product and pharmaceutical approvals and perform quality assurance audits. Notable assignments included:

- Nationwide Silica, Diesel Particulate Matter and Noise Exposure Assessment for a Major Aggregates Supplier
- Industrial Hygiene Consultant for a Pharmaceutical Development Laboratory
- OSHA Laboratory Standard/Hazard Communication Instructor
- Dept. of Transportation Drug Test Collection Training
- Ozone Monitoring in a Data Center
- Air Monitoring/Project Oversight in a Hospital Birthing Center
- Silica/Beryllium Exposure Survey in a Dental Laboratory
- Microbial investigations in multiple commercial buildings
- Inspector for microbial abatement of a 161 unit condominium property
- Preparation of a corporate drug & alcohol misuse policy and plans
- Technical consultation for handling potential anthrax exposures

- Indoor Environmental Quality Assessment of EPA Headquarters
- Indoor Environmental Quality Assessment for the Department of Transportation
- Indoor Environmental Quality Assessment for a public transit authority building
- Drinking Water Lead/Microbials Sampling (Washington, DC)
- Asbestos air monitoring and removal oversight for emergency response action in Libby, MT
- Management of asbestos/hazardous waste medical surveillance programs for multiple clients
- Management of Hearing Conservation Programs for multiple clients
- Established/manage a nationwide medical examination program for a federal law enforcement agency
- Emergency response and air monitoring/IH team management during a Baltimore train fire
- Review and evaluate pre-clinical toxicology studies in preparation for submission of an IND
- Quality assurance audits of various toxicology studies and GLP inspections
- Lead proposal writer on multiple successful federal bids

1999 - 2000 Senior Project Manager
Washington Occupational Health Associates, Inc.
Washington, DC

Client responsibilities included managing medical surveillance, hearing conservation, drug/alcohol programs, and indoor air quality surveys for multiple clients; responding to technical inquiries regarding a variety of health and safety issues; litigation support (literature review, technical briefs, regulation monitoring, document management, and report and exhibit preparation); and overall program management for litigation and occupational health clients. Internal responsibilities included directing and determining technical staff assignments, web site maintenance, database management, assuring daily business operations including staffing, computer network operations and equipment, coordinating and authoring bids and proposals, assisting President with company marketing efforts, securing new business. Reported directly to the President and coordinated with Chief Financial Officer and staff MDs on project assignments.

1997 - 1999 Research Associate
Washington Occupational Health Associates, Inc.
Washington, DC

1996 - 1997 Regulatory Scientist
SRA International, Inc.
Washington, DC

Provided regulatory consultation for FDA human and veterinary pharmaceutical approvals, health and safety evaluations for various chemicals, EPA pesticide registrations, litigation support and quality assurance inspections for clinical studies.

Additional projects included an air sampling survey and staff training on sampling methodology, preparation of a worker exposure risk assessment to pentachlorophenol, initiation of company effort for new animal drug approval (NADA) for swine dysentery, multiple pharmaceutical safety reviews, monitoring and oversight for a two generation reproduction study, and third party QA/QC audits of completed studies.

1994 - 1995 Research Analyst
 Sciences International, Inc.
 Alexandria, VA

Supported both the Exposure Assessment and Industrial Hygiene Group (70%) and the Toxicological Evaluation and Risk Assessment Group (30%).

Responsibilities included a retrospective exposure assessment in a phosphorus manufacturing plant, litigation support for various chemical exposures, a review of the safety and health risks for workers involved in the cleanup of the "retired" Nuclear Weapons Complex, and preparation of Toxic Release Inventory (TRI) chemical reports, and preparation of Agency for Toxic Substance and Disease Registry (ATSDR) toxicological profiles.

RELEVANT COURSEWORK:

Toxicology, Methods in Occupational Epidemiology, Environmental Health Assessment, Occupational-Environmental Health, Epidemiology, Biostatistics, SAS, Health Policy, Clinical Decision Analysis, Fundamentals of Industrial Hygiene, Intro to Ergonomic Evaluation, Calculation Methods in IH

PRESENTATIONS/PUBLICATIONS/ACTIVITIES:

Anish K. Ranpuria (co-presenter). April 2009. “*MSHA's New Health Emphasis...Are You Ready for an Industrial Hygiene (IH) Inspection?*” Webinar for the Industrial Minerals Association – North America.

Ranpuria, Anish, Ertel, Dennis and Blackman, Nicole, *Characterizing the Airborne Particulate in Portland Cement Plants*, SN 3117, Sandler Occupational Medicine Associates, Inc., Gaithersburg, Maryland, USA, 2009, 25 pages.

Industrial Hygienist of the Year Award, Potomac Local Section of the AIHA – 2008

Invited Lecturer for Council of Accreditation in Occupational Hearing Conservation Training Course (2005, 2009)

George Washington University Annual Career Panel for Incoming Graduate Students, 2006, 2007

ACGIH Symposium – “National Uniformity on Mold” – attendee, 2003

AIHA Leadership Workshop – Fairfax, VA, 2003

Presentations on Environmental Full Cost Accounting to Chinese Executives Delegation Program at the University of Maryland: Jiangsu(2), Zheijang(2), Henan, Guangzhou (3), Shangdong Provinces, 2002-2006

Bernard BK, Hoberman AM, Brown WR, **Ranpuria AK**, Christian MS. Oral (gavage) two-generation (one litter per generation) reproduction study of pentachlorophenol (penta) in rats. *Int J Toxicol.* 21(4):301-18, 2002

Bernard BK, **Ranpuria AK**, Hoberman AM. Developmental toxicity study of pentachlorophenol in the rabbit. *Int J Toxicol.* 20(6):345-52, 2001

Patty's Toxicology, Fifth Edition. Vol 4: *Hydrocarbons/Organic Nitrogen Compounds.* Chapter 53. Phenol and Phenolics. Contributing Author. Wiley & Sons, 2000

PROFESSIONAL SOCIETIES AND MEMBERSHIPS:

Industrial Minerals Association Safety Committee – Member (2009)

Delta Omega Public Health Honor Society – Inducted Member (2004-Present)

American Industrial Hygiene Association (AIHA) - Full Member (1995-Present)

Potomac Section of the AIHA – Treasurer (2002-2004, 2007-Present)

Potomac Section of the AIHA – Secretary (2000-2002)

American Conference of Governmental Hygienists – Associate Member (2004-Present)

AIHA Committee on Occupational and Environmental Medicine – Member (2007-Present)



Pamela Burda, MS, CHP, CSP **Occupational Health Specialist**

Ms. Pamela Burda joined SOMA in 2003 as an Occupational Health Specialist. She has been involved in a wide variety of projects to determine health hazards and environmental conditions present in a variety of occupational and residential settings. Ms. Burda is a Certified Health Physicist with over fifteen years of experience in evaluating and controlling health hazards in the workplace. She holds an undergraduate degree in Chemistry and a Master's Degree in Nuclear Engineering, both from the University of Arizona. She has experience in a wide range of areas pertaining to occupational health, including ionizing and non-ionizing radiation protection, industrial hygiene, safety, and quality assurance. She has provided consulting services to clients, both governmental and private.

EDUCATION AND TRAINING:

Master of Science in Nuclear Engineering, University of Arizona, Tucson, Arizona, 1989

Bachelor of Science in Chemistry, University of Arizona, Tucson, Arizona, 1978

EXPERIENCE:

2003 - Present Occupational Health Specialist
Sandler Occupational Medicine Associates, Inc.
Gaithersburg, MD

Duties include performing industrial hygiene surveys and environmental surveys to evaluate health hazards associated with potential exposures to chemical and physical stresses, including gases, vapors, particulates, noise, radiation, and heat stress. Such hazard evaluations are also performed for reviewing pertinent environmental data and other relevant information. Specific jobs include:

- Evaluating the effects of low-frequency EMF on workers and members of the public;
- Assessing the hazards associated with quarry sites, including silica, noise, diesel fumes, and welding fumes;
- Reviewing and rewriting Material Safety Data Sheets to ensure compliance with ANSI standards;
- Monitoring noise and silica exposure to individuals working on or around trains;
- Reviewing Radiological Protection Plans to determine adequacy;
- Conducting health and safety audits, industrial hygiene surveys, IAQ surveys, noise surveys, radiological surveys, and environmental surveys for a variety of occupational and residential settings, including mines, construction sites, apartment buildings, etc.;

- Conducting Indoor Air Quality (IAQ) evaluations, to determine the extent of microbiological contamination;
- Reviewing case material for legal consulting on matters of industrial hygiene and environmental health and safety;
- Conducting industrial hygiene research.

2002 - 2003 Safety Specialist
Washington Group International
Lusby, MD

Duties included evaluating health hazards associated with a construction project performed inside the containment building of a nuclear reactor facility. Specific jobs included:

- Developing and implementing procedures designed to insure that work was performed in compliance with applicable regulations and site safety procedures;
- Evaluating safety and industrial hygiene hazards associated with specific tasks such as welding, removal and installation of insulation, and overhead lifts of heavy objects;
- Performing surveys to evaluate hazards, including heat stress, cold stress, radiation, radioactive contamination, welding fumes, noise, nuisance dust, fiberglass, and electrical hazards;
- Ensuring that workers followed all approved safety practices.

2001 - 2002 Division III Quality Assurance Manager
Neutron Products, Inc.
Dickerson, MD

Duties included developing and implementing a Quality Assurance program for the manufacture and transportation of sealed cobalt-60 sources, including design of shipping casks and sealed sources, and evaluating hazards associated with the manufacturing process. Specific jobs included:

- Identifying applicable NRC, FDA, and DOT regulations, developing implementing procedures to ensure compliance, and evaluating employee training required for compliance;
- Performing audits on radiation processing services, manufacture of cobalt-60 sources, and remanufacture of teletherapy units to verify compliance with NRC and FDA requirements and customer specifications;
- Assessing and mitigating safety hazards to workers in a work environment that included heavy machinery, hazardous chemicals, and radiation sources of several thousand curies;
- Developing procedures to satisfy the requirements for offsite disposal of radioactive waste.

1999 - 2001 Senior Engineer/Scientist
Systematic Management Services, Inc.
Germantown, MD

Duties included supporting Department of Energy construction and environmental remediation projects by assessing hazards and developing procedures to ensure safe work practices. Specific jobs included:

- Performing audits for the National Spent Nuclear Fuel Program to verify that spent nuclear fuel was being handled, treated, and transported in accordance with applicable NRC and DOT regulations;
- Performing root cause analysis on specific problems revealed during the audits to determine the root cause and make recommendations to prevent similar problems in the future;
- Developing implementing procedures to ensure compliance with DOE regulations in the area of radioactive waste management;
- Performing assessments of the Westinghouse Industrial Hygiene Program at the DOE Savannah River Site in order to determine whether industrial hygiene and safety hazards were addressed in compliance with in-house procedures and applicable OSHA regulations; activities at the site included construction, environmental remediation, and chemical processing.

1999 Radioecology Program Coordinator/Radiation Safety Officer
Savannah River Ecology Laboratory
Aiken, SC

Duties included ensuring that all work in a radiochemical laboratory was carried out in compliance with the Facility Manager's (Westinghouse Savannah River Company) Radiation Protection Plan, as well as complying with industrial hygiene and safety requirements. Specific jobs included:

- Developing a Radiation Protection Plan to ensure that work was performed in accordance with all applicable regulations, and that workers and the environment were protected;
- Ensuring that radioactive and hazardous waste was stored and disposed of in accordance with the Facility Manager's requirements, which were based on DOE O 435.1;
- Devising and performing Quality Assurance checks which verified that instruments used for radiation detection were calibrated and working properly, and that logs were kept to document that they had been tested;
- Performing surveys to ensure that radioactive materials and chemicals were handled and controlled safely and in compliance with applicable procedures;
- Collecting and analyzing data to determine the concentration of cesium-137 in the local environment.

1995 - 1999 Technical/Engineering Specialist
Systematic Management Services, Inc.
Oak Ridge, TN

Duties included supporting Department of Energy construction and environmental remediation projects by assessing hazards and developing procedures to ensure safe work practices. Specific jobs included:

- Developing a Radiation Protection Program for a project involving the vitrification of radioactive waste, including determining the hazards associated with the process, performing an accident analysis, designing a decontamination facility, and developing methods for the storage and disposal of mixed waste;
- Assisting DOE on various D&D projects at Oak Ridge in management and disposal of radiologically and chemically contaminated materials, determining Lessons Learned from various safety-related incidents, and evaluating potential uses for the site after work had been completed. These projects involved removal of structures that were no longer needed as part of the DOE mission;
- Assisting in the development of a system for tracking radioactive waste generated at the Oak Ridge Reservation. The system was based on an Excel spreadsheet that tracked current waste by type of material, isotopes present, and means of disposal, if one had been determined, and also projected the amount of waste that would be generated in the future;
- Assisting in a project involving removal of uranium hexafluoride from an experimental reactor at the Oak Ridge National Laboratory, to ensure that the uranium hexafluoride was not released during removal or transportation, that radiation dose to workers was kept within DOE-approved limits, and that records were kept so that the entire process was sufficiently documented to verify safe handling and transportation;
- Developing audit plans for audits of radiochemical laboratories used by DOE, conducting the audits, and performing QA/QC reviews on audits to verify laboratory compliance with all applicable regulations and ISO 9000 requirements;
- Auditing Radiation Protection Programs of DOE contractors to verify compliance with 10 CFR 835, and that they adequately protected workers, the public, and the environment.

1991 - 1995 Radiological Engineer
MK-Ferguson of Oak Ridge Co.
Oak Ridge, TN

Duties included evaluating radiological, safety, and industrial hygiene concerns for the Construction Manager at the Oak Ridge Department of Energy Site. Specific jobs included:

- Performing surveys to evaluate radiological and industrial hygiene hazards present in the work area;
- Evaluating work activities to ensure that work was being performed safely and in compliance with company procedures;

- Developing work procedures to implement applicable regulations;
- Preparing and teaching a class in nuclear criticality safety;
- Preparing and teaching classes to health physics technicians to fulfill the DOE Radiological Control Technician training requirements.

1989 - 1991 Radiological Engineer
MK-Ferguson
Cleveland, OH

Duties included supporting construction and environmental restoration activities at both DOE and commercial sites. Specific jobs included:

- Characterizing the sites (RCRA, CERCLA, and active) in terms of radiological and chemical contamination present;
- Performing personnel monitoring to ensure that workers were not exposed to chemical or radiological hazards;
- Developing and reviewing Environmental Impact Statements and Environmental Assessments.

1984 - 1989 Graduate Teaching and Research Assistant
University of Arizona
Tucson, AZ

Specific jobs included:

- Performing research to determine the suitability of hot-isotactically-pressed copper as a canister for the disposal of radioactive waste;
- Teaching a laboratory course in radiochemistry to both undergraduate and graduate students. The course covered topics such as the use of Geiger-Mueller and proportional counters, gamma spectroscopy, radiochemical separations, neutron activation analysis, ALARA principles, contamination control, methods of decontamination, and mitigation of risks from working with hazardous chemicals.

CERTIFICATION/LICENSURE:

Certified Health Physicist, 1998
Certified Safety Professional, 2000
Certified AHERA Asbestos Inspector, 2004
Certified Lead Inspector Technician, State of Maryland, 2010