CENTER FOR ENVIRONMENTAL RESOURCE MANAGEMENT

THE UNIVERSITY OF TEXAS AT EL PASO

Cooperative Agreement: CR-819849-01

Center Report
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The University of Texas at El Paso

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Mission and Purpose

The UTEP-EPA Environmental Research Center (ERC) cooperative agreement has four purposes:

- to establish and maintain a coherent program of education, outreach, and research to support analyses and remediation of critical Superfund-related environmental issues,
- to provide the university with the infrastructure necessary to operate a Center for Environmental Resource Management,
- to provide support for a culturally diverse student population to develop the skills necessary to become environmental scientists and engineers, and
- to address the issues of the adverse impact of environmental factors on the primarily-minority, low-income peoples of the area served by the university.

The ERC is an integral component of UTEP's Center for Environmental Resource Management (CERM) and is synonymous with it. CERM provides university-wide coordination of outreach, service, education, policy, research, development, and technology transfer activities that focus on environmental issues, as well as support for a culturally diverse student population to develop skills necessary to become environmental engineers and scientists. CERM's goal is to address the environmental problems that threaten the health, safety, well-being, and economic development of the southwest border region of the United States and northern Mexico.

Although one of CERM's research priorities has been on Superfund-related issues (detection, assessment and evaluation of the risks to human health of hazardous substances and the detection and remediation of hazardous substances in the environment), the problems of the area served by the University of Texas at El Paso, primarily the southwest border region of the United States and northern Mexico, are broader in scope. Accordingly, the center seeks to address the broad spectrum of issues that confront the southwest border, to include hazardous waste, air quality, water availability and quality, and ecological, public health, and policy issues.

CERM's goal is to address the environmental problems that threaten the health, safety, well-being, and economic development of the southwest border region of the United States and northern Mexico.

Background about the University and the Region

The University of Texas a El Paso is a comprehensive regional university serving a large, binational, bicultural population in an area with unique environmental challenges -- the border region of the southwestern United States and northern Mexico. UTEP's six colleges (business administration, education, engineering, health sciences, liberal arts and science) and the graduate school offer 64 bachelor's and 57 master's degrees. Doctoral degrees are offered in geological sciences, computer engineering, psychology, materials science and engineering, environmental science and engineering, educational leadership and administration, and biological sciences. A new Ph.D. program in history will enroll its first students in Fall 1999. UTEP offers science and engineering degrees in Allied Health, Biology, Chemistry, Geology, Geophysics, Mathematics, Medical Technology, Microbiology, Physics, and Civil, Electrical, Mechanical and Industrial, and Metallurgical Engineering. Master's degrees are offered in 54 programs. Through its educational mission, the university is committed to developing the capacity of the region it serves by preparing the next generation of professionals and future leaders..

With almost 15,000 students, UTEP is one of the largest Hispanic-majority universities in the United States. Established in 1914 as the Texas State School of Mines and Metallurgy, it became a part of the University of Texas system in 1919 and is the second oldest academic component of the system. For more than a decade, student enrollment trends at UTEP have closely reflected the demographics of the El Paso region. Nearly two-thirds of UTEP's students are Hispanic, 85 percent of these students are from El Paso County and another 9 percent are from Mexico, most commuting daily from Ciudad Juárez. The university ranks second in the nation for the total number of bachelor's degrees awarded to Hispanics and is nationally ranked in several categories as one of the top 10 Hispanic degree producers. UTEP ranks:

first in health professions;
second in business and management;
second in multi/interdisciplinary studies;
second in physical sciences and science technologies;
third in engineering and engineering technologies;
third in protective services;
fifth in visual and performing arts;
sixth in biological sciences;
sixth in communications and communications technologies; and
eighth in English language and literature.

The Paso del Norte Region

El Paso is located at the juxtaposition of the states of Texas, New Mexico and Chihuahua. Immediately south of El Paso and separated only by the narrow Rio

Grande is Ciudad Juárez: to the northwest is Sunland Park, in southern Doña Ana County, New Mexico. Although divided by three states and two nations, the communities comprise a single metropolitan and ecological area known as *Paso del Norte* (during the era of Spanish Colonial rule, this was regarded as the northernmost year-round snow-free pass through the mountains). Among the problems of the region are:

- Rapid industrialization. Free trade and the twin-plant, or *maquiladora,* concept have made the region a gateway of commerce. Yet, the industrial development has not brought prosperity to the region. *Maquilas* capitalize on the wage rates in Mexico where workers are typically paid $4 -$6 per day.
- Expanding population. The combined population of the region is estimated to exceed 2.2 million people. By the 2020 it is expected to be 6 million.
- Low income levels The 17th largest city in the United States, El Paso is also the fourth poorest. The average household income is less than $15,000 per year; unemployment rarely drops below double digits. Yet, as poor as El Paso is, it is economically well off compared to Juarez, which, in turn is at an economic advantage compared to the interior of Mexico.
- Lack of infrastructure. Industrial and population growth have spawned urban sprawl at a pace that has exceeded the support capacity of municipal governments. More than 70,000 people in El Paso County live in colonias, unincorporated communities without basic infrastructure such as running water and waste treatment services. In Juarez only 60% of households are served by sewer lines – there is no wastewater treatment facility for this community of more than 1.5 million.
- Poor air quality. El Paso County is a non-attainment area for three criteria pollutants: ozone, carbon monoxide, and particulate matter. Similarly, Juárez violates the Mexican national norms for these pollutants. Additionally, two separate portions of southern Doña Ana County, New Mexico are non-attainment for ozone and particulate matter. Vehicles are the most significant source of pollution – the dispersed community, coupled with inadequate public transportation, force a heavy reliance on personal automobiles. The average age of passenger vehicles is older than other U.S. cities, and as a consequence, vehicle emissions are higher. Further, inordinately high vehicle emissions are being generated from cars idling their engines while in queue waiting to clear Customs at the three international bridges that connect the two cities. Other significant sources in Mexico include brick kilns, small automobile paint shops, unpaved roads, and home heating and cooking using wood and scrap for fuels.
- Uncertain water supply. The Paso del Norte region is shaped by its position at the conjunction of three states and an international boundary, limited rain fall (under nine inches per year), and scarce water resources. The region is heavily dependent upon two transboundary aquifers, the Hueco and Messilla Bolsons, for fresh water. Current estimates are that the Hueco

Bolson will run out of acceptable fresh water within 25 years. Historically, the urban areas have exploited high quality ground water while the region's farmers have relied on the surface waters of the Rio Grande, managed downstream of Elephant Butte Dam by a complex system of international treaties and interstate compacts. Overdrafting has lowered the water tables of the region's aquifers, yet overall municipal and industrial water consumption is increasing in lock step with the region's rapid population growth. As ground water supplies diminish, the region's cities are planning to shift to using surface water. Increased municipal use of surface water may come at the expense of agricultural use. As municipalities shift to using surface water and lesser quality ground water, water rates will rise and this will have economic consequences for both urban and agricultural users.

- Lack of hazardous waste disposal facilities in Mexico. Maquilas are required by law to retrograde all hazardous waste to the United States. Management and tracking of hazarous waste generation and movement is a significant problem that is aggravated by differing national laws and regulations, as well as differences in terminology and definitions.

Administrative Overview of the Cooperative Agreement

Cooperative Agreement CR 819849-01 was the result of an application for federal assistance submitted to EPA's Office of Research and Development (ORD) in 1992, and revised in 1993. UTEP proposed the establishment of an environmental research center and requested $ 5 million over a five-year period. The initial award, issued in March 1993, was for $500,000 and was followed by a second $500,000 in September 1993. After the initial award, the understanding was that UTEP would annually submit an administrative request for release of additional installments of one million dollars. Subsequent amendments allocated additional funds and extended the budget period. The fourth amendment to the cooperative agreement extended the budget period to cover the entire project period and aligned both to coincide with UTEP's academic and fiscal cycle, extending the end-date of the agreement through August, 1998. In May, 1998, amendment 8 of the cooperative agreement extended the budget and project period through August 31, 1999.

To date, UTEP has received four of the intended five million dollars. UTEP will submit a request for the final funding increment and an appropriate extension of the project period.

ORD's initial project officer for the cooperative agreement was Mr. Darwin Wright. Following his illness, Mr. Charles T. Mitchell became the project officer.

Funding

Date	Amount
Mar 93	$500,000
Sep 93	$500,000
Jul 94	$1,000,000
Sep 95	$1,000,000
Sep 97	$1,000,000
Total	**$4,000,000**

Directors

The first Director of the Center for Environmental Resource Management was **Dr. Stephen Riter**, who also was the Dean of the College of Engineering. In January, 1995, he was appointed interim Vice President for Academic Affairs. He relinquished his responsibilities as Dean but remained as Director of the Center pending the selection of a replacement.

Dr. Charles G. (Chip) Groat became the Director on July 15, 1995. He came to UTEP from Louisiana State University, where he was the Director of the Center for Coastal, Energy, and Environmental Resources (CCEER). He had previously served at UTEP; from 1976 to 1978 he was the Chairman of the Department of Geological Sciences. In addition to his appointment as Director of CERM, he was appointed as a Professor in the Department of Geological Sciences. His curriculum vitae is attached at Appendix 1.

In early 1998, he was appointed as UTEP's Associate Vice President for Research and Sponsored Projects. He continued to serve as Director of CERM with the able assistance of Associate Director, Mr. C. Wesley Leonard.

On July 30, 1998, President Clinton announced his nomination of Dr. Groat to be Director of the U.S. Geological Survey. Following Senate confirmation of his appointment, Dr. Groat was sworn in as the 13th Director of the USGS on November 13, 1998.

Since that time, **C. Wesley Leonard**, CERM's Associate Director, has been serving as the Center's Acting Director. The University has initiated a national search to fill the vacant position. Meanwhile, the University and the Center have been fortunate to have the continuity provided by Mr. Leonard. In addition to his normal responsibilities he was able to relieve Drs. Riter and Groat of much of the day-to-day operating responsibilities of the Center during the times the university was searching for replacements. Mr. Leonard's vita is attached at Appendix 1.

Organization and Management

The Center reports to the University's Associate Vice President for Research and Sponsored Projects, Dr. Paul Maxwell. The Center Director is assisted by a Science Advisory Board and university Internal Advisory Committee.

Science Advisory Board

This board consists of distinguished scientists and scholars with substantial experience in disciplines pertinent to the mission. Members of the board are:

Dr. Paul Ganster, San Diego State University
Dr. Richard Howe, University of Texas at San Antonio
Dr. Robert Parmenter, University of New Mexico
Dr. David Pijawka, Arizona State University
Dr. Adel F. Sarofim, University of Utah
Mr. Thomas E. Martin, Environmental Manager, Texas Operations, ASARCO

Biographical sketches of the board members are at Appendix 2.

Internal Advisory Committee

Members of the university's internal advisory committee are:

Dr. Stephen Riter, Provost and Vice President for Academic Affairs
Dr. Thomas E. Brady, Dean of the College of Science
Dr. Andrew H.P. Swift Jr., Dean of the College of Engineering

Their biographical sketches are at Appendix 3.

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Center Highlights

CERM has made steady progress over the life of the cooperative agreement and is accomplishing its mission.

- **Research and other activities (education, outreach and policy):**
  - The Center has funded environmental research, education and outreach activities by UTEP faculty members and professional staff. Table 1 provides a list of these activities.
  - The Center has also provided support to a variety of research, education, outreach and policy activities funded by other sources. This support has been varied, including administrative management, facility and equipment support and maintenance, and technical and scientific collaboration. Table 2 is a list of some of the activities supported by CERM.
  - Combined, CERM-supported research activities have achieved national and international recognition at conferences and symposia, and in peer-reviewed scientific and professional journals. A list of selected publications, presentations, posters, theses and dissertations, and project reports is attached as Appendix 5.
  - The Center has a cooperative agreement with Region 6 of the EPA to support the development and implementation of the HAZTRAKS program to enhance the abilities of both the U.S. and Mexican federal and state environmental enforcement agencies to communicate about hazardous waste movement in and out of the border region.
  - The Center has another cooperative agreement with Region 6 to translate EPA manuals and training materials into Spanish.
  - Through CERM, UTEP is a member in two research consortia, the Southwest Center for Environmental Research and Policy (SCERP), and the Historically Black Colleges and Universities/Minority Institutions Environmental Technology Consortium. The former is funded through EPA, the latter through the Department of Energy.
  - CERM worked with Region 6 and Austin College, as well as a variety of local organizations, to provide public access to time-relevant information about the development of ozone in the region. CERM operates the website, www.ozonemap.org, which displays a graphical animation of the development of ozone each day.

- **Infrastructure support and development.** The cooperative agreement has provided the support necessary to enable CERM to become the largest research center on the UTEP campus and the leading environmental research center on the U.S.-Mexico border. The Center has become the umbrella and administrative headquarters of a variety of other centers, programs, and activities. The infrastructure support provided by the cooperative agreement has permitted UTEP to leverage these activities with funds from a variety of sources. Some of these centers and programs are:

- The Energy Center, which serves as a hub for university research related to renewable energy and energy efficiency. Its programs include school-based energy conservation education activities and alternative fuels, wind energy, and solar thermal research for a variety of applications. The Wind Energy Research Group performs research involving the design and operation of two-bladed teetered rotor wind turbines using a unique experimental wind turbine facility in a newly-developed variable sped test bed. The Wind Group is also doing cutting-edge research into multi-source generating systems. The Alternative Fuels Research Laboratory performs applied research aimed at maximizing the performance and emissions benefits offered by internal combustion engines using alternative fuels. The Watt Watchers program is teaching K-12 students in Texas and New Mexico to become conscientious energy consumers and to help their schools save energy dollars and prevent pollution. In addition, the Energy Center operates the world's leading salinity gradient solar pond research facility in conjunction with an industrial partner, Bruce Foods, at their plant located in northeast El Paso.
- The Pan American Center for Earth and Environmental Studies – a NASA-funded, Mission to Planet Earth program, which applies remote sensing technology to basic and applied research in geosciences, environmental science and engineering, and computer science and engineering. PACES also supports educational activities such as GLOBE (Global Observations to Benefit the Environment) and GIS training for area organizations.
- *When Water Works for Health* is a program funded by the Paso del Norte Health Foundation and is designed to improve the health of the region's inhabitants, primarily low-income, minority populations, by improving water quality and treatment methods. The program is administered by CERM staff and provides funds for infrastructure improvements to low-income home owners. The program also includes educational and public awareness components.
- CERM's Environmental Justice Initiative coordinates research, education and policy activities which address or ameliorate the adverse impact of environmental issues on under-represented, low-income, populations. The Center has a cooperative agreement with the EPA for a Community-University Partnership for Environmental Justice – an alliance between CERM and the University of Texas School of Public Health which provides a forum for community groups to become part of the environmental policy and regulatory process. Through funds received from the SCERP consortium, the Center operates a similar program in Ciudad, Juarez, El Paso's twin sister city in Mexico.

- **Student and academic program development.**
  - Student development is an integral component of CERM activities. We strongly believe that the people who will solve the environmental problems of the area we live in are the people who live here – and those people go to

UTEP. Our students are very representative of the region, 67% are Hispanic-Americans, another 9% are Mexicans. Accordingly, we charge ourselves with the mission of providing our students with the skills and knowledge necessary to become environmental scientists and engineers.

- Every research activity, and almost all of the education and outreach activities, involves students. They are engaged in hands-on activities that enrich the quality of their education. As part of their work, UTEP students author or co-author technical reports, participate in poster sessions, make presentations, and write theses and dissertations that demonstrate their scientific and technical development. They attend and attain recognition at national and international conferences and symposia -- CERM students have been regularly recognized at the annual conferences of the Great Plains/Rocky Mountain Hazardous Substance Research Center and of the American Geophysical Union.
- Since its inception, CERM has sponsored activities employing more than 350 students (about 10% have been directly supported by this cooperative agreement). As examples, one received her Ph.D. in Geological Sciences and is now employed at an EPA national laboratory at Research Triangle Park in North Carolina. Another is employed at Region 6 in Dallas. Annually, a group of students complete summer internships at other EPA labs.
- CERM has also provided the umbrella under which the University has assembled more than 60 faculty members from numerous academic disciplines to form the Environmental Science

*UTEP's **Environmental Science and Engineering Ph.D.** program is an interdisciplinary doctoral program and, as such, is housed at CERM, not assigned to one of the academic colleges or departments. This unique organizational structure allows the university to ensure the interdisciplinary nature of the program.*

The program prepares scientists and engineers to address the environmental issues facing this region, the nation, and the world. It produces graduates who apply cross-disciplinary perspective to the understanding, management, and remediation of human impacts on the environment, with particular focus on the problems of the southwest border region of the United States and northern Mexico.

The program is designed for individuals with environmentally-related master's degrees in engineering or the natural sciences. Doctoral candidates will complete at least 60 credit hours beyond the master's degree, including course work providing in-depth treatment of current technologies for environmental protection and remediation and fundamental concepts in environmental biology, ecology, geology, and chemistry. The core course work also emphasizes environmental policy, law, and ethics, providing graduates with an understanding of the social and political context of environmental issues. The severe environmental problems that face this region provide a special focus for course work and research and will provide an opportunity for students to work together on interdisciplinary projects.

Graduates of the program will have the knowledge and skills to serve at the highest levels as practitioners and in academic positions.

and Engineering faculty. The director of this faculty group is Dr. Jorge Gardea-Torresdey. His vita and a list of Environmental Science and Engineering faculty members is attached at Appendix 4 to this report.

- During the period of this cooperative agreement, the University developed and secured approval of an inter-disciplinary Environmental Science and Engineering Ph.D. program housed at CERM. Dr. Gardea is the program director. The program's first two graduates received their Ph.D.s this past May. One is continuing post-doctoral work in phytoremediation technologies on a CERM-sponsored research project. The other is a faculty member at a Mexican university. Currently, there are more than 30 students enrolled in the program.
- CERM has also supported faculty, curriculum, and course development activities. We have used planning grants to stimulate faculty interest in environmental issues and to support faculty development of their research programs.
- CERM is collaborating with UTEP's Colleges of Science and Engineering to sponsor a program to "green" the science and engineering curricula and possibly implement a program which certifies graduates as environmental specialists.

- **Environmental Justice.** When considering CERM's efforts in this subject, one must be mindful of the region which UTEP serves. The border region of the southwest United States and northern Mexico is of predominantly Hispanic heritage. Income levels on the U.S. side are among the lowest in the nation – annual household income is less than $15,000. Consequently, virtually everything we do to address environmental issues (technical and scientific research projects, education and outreach activities, and policy development and studies) has some component of environmental justice. Specific Environmental Justice activities include:
  - Drs. Richard Bath and Howard Neighbor conducted a study of "Environmental Justice, Hispanics, and the Disposal of Hazardous Wastes in the El Paso Region." Four specific instances were studied: (1) The Superfund hazardous mine tailings clean up effort at Cleveland Mill in Silver City, NM; (2) the selection of Hudspeth County, Texas for the disposal of the state's low level radioactive waste(Sierra Blanca); (3) the waste incinerator and landfill selection process in Sunland Park, NM; and (4) implementation of measures under the 1990 Clean Air Act to insure emission standards compliance in El Paso, TX. Their report was provided to the Environmental Justice office of EPA Region 6 and was included in our 1995 Annual Report.
  - Dr. James VanDerslice conducted a study: "Development of Risk Assessment and Risk Communication Methods for the US-Mexico Border." This study revealed cultural differences in risk perception and response.
  - CERM provided a faculty development and planning grant to Dr. James Clingermayer, to investigate "State Politics, Administrative Context and the Siting of Hazardous Waste Facilities."

- CERM provided another faculty development and planning grant to Drs. James Peterson and Pablo Vila, to investigate "The Human Resources of the Rio Grande Ecosystem: Evaluating Human/Environmental Interaction and Management Options in the Desert Borderland." Their investigation addressed the ethnic, social, cultural, economic and national identities in the region.
- Dr. Jeff Brannon led the "Colonia Self-Help Septic Tank Project," which used engineering students to properly design septic systems for colonia residents.
- Dr. James VanDerslice worked on "Development of a Geographic Information System for Investigating Environmental Impacts on Public Health." This system will facilitate public access to environmental quality and public health data.
- EPA, through the Southwest Center for Environmental Research and Policy (SCERP) has supported several CERM activities that have directly or indirectly addressed the issue of environmental justice in this region.
    - Most notable is the *Agua Para Beber* project. *Aqua Para Beber* is a community outreach, train-the-trainer, program that addresses the lack of potable water and wastewater services in Colonias. This program has been proven to have a positive effect on the health of colonia residents. Recently we have been able to export the program to other communities on the US-Mexico Border from Laredo, Texas, to San Diego, California.
    - Dr. Maria Amaya of UTEP's college of Nursing received SCERP support for three studies, "An Analysis of Lead Exposure During Pregnancy and the Neonatal Period Among Indigent Hispanic Women," "Lead and Folic Acid Level in Pregnant Women in Ciudad Juarez, Mexico," and "Prevention of Childhood Toxic Lead Exposure in a U.S.-Mexico Border Community."
    - Dr. Nicholas Pingitore conducted research into "The Border Basket: Analysis of Toxic Metals in Retail Foods, El Paso-Juarez." In addition to examining commonly-purchased, regionally-specific foodstuffs, the study

When Water Works for Health *is a $1.7 million comprehensive program for the purpose of improving health in El Paso County, Texas, Doña Ana County, New Mexico, and Cd. Juárez, Chihuahua. This is to be achieved through a multifaceted approach that includes outreach, education, curricula development, media campaigns, and direct household assistance. Specifically the project includes the following:*

- *partnerships with Community Based Organizations (CBOs) to facilitate non-formal, participatory education concerning water conservation, health, sanitation, and hygiene, and to promote the project at the community level;*
- *direct household assistance for on-site water and sanitation systems and connections to municipal water and sewerage systems;*
- *data compilation and assessment;*
- *development and piloting of primary and secondary school water and health curriculum; and*
- *development and implementation of a water/health media campaign.*

This program is directed by CERM Program

also investigated culturally-preferred herbs, medicinals, and utensils. A significant finding of his work was that the ink on Mexican produced packaging contained lead and consequently was a potential threat to consumers.

- **Other Activities.**
  - CERM Home Page. The Center has an active presence on the Internet. Its address is www.cerm.utep.edu.
  - Geographic Information Systems (GIS)**.** The Center worked to address a perceived weakness in the University's environmental capabilities by coordinating the development of Geographic Information Systems. We continue to work closely with UTEP's Pan American Center for Earth and Environmental Studies and Texas Centers for Border Economic Development to make GIS technology available to appropriate environmental programs.
  - Support of EPA Region 6, the El Paso Border Office, and Texas Natural Resource Conservation Commission (TNRCC). CERM has established good working relationships with EPA Region 6: the EPA Border Office in El Paso; TNRCC, both in Austin and El Paso; and the Border Environment Cooperation Committee (BECC). When necessary, we have assisted these agencies in the conduct of their business in El Paso.
  - The Rio Bosque Wetlands Park. UTEP is working together to create a public wildlife refuge park and waterfowl habitat to provide unique recreational and educational experiences for the residents of the El Paso region. The park uses treated effluent from a municipal wastewater treatment plant to establish a 372 acre moist soil managed wetland. CERM is responsible for overall project management. Project partners include the City of El Paso; Ducks Unlimited; and the International Boundary and Water Commission.
  - CERM staff members are involved in a wide variety of other programs and issues and many times volunteer their time to community efforts. Among them are:
    - U.S.-Mexico Joint Advisory Committee (JAC) on Air Quality Improvement for the El Paso, Texas-Sunland Park, New Mexico-Ciudad Juarez, Chihuahua Airshed is an official, binational committee that addresses the issue of improving the air in this international community. Dr. Chip Groat, former CERM Director, was a member of this committee. Assistant Director Bob Currey was his alternate. Dr. Wen-Whai Li, CERM Air Quality Scientist, will be appointed to the committee at its next meeting in May.
    - Good Neighbor Environment Board. The GNEB is an advisory board to the President, the Congress, and the EPA concerning environmental priorities on the U.S.-Mexico border. Dr. Chip Groat, former CERM Director, was a member of this committee. Assistant Director Bob Currey was his alternate.
    - The Far West Texas Water Planning Board. Mr. Tom Martin, CERM Science Advisory Board, is the industry representative to this board. Former Director Groat was also a member .

- Clean Cities Coalition. El Paso and Juarez constitute the only international community participating in this DOE program.
- Paso del Norte Air Quality Task Force -- a grass-roots organization comprised of air quality professionals and concerned citizens residing in the common airshed of El Paso, TX; Ciudad Juarez, Chihuahua; and Sunland Park, New Mexico. CERM staffers Bob Currey and Bob Gray have been active in this organization.
- Sierra Club. Associate Director Wesley Leonard has served as president of the local chapter.
- El Paso Solar Energy Association -- Energy Center staff members have served as officers and continue as advisors in the association's programs. Through their efforts the association assisted Habitat for Humanity of El Paso to build the first EPA Energy Star home in El Paso.
- Other organizations, in which CERM staff members hold membership or officer positions, include:
    - El Paso Hispanic Chamber of Commerce
    - American Planning Association
    - American Institute of Certified Planners
    - Ground Water Foundation
    - Habitat for Humanity of El Paso
    - El Paso Community Health Policy Development Committee
    - Mexican American Engineers and Scientists
    - Texas Alliance of Minority Engineers
    - Rio Grande/Rio Bravo Alliance
    - New Mexico Wilderness Alliance
    - Franklin Mountains Wilderness Coalition
    - Chihuahuan Desert Wildlife Rescue
    - Ducks Unlimited, El Paso Chapter
    - El Paso/Trans-Pecos Audobon Society
    - Franklin Mountains Wilderness Coalition
    - NEPA Steering Committee for El Paso - Las Cruces Regional Sustainable Water Project
- CERM staff members have made presentations to numerous local organizations and schools.

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Table 1

Projects Supported by Cooperative Agreement CR 819848-01		
Research, Education, Outreach and Policy Projects		
Project Title	**Principal Investigator**	**Status**
Investigation of Heat and Mass Transfer in Hazardous Substance Containment Facilities	M.C. Robbins, Ph.D., Dept of Mech & Ind Engr	Complete
Flow Through Flaws in Impermeable Barriers	J. Walton, Ph.D., Dept of Civil Engr	Complete
Octanol/Water Partition Coefficients	W. Herndon, Ph.D., Dept of Chemistry	Complete
Environmental Justice, Hispanics, and the Disposal of Hazardous Wastes in the El Paso Region	C.R. Bath, Ph.D., Dept of Pol Sci	Complete
Long-term Performance of Cementitious Waste forms in the Unsaturated Zone: the Role of Soil Gasses.	J. Walton, Ph.D., Dept of Civil Engr	Complete
Bioremediation of Chromium in Contaminated Soils and Potential Application to the Bioremediation of Cr(vi) Contaminated Sites	P. Goodell, Ph.D., Dept of Geology	Complete
Cyanobactorial Bio-reactors for Removal of Heavy Metals from Contaminated Soils and Streams	R. Webb, Ph.D., Dept of Biology	Complete
Removal and Selective Recovery of Heavy Metal Ions from Superfund Sites Using Biological Materials	J. Gardea-Torresdey, Ph.D., Dept of Chemistry	Complete
Development of Risk Assessment and Risk Communication Methods for the US-Mexico Border	J. VanDerslice, Ph.D., School of Public Health (Univ of Texas Health Sci Ctr at Houston, El Paso satellite program)	Complete
Management of Waste Brines from Desalination of Ground Water	J. Walton, Ph.D., Dept of Civil Engr Walton	Complete
A Cost Benefit Study for the Inclusion of Wind Generated Electricity into El Paso County	Emil Moroz, Dept of Mech & Ind Engr	Complete
Aqua Para Beber Support Study: Socio-Cultural Impediments to Adoption of Household Drinking Water Disinfection and Safe Hygiene Practices in the El Paso-Juarez Area	Ms Amy Liebman, CERM	Complete
Implementing a Trans-Border Air Pollution Emission Reduction Credit Program in the El Paso-Juarez International Airshed	Ronald Ketter, Ph.D., Dept of Political Sci	Complete

Development of a GIS System for Investigating Environmental Impacts on Public Health	J. VanDerslice, Ph.D., School of Public Health (Univ of Texas Health Sci Ctr at Houston, El Paso satellite program)	Complete
Validation of a Wind Field Model for the El Paso-Juarez Airshed	Rosa Fitzgerald, Ph.D., Dept of Physics	Complete
Colonia Self-Help Septic Tank Project	Jeffrey Brannon, Ph.D., Dept of Econ & Fin	Complete
Capacity Building for Community-Based Organizations Implementing Water and Hygiene Projects	Ms Amy Liebman, CERM	Complete
Brine Management Using Salinity Gradient Solar Pond Technology	J. Walton, Ph.D., Dept of Civil Engr	Ongoing
Continued Study of Alfalfa Phytofiltration Technology to Clean Heavy Metal Contaminated Waters	J. Gardea-Torresdey, Ph.D., Dept of Chemistry	Ongoing
Wetlands Test Site – Fresh Water Research Program	J.A. Sproul, CERM	Ongoing
Biodegradation of Chlorinated Alkenes and Chlorinated Benzenes by Aerobic Microbial Metabolism	N. Guentzel, Ph.D., Division of Life Sciences, University of Texas at San Antonio	Complete
Establishment of an Internet World Wide Web Node	E. Hutson & O. Covarrubias, CERM	Complete
Characterization of Wind Field for the Paso del Norte Air Quality Basin Using High-Resolution Grids and Data from Multiple Meteorological Monitoring Stations	R. Fitzgerald, Ph.D., Physics W-W Li, Ph.D., Civil Engr	Ongoing
Faculty Development and Planning Grants		
Developing Model Legal Agreements and Management Strategies for Environmental Protection on the U.S.-Mexico Border	W. Weaver, Ph.D., & P. Frederickson, Ph.D., Dept of Political Sci	Complete
The Human Resources of the Rio Grande Ecosystem: Evaluating Human/Environment Interaction and Management Options in the Desert Borderlands	J. Peterson, Ph.D., & P. Vila, Ph.D., Dept of Soc and Anthro	Complete
Minimization of Border Manufacturing Hazardous Waste Generation	R. Quintana, Ph.D., Dept of Mech & Ind Engr	Complete
State Politics, Administrative Context, and the Siting of Hazardous Waste Facilities	J. Clingermayer, Ph.D., Dept of Pol Sci	Complete
Potential Role of Controlled-Source Seismology in Evaluating Direction of Fluid Flow and Contaminant Migration in Arid Regions	K. Miller, Ph.D. Dept of Geological Sciences	Complete

Recharge Potential and Environmental Protection of Mountain Front Recharge Areas in the El Paso, Texas Region	G. Ohlmacher, Ph.D., Dept of Geological Sciences	Complete
Pilot Study: Determination of the Ability of the Rotifer Brachionus Calyciflorus to Bioaccumulate Toxicants from Freshwater Ecosystems	E. Walsh, Ph.D., Dept of Biological Sciences	Complete

Table 2			
Selected CERM Projects Funded by Other Sources			
Title	**PI**	**Funding Source**	**Status**
Binational Study of Water Requirements and Resources in the El Paso/Cd. Juarez Region	Dr. Stephen Riter & C. Wesley Leonard CERM	SCERP	Complete
The Rio Grande River as a Potable Water Source: An Evaluation of Anthropogenic Contaminant Occurrence, Fate, Removal, and DBP Formation	Dr. Charles Turner Civil Engr	SCERP	Complete
Rio Grande Sediments: Adsorption and Desorption of Strontium, Lead, and Cesium	Dr. Hector Fuentes & Dr. Charles Turner Civil Engr	SCERP	Complete
Disinfection By-Product Removal from Recycled Waste Water	Dr. Anthony J. Tarquin Dr. Charles Turner Civil Engr	SCERP	Complete
Eco-Toxicological Impact of Agricultural Chemicals on the Rio Grande Corridor	Dr. Roger Case Dr. Carl Lieb Biology	SCERP	Complete
Characterization of Unsaturated Zone Geological and Hydrological Properties in the El Paso-Juarez Border Region	Dr. Mark R. Baker Geology	SCERP	Complete
Exploring Some Fundamental Issues in Corrosive Waste/Container-Materials Interactions	Dr. L.E. Murr Metallurgy & Mat'l Sci	SCERP	Complete
United States and Mexico Southwest Borderwide Environmental Problems, Needs and Action Priorities,	Dr. Donald A. Michie Marketing & Mgmt	SCERP	Complete
An Analysis of Lead Exposure During Pregnancy and the Neonatal Period Among Indigent Hispanic Women	Dr. Maria Amaya Nursing & Applied Hlth	SCERP	Complete
HAZMAT: Border Research and Policy Issues	Dr. Donald A. Michie Marketing & Mgmt	SCERP	Complete
Upper Atmosphere Wind and Temperature Profile Data for the El-Paso-Juarez Airshed	Dr. Jack Smith EE	SCERP	Complete
Study of Brick Kiln Designs and Development of Technical Courses for the Brickmakers Training Center in Cd. Juarez	Nancy Lowery CERM	SCERP	Complete

The Provision of Safe Drinking Water for Low Income Border Communities Using Appropriate Water Purification/Waste Water Techniques	Wesley Leonard Amy Leibman CERM	SCERP	Complete
Lead and Folic Acid Levels in Pregnant Women in Cd. Juarez	Dr. Maria Amaya Nursing & Appl Hlth	SCERP	Complete
Characterization of Border Crossing Vehicles	Dr. Ryan Wicker Mech & Ind Engr	SCERP	Complete
Prevention of Air Contamination: VOC Reduction in Paint and Body Shops in Juarez	Jan Hartman CERM	SCERP	Complete
Quantitative Analysis of Dynamic Video Images and Static Images of the Paso Del Norte Air Basin: Years 1992-1994	Dr. Chuck Turner Dr. Jim Parks Civil Engr	SCERP	Complete
The Border Basket: Analysis of Toxic Metals in Retail Foods, El Paso-Juarez	Dr. N Pingitore Geology & Dr. Maria Amaya, Nursing	SCERP	Complete
Trans-border Visibility Analysis: Quantitative Analysis of Dynamic, Multi-site Video Images of the Paso del Norte Airshed: Years 1995-1996	Dr. Chuck Turner & Dr. Jim Parks Civil Engr	SCERP	Complete
Coordination and Transfer of Research Efforts to the Brick makers Training Center in Cd. Juarez	Nancy Lowery	SCERP	Complete
Water Quality and Coupling Between Surface and Ground Water: West Texas, Southern New Mexico, and Northern Chihuahua	Dr. John Walton Civil Engr & Dr. Greg Ohlmacher Geology	SCERP	Complete
Identity, Elemental/Isotopic Composition, and Origin of Particulates in El Paso-Juarez Air, 1968-1998	Dr. Nick Pingitore Geology & Dr. J. Gardea Chemistry	SCERP	Ongoing
Prevention of Childhood Toxic Lead Exposure in a US-Mexico Border Community	Dr. Maria Amaya Nursing & Appl Hlth	SCERP	Ongoing
Binational Community-University Partnership for Environmental Health Education in Mexico	Amy Liebman CERM	SCERP	Ongoing
Interactive Teaching of El Paso Air and Water Quality Concerns	Dr. John Walton Civil Engr	SCERP	Ongoing
Water Desalination and SOC Removal Using Low Pressure Reverse Osmosis	Dr. Chuck Turner Civil Engr	SCERP	Ongoing

An Expert Systems Approach to Managing and Minimizing the Consequences of Accidental Chemical Spills in the US- Mexico Border Region	Dr. Wen-Whai Li Civil Engr	SCERP	Ongoing
Analysis of Issues in the Development of a Public Environmental Information Network in the Texas-Mexico Border	Dr. Dennis Soden Pol Sci	SCERP	Ongoing
Teacher Enhancement & Community Awareness in Air & Water Quality Education In El Paso	Ms. Elsa Villa College of Engr	SCERP	Ongoing
Survey of Riparian Habitats along the Rio Grande	Dr. Susan Watts Biology	SCERP	Ongoing
Development of a Hybrid Electrical Power System Using a Wind Turbine & a Spark Ignited Engine for Air Pollution Mitigation & Water Conservation in the EP-Juarez Region	Dr. Ryan Wicker Mech & Ind Engr	SCERP	Ongoing
Characterization of Ambient (Fine) Particulate Matter in the Paso del Norte Region	Bob Currey, CERM & Dr. Wen-Whai Li, CE	SCERP	Ongoing
Proposal for Investigation of Potential Hazards to Groundwater Created by Illegal Dumping in the Rio Grande Alluvial Aquifer, El Paso County, Texas	Dr. Richard Langford Geology	HBCU/MI (DOE)	Complete
Pollution Prevention Technology to Clean Heavy Metal and Organic Contaminants from Waters (Study of Alfalfa Phytofiltration Technology to Clean Heavy Metal Contaminated Waters)	Dr. Jorge Gardea Dr. Kirk Tiemann Chemistry	HBCU/MI (DOE)	Ongoing
Three Dimensional Analysis of Flow in Earth Fissures: An Estimate of Vertical Versus Lateral Transport	Dr. Richard Langford Geology	HBCU/MI (DOE)	Completed
Induced Subsurface Mineral Growth to Sequester Radionuclides and Toxic Elements by Coprecipitation with Calcite	Dr. N. Pingitore Geology & Dr. John Walton Civil Engr	HBCU/MI (DOE)	Ongoing
Binational Community-University Partnership for Environmental Health Education	Amy Liebman CERM	EPA	Ongoing
When Water Works for Health	Amy Liebman CERM	Paso del Norte Health Foundation	Ongoing
HAZTraks	R. Gray, CERM	EPA Region 6	Ongoing

Solar and Waste Heat Desalination by Membrane Distillation	Dr John Walton, CE Dr Charles Turner, CE Mr. H. Lu, CERM	US Bureau of Reclamation	Ongoing
Thermal Desalination Using MEMS and Salinity Gradient Solar Pond Technology	Dr. John Walton, CE Mr. H. Lu, CERM	US Bureau of Reclamation	Ongoing

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Appendix 1 -- Vita: C. Wesley Leonard, Acting Director

C. Wesley Leonard
Acting Director, Center for Environmental Resource Management

Title/Dept.: Director, The Energy Center
Associate Director, Center for Environmental Resource Management

University: The University of Texas at El Paso

Education: B.A., 1961, Sociology/Anthropology, Emory University, Atlanta, GA.

Research Interests: Energy, water and environmental policy analysis; environmental education; solar and other renewable energy technologies; energy efficiency; technology transfer of appropriate energy and water technologies.

General Background: After pursuing a career in marketing and advertising for a number of years, Mr. Leonard became energy coordinator for the City of El Paso, Texas in 1978. In this position, he developed energy conservation and efficiency programs which resulted in hundreds of thousands of dollars in savings for the City. Mr. Leonard joined the professional staff at the University of Texas at El Paso (UTEP) in 1988 and is presently Director of UTEP's Energy Center and Associate Director of the Center for Environmental Resource Management (CERM). In this capacity, he administers energy and environment-related programs with budgets of more than $12,000,000. In addition, Mr. Leonard is immediate past chairman of the Management Committee of the Southwest Center for Environmental Research and Policy (SCERP), a nine-university consortium whose mission is to address the environmental problems plaguing the U.S.-Mexico border region. Mr. Leonard's administrative specialization is the development, implementation and management of complex, multi-disciplinary projects. His primary research interests are solar and other renewable technologies, environmental policy, and technology transfer of appropriate energy and water technologies.

Grants and Contracts Experience: Since 1988, principal investigator or co-principal investigator of twenty-five funded projects at the University of Texas at El Paso, with budgets totaling more than $10,000,000. The primary focus has been on the utilization of low-cost renewable/appropriate technologies for housing and water in the colonias in the U.S.-Mexico border region. A secondary emphasis has been on securing funding for programs to develop minority students as environmental/energy scientists and engineers.

Sample Publications:

Gilliland, M. and W. Leonard, "Energy Planning at the Local Level," Resources and Conservation, Vol. 8 (1983), pp. 253-269.

Swift, A., P. Golding and W. Leonard, "Commercialization of Solar Ponds," Solar Today, July-August 1990, pp. 17-18.

Swift, A., P. Golding, C. W. Leonard, "Research Toward Commercialization at the El Paso Solar Pond," ASES, Solar 90, Proceedings, Ed. by Burley and Coleman, Austin, TX., March 1990, pp. 71-75.

Swift, A., P. Golding, C.W. Leonard and R. L. Reid. "The Research and Development Program at the El Paso Solar Pond." In Proceedings of the Second International Conference, Progress in Solar Ponds, Rome, Italy, March 25-30, 1990, pp. 255-74. Edited by S. Folchitto and P. Principi. Rome, Italy: Agip Petroli, 1990.

Energy Use in El Paso, with K. Bombach and M. Gilliland, City of El Paso, 1981.

Municipal Energy Management, with G. DeVore and P. Callsen, City of El Paso, 1981.

Energy Options and El Paso's Economy, with K. Bombach and M. Gilliland, City of El Paso, 1982.

Appendix 2 – Science Advisory Board

Biographical Sketches:

Dr. Paul Ganster
San Diego State University

Dr. Richard Howe
University of Texas at San Antonio

Dr. Robert Parmenter
University of New Mexico

Dr. David Pijawka
Arizona State University

Dr. Adel F. Sarofim
University of Utah

Mr. Thomas E. Martin
Environmental Manager, ASARCO Incorporated,
El Paso, Texas

PAUL GANSTER
Professor of History
Director of the Institute for Regional Studies of the Californias
San Diego State University

Paul Ganster holds a B.A. from Yale University and a Ph.D. in history from UCLA. He is author of more than forty articles, book chapters, and editor of works on policy questions of the U.S.-Mexican border region, border environmental issues, Latin American social history, and comparative border studies. Recent works include "Environmental Implications of Population Growth in the San Diego-Tijuana Region" and "Sustainable Development in San Diego and Tijuana: A View from San Diego" (both forthcoming, Center for U.S.-Mexican Studies, University of California at San Diego, 1998); "Environmental Issues of the California-Baja California Border Region" (San Diego State University, 1996); and editor, with A. Sweedler, J. Scott, and W. Eberwein, of “Borders and Border Regions in Europe and North America” (SDSU 1997).

Prior to joining SDSU in 1984, Dr. Ganster was Coordinator of Mexico Programs at UCLA, and he has taught at Utah State University, the Universidad de las Américas in Puebla, Mexico, and the Universidad de Costa Rica, in San José, Costa Rica. He has served as a consultant on programmatic development for universities in Mexico, Bolivia, Costa Rica, and Ecuador.

Dr. Ganster has served on a number of regional advisory boards for organizations dealing with the border region. He is Chair of the Environment and Health Committee of the Border Trade Alliance, a border-wide trade organization. He is Principal Investigator and a member of the Management Committee of the Southwest Center for Environmental Research and Policy, a Congressionally funded consortium of U.S. and Mexican universities for applied research on border environmental issues. He is former Vice President and current board member of PROFMEX, the Consortium for Research on Mexico. Dr. Ganster is on the San Diego Association of Governments Committee on Border Region Opportunities (COBRO), and was recently on the Citizens' Committee on the Parallel Conveyance System for the Border Environment Cooperation Commission (BECC) and the State Commission for Public Services of Tijuana (CESPT). He is a member of the advisory board of the Center for Small Business and International Trade at Southwestern College and the advisory board for the San Diego Museum of Contemporary Art border art project.

Dr. Ganster is Research Associate at the UCLA Program on Mexico and served as Executive Secretary of the Conference on Latin American History for a five-year term and as President of the Association of Borderlands Scholars for a two-year term. He is co-editor of the Journal of Borderlands Studies, now published by SDSU Press. Dr. Ganster also has been a visiting professor at the School of Economics of the Universidad Autónoma de Baja California in Tijuana.

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RICHARD S. HOWE
Professor, Division of Engineering
University of Texas at San Antonio

Richard Howe received his B.S. in Civil Engineering at the University of Kentucky, his S.M. in Sanitary Engineering at Massachusetts Institute of Technology, his M.S. in Water Resource Management and Urban and Regional Planning, as well as his Ph.D. in Resource Management, from the University of Wisconsin-Madison. Dr. Howe has been at the University of Texas at San Antonio (UTSA) since 1976, serving as a professor in the Division of Engineering, and Professor and Director of the Division of Environmental Studies. He also is assigned to the graduate programs in Environment Science and Management of Technology, and continues to Direct the Alliance for Education. He has held Adjunct Professorial appointments at both the University of Texas at Austin and the University of Texas Health Science Center.

Prior to joining UTSA, Dr. Howe was an Associate Professor in the School of Public and Environmental Affairs at Indiana University, Bloomington, Indiana. He also served the City of Chicago as Acting Deputy Commissioner and Director of Planning and Research in the Department of Environmental Control.

Dr. Howe is active in a number of professional organizations. His memberships include: the American Academy of Environmental Engineers, Diplomate; American Society of Civil Engineers, Fellow; American Society for Public Administration; American Planning Association; American Water Works Association; National Society of Professional Engineers; Water Environment Federation (formerly (WPCF); Texas Section, American Society of Civil Engineers, and the Texas Society of Professional Engineers.

He is the author of numerous publications, the most significant include: “Design San Antonio: A Grassroots Model,” with Boone Powell, published in the Design Management Journal, Vol. 4, No. 3, Summer 1993; “The Politics of Nonpoint Pollution Control: A Local Perspective,” published in the Journal of Soil and Conservation, Vol. 40, No. 1, Jan/Feb. 1985; and “San Antonio Maps Its Energy Future,” published in Public Power, Jan/Feb. 1984.

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ROBERT R. PARMENTER
Associate Professor of Research, Department of Biology
Director, UNM Sevilleta Field Research Station
University of New Mexico, Albuquerque

Robert Parmentor received his B.A. in biology at Colorado College, his M.S. in zoology at the University of Georgia, and his Ph.D. in biology and ecology at Utah State University. His research focuses on ecosystem disturbance and restoration, climatic influences on plant and animal populations, successional processes, plant-animal interactions, predator-prey relationships of both vertebrates and invertebrates, decomposition and nutrient cycling, and the ecology of zoonotic diseases.

Dr. Parmenter is active in a number of scientific and professional societies, includingThe Ecological Society of America, serving as Chair of the Long-Term Studies Program, member of the Officers Nominations Committee, and local program chair for the national meeting in 1997; the Entomological Society of America, the American Society of Mammalogists, serving on the Committee for Animal Care and Use in Research; and the Coleopterists Society. He has served as a review panel member and a proposal reviewer for a number of programs of the National Science Foundation and as manuscript reviewer for scientific journals, including *Biology and Fertility of Soils, Coleopterists Bulletin, Ecography, Ecology, Ecological Applications, Environmental Entomology, Journal of Arid Environments, Journal of Herpetology, Journal of North American Benthological Society, Journal of Wildlife Management, Oecologia, Oikos Pedobiologia, the Prairie Naturalist*, and *Proceedings of the Kansas Entomological Society.* He is the author of over 30 scientific journal articles.

Dr. Parmenter has been the principal investigator for numerous grants from the National Science Foundation, the National Park Service, NASA, USDA Forest Service, the Department of Defense (USAF). In addition to his research and participation on graduate student committees, Dr. Parmenter teaches courses at UNM in Desert Field Biology and Ecosystem Research Techniques. At Utah State University he taught General Ecology, Field Ecology, Mammalogy, Herpetology, Human Physiology, General Biology, and Public Health.

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K. DAVID PIJAWKA
Professor, School of Planning and Landscape Architecture and Center for Environmental Studies, Arizona State University

David Pijawka holds a B.A. in Geography, Brock University, Canada; a M.A. in Geography, Clark University, MA; Ph.D. in Geography, Clark University, MA.

Dr. Pijawka's professional experience includes: (1998) Acting Director, School of Planning and Landscape Architecture; Professor in Planning (1995-present); Professor, Center for Environmental Studies; Interim Director, Center for Environmental Studies (1995-1996); Professor of Public Administration, School of Public Affairs (1992-1995); Associate Professor of Public Affairs (1987-1992); Assistant Director, Center for Environmental Studies (1982-1995). He has supervised graduate students as follows: several Ph.D. students completed, 15 Masters Students completed. One masters student nominated by department as outstanding thesis at ASU.

His research interests are environmental risk assessment and hazard management; environmental policy; environmental perception and behavior studies; socioeconomic impact analysis; siting and equity assessments; recycling and waste management; and sustainable development and design.

Dr. Pijawka's professional activities include the following: 1997-, Co-Principal Investigator, Central Arizona - Phoenix Long-Term Ecological Research project; Co-Principal Investigator Sustainability Design Study for U.S. Environmental Protection Agency; Principal Investigator for Nuclear Waste Siting Study; Principal Investigator on Environmental Showcase Home Study (Life-cycle analysts). Director and principal editor, *Recycling Review* (1992-present); Director of Research, Office of Hazards Studies, ASU (1990-1996); Co-Principal Investigator, Socioeconomic Impacts of Siting the High-level Nuclear Waste Repository (on leave), funded by Department of Energy; Review Committee, International Nuclear Waste Conference, NRC; Committee on Transportation of Hazardous Materials, NAS-Transportation Research Board; Member, Governor's Commission on Arizona's Environment; Member, Arizona Comparative Environmental Risk Project; Editor, Special Issue, Policy Studies Review, 1991; Principal Investigator, Southwest Center for Environmental Research and Policy (1995, 1996) and Management Committee Member, EPA funded environmental research on the US - Mexico border region, (1995-1999).

Relevant publications include:

Pijawka, K.David., and others. 1991. *Regional Waste Stream Analysis for Solid Waste* M*anagement*. Maricopa Association of Governments. 179 pages.

Flynn, J., J. Chalmers, R. Kasperson, H. Keureuther, K. D. Pijawka, and P. Slovic. 1995. *One hundred years of solitude: redirecting America's high-level nuclear waste policy.* Westview Press, Boulder, CO.

Pijawka, D., and K. Shetter. 1995. *The environment comes home.* University of Arizona Press and Herberger Center for Design Excellence.

Pijawka and others. 1995. Design of routing networks Using GIS: applications to solid and hazardous waste planning. *Transportation Research Record*.

Pasqualletti, M., and D. Pijawka. 1996. Unsiting nuclear power plants: decommissioning, risks, and their land use context. *Professional Geographer* 48(1):57-69.

CoAuthors Not Listed Above: P.Slovic, R. Kasperson, R. Kates, A. Mushkatel, H. Kunreuther, J. Hall, E. Radwan, T. Glickman, among others.

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ADEL F. SAROFIM
Presidential Professor, College of Engineering
University of Utah

Adel F. Sarofim is Presidential Professor in the College of Engineering, University of Utah and Senior Technical Advisor to Reaction Engineering International in Salt Lake City. He was affiliated with MIT from 1958-1996: as an Instructor in Chemical Engineering in 1958 and 1960; Assistant Professor in Chemical Engineering from 1961-1967; Associate Professor from 1967 to 1972; and Full Professor in Chemical Engineering since 1972. He held the position of Lammot du Pont Professor of Chemical Engineering at MIT from 1989-1996, Emeritus from October 1, 1996.

Dr. Sarofim has been a Visiting Professor at Sheffield University, England, the University of Naples, Italy; and at the California Institute of Technology. Dr. Sarofim is the author and co-author of over 200 papers on the subjects of radiative heat transfer, furnace design, circulation patterns in glass melts, the freeze process for desalination, nitric oxide formation in combustion systems, combustion generated aerosols, soot and polycyclic aromatic hydrocarbon formation, and the characterization of carbon structure and reactivity.

He received the Sir Alfred Egerton Gold Medal from the Combustion Institute in 1984; the Kuwait Prize for Petrochemical Engineering in 1983; the Walter Ahlström Environmental Prize of the Finnish Academies of Technology in 1993; the Senior Thermal Engineering and the Towend-BCURA Awards of the Institute of Energy in 1994; the University of Pittsburgh's 1995 Award for Innovation in Coal Conversion; the U.S. Department of Energy's 1996 Homer H. Lowry Award in Fossil Energy, and the Coal Division of the American Institute of Mining, Metallurgical, and Petroleum Engineers, the American Society of Mechanical Engineers' 1996 Percy Nicholls Award, the 1998 Lawrence K. Cecil Award of the Environmental Division of the American Institute of Chemical Engineers,and an honorary doctorate in chemical engineering from the University of Naples "Federico II" in 1998. He was the Hoyt C. Hottel Lecturer at the Combustion Institute in 1986 and the Lacey Lecturer at the California Institute of Technology in 1987.

Center

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THOMAS E. MARTIN
Environmental Manager
ASARCO Incorporated, El Paso, Texas

Thomas Martin received his professional Metallurgical Engineering Degree at the Colorado School of Mines. Areas of his expertise include plant management, project management and maintenance, cost controls, material handing and sampling, and non-ferrous process metallurgy. His environmental expertise includes permitting of air and hazardous waste injection well, supervision and expert witness for contested cases, compliance, fuel spill groundwater interception and remediation, PCB compliance, negotiation of administrative consent orders, environmental audits, environmental management system development, governmental affairs and public relations.

Mr. Martin has been with ASARCO, Incorporated since 1969. ASARCO is one of the world's leading integrated producers of nonferrous metals, principally copper, lead, zinc, silver, and gold. ASARCO also produces specialty chemicals, minerals, and other industrial products, and provides environmental services. Mr. Martin has held ASARCO positions of General Superintendent, Reorganization Project Manager, Maintenance Manager, Technical Services Manager, and the position he currently holds, Environmental Manager. He is responsible for all environmental affairs at the company's El Paso Plant and participates in and supervises all negotiations with appropriate agencies on compliance matters. In addition, he is responsible for regulation development and management of the company's involvement with environmental legislation development for both the El Paso and Amarillo copper plants.

U.S. EPA appointed Mr. Martin to the Joint Advisory Committee for Air Quality Improvement of the El Paso-Ciudad Juarez-Dona Ana County Air Quality Management Basin (formed as a follow-on to the La Paz Agreement). He serves on the Advisory Council of the Southwest Center for Environmental Research and Policy (SCERP) and is a member of the following professional associations: Air and Waste Management Association and The Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers. He also serves as the industry representative to the Far West Texas Water Planning Board.

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Appendix 3 – UTEP Internal Advisory Committee

Biographical Sketches

Dr. Stephen Riter
Provost and Vice President for Academic Affairs

Dr. Thomas E. Brady
Dean of the College of Science

Dr. Andrew H.P. Swift Jr.
Dean of the College of Engineering

STEPHEN RITER
Provost and Vice President for Academic Affairs
University of Texas at El Paso

Stephen Riter received his B.A. and B.S.E.E. at Rice University and his M.S.E.E. and Ph.D. from the University of Houston. He came to the Electrical Engineering Department at the University of Texas at El Paso (UTEP) in 1980 as Chair and Professor. He has served as Director of the Center for Environmental Resource Management, MacIntosh Murchison Professor of Engineering, Director of the Institute for Manufacturing and Materials Management, Dean of the College of Engineering, and Interim Vice President for Academic Affairs before being named to his current position. His research interests are in the areas of Environmental Policy and Technology Transfer.

Prior to coming to UTEP, Dr. Riter was with Texas A&M University where he was a Professor in the Electrical Engineering Department, and served as Associate Director of the Center for Energy and Mineral Resources and Associate Director of the Center for Urban Programs.

Dr. Riter has a record of extensive professional and public service. He has served on the Policy Advisory Committee of the Houston Advanced Research Center; Executive Committee, Engineering Deans Council of the American Society for Engineering Education; Chair, Educational Advisory Committee, Texas State Board of Registration for Professional Engineers; Chair, Texas Deans of Engineering; Executive Committee Member and Board of Directors, Texas Society of Professional Engineers; and numerous committees for IEEE. Public service has included serving on the Texas Interagency Task Force on Border Health and Environmental Issues; the Water Conservation Committee of the El Paso Public Service Board; the Policy Advisory Committee of the Texas Dept. of Community Affairs; and the University Coordinating Committee, Texas Energy and Natural Resources Advisory Council. In addition, he has served on a variety of permanent and ad-hoc committees within the University, including search committees for Deans and Vice Presidents. He served as Chair of University Entrance Committee, Undergraduate Program Self Study for Southern Association Accreditation, and Chair for University and Pre-College Mathematics Improvements Initiatives.

Dr. Riter was selected West Texas Engineer of the Year, received the Conquistador Award from the City of El Paso, and was named Halliburton Professor at Texas A&M University. He is the author of over forty publications

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THOMAS E. BRADY
Dean, College of Science
University of Texas at El Paso

Thomas Brady received his B.A. in biology and philosophy at Beloit College, Beloit, Wisconsin, and his M.S. and Ph.D. in biology from Yale University. He has been the Dean of the College of Science at the University of Texas at El Paso (UTEP) since 1997.

Before coming to UTEP, Dr. Brady was at the National Science Foundation in Washington, D.C. There, he served in a number of capacities including Senior Science Associate and Executive Officer of the Directorate for Biological Sciences; Director, Division of Environmental Biology; Deputy Director and Acting Director of the Division of Integrative Biology and Neuroscience; Cluster Leader, Developmental Mechanisms Cluster, and Director, Plant and Microbial Development Mechanisms Program, Division of Integrative Biology and Neuroscience.

Previous experience included positions as Senior Research Fellow, Department of Plant Cytology and Morphology, Landbouw Universiteit, Wageningen, The Netherlands; Stone Professor of Biology, Professor, and Chair, Biology Department, Hamilton College, Clinton, New York; Harry Pierce Visiting Research Professorship, Department of Biology, Technion – Israel Institute of Technology, Haifa, Israel; and Assistant/Associate Professor, Department of Biological Sciences, Texas Tech University.

Dr. Brady has had extensive professional affiliations and service to the U.S. scientific community. He served on the Biotechnology Research Subcommittee (BRS) of the National Science and Technology Council, which published *Biotechnology for the 21st Century: Realizing the Promise*. He co-chaired the Agriculture Working Group of BRS whose report became part of the publication *Scientific Opportunities in Biotechnology*. He was the NSF representative for the USDA-Agricultural Biotechnology Research Advisory Committee. He developed the Memorandum of Understanding, Management Plan, and Program Announcement for the NSF-Sloan Foundation Molecular Evolution Postdoctoral Program. In addition, he has been active on the Federal Subcommittee on Science, Math, Engineering, and Technology Education (SMETE), in both the undergraduate working group and the Education and Human Resources Program, Planning, and Budget Working Group.

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ANDREW H. P. SWIFT, JR.
Dean, College of Engineering
Professor of Mechanical Engineering
Macintosh Murchison Chair in Engineering
University of Texas at El Paso

Andrew Swift received his B.S. in Mechanical Engineering and Mathematics at Union College, Schenectady, New York. He received his M.S. and D.Sc. in Mechanical Engineering from Washington University, St. Louis, Missouri. He has been Dean of the College of Engineering at the University of Texas at El Paso (UTEP) since 1996, and a member of the UTEP faculty since 1983.

Dr. Swift's professional experience includes affiliation with the U.S. Army Corps of Engineers, St. Louis District, where he assisted in the design, implementation and analysis of energy conservation and alternative energy programs and hardware. He has provided consulting services for the Department of Energy, Wind Energy Program and the Electrical Power Research Institute in Palo Alto, California. He holds a patent for the TEETER Code, a wind turbine design and analysis code for two-bladed, teetered wind turbine rotors, and is the author of over 70 publications in the area of renewable energy systems design, analysis and testing. With E. Moroz, Dr. Swift co-authored the chapter on "Wind Turbines" in *The Engineering Handbook*.

Dr. Swift received the American Wind Energy Association's Academic Award in 1995 for "Continuing contributions to wind energy technology as a teacher, researcher, and author." He was awarded the Associated Western University Faculty Fellowship with the National Renewable Energy Laboratory , and he received the Best Technical Paper Award from the American Society of Mechanical Engineers, Solar Energy Division in 1991-92.

Active in scientific and professional societies, Dr. Swift is a member of the Society of Mechanical Engineers (ASME), having served on the Energy Committee, Chair of the Wind Energy Technical Committee, and as a Member of the Executive Committee of the ASME Energy Sources Technology and Exhibition. He served as Technical Editor for the Journal of Solar Energy Engineering, Solar Ponds, and OTEC; he is a member of the Sigma Xi Research Society and served as Chair of the UTEP Chapter Nominating Committee. Other memberships include Tau Beta Pi, Honorary Engineering Society; Pi Tau Sigma Engineering Society; American Wind Energy Association; Texas Solar Energy Society; American Society for Engineering Education; American Solar Energy Society (ASES), having served as a member of the ASES Local Organizing Committee for 1990 and chair of the 3rd International Solar Pond Congress in 1993.

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Appendix 4

Environmental Science and Engineering Ph.D. Program Faculty

ENVIRONMENTAL SCIENCE AND ENGINEERING Ph.D. PROGRAM FACULTY

DIRECTOR

Jorge Gardea-Torresdey, Ph.D., Professor of Chemistry, 1994
B.S., Autonomous University of Chihuahua; M.S., Ph.D., New Mexico State University

CORE FACULTY

Arenaz, Pablo, Associate Professor of Biological Sciences, 1984
B.S., M.S., University of Nevada at Reno; Ph.D. Washington State University

Chianelli, Russell R., Professor of Chemistry, 1996
B.S., Ph.D., Polytechnic Institute of Brooklyn

Herndon, William C., Professor Emeritus of Chemistry, 1972
B.S., The University of Texas at El Paso; Ph.D., Rice University

Jones, Larry Paul, Professor of Biological Sciences, 1972
B.S., Augustana College; M.S., Iowa State University; Ph.D., Oregon State University

Li, Wen-Whai, Associate Professor of Civil Engineering, 1997.
B.S., National Taiwan University; M.S., Ph.D., Colorado State University

MacKay, William P., Professor of Biological Sciences, 1990
B.A., M.A., California State University, Fullerton; Ph.D., University of California at Riverside

Pingitore, Nicholas E., Professor of Geological Sciences, 1977
A.B., Columbia College; Sc.M., Ph.D., Brown University

Riter, Stephen, P.E., Professor of Electrical Engineering, 1980
B.A., B.S.E.E., Rice University; M.S., Ph.D., University of Houston

Tarquin, Anthony Joseph, P.E., Professor of Civil Engineering, 1969
B.S.I.E., M.S.E., Ph.D., University of West Virginia

Turner, Charles D., P.E., Professor of Civil Engineering, 1990
B.S., M.S., University of Nebraska at Lincoln; Ph.D., Colorado State University

VanDerslice, James, Assistant Professor of Public Health,
University of Texas at Houston School of Public Health at El Paso, 1993
B.S., Humboldt State University; M.S.E.E., Ph.D., University of North Carolina

Walton, John, Assistant Professor of Civil Engineering, 1993
B.S., Western Illinois University; M.S., University of Virginia; M.S., University of Washington; Ph.D., University of Idaho

Webb, Robert, Assistant Professor of Biological Sciences, 1992
B.A., M.A., Ph.D., Temple University

ESE CONTRIBUTING FACULTY

Ashur, Suleiman A., Assistant Professor of Civil Engineering, 1995
B.S., An-Najah National University, West Bank; M.S.E., University of Michigan; Ph.D., Arizona State University

Carmichael, David L., Associate professor of Anthropology, 1991
B.A., University of New Mexico; M.A., Ph.D., University of Illinois

Das, Siddhartha, Assistant Professor of Biological Sciences, 1993
B.S., M.S., Ph.D., University of Calcutta

Davis, Michael Ian, Professor of Chemistry, 1968
B.Sc., Ph.D., University of London

Doser, Diane E., Professor of Geological Sciences, 1986
B.S., Michigan Technological University; M.S., Ph.D., University of Utah

Ferregut, Carlos Miguel, Associate Professor of Civil Engineering, 1990
B.S. National Polytechnic Institute of Mexico; M. Eng., National Autonomous University of Mexico; Ph.D., University of Waterloo

Fisher, Walter W. P.E., Professor of Metallurgical and Materials Engineering, 1978
B.S., University of Utah; M.S., Ph.D., New Mexico Institute of Mining and Technology

Fitzgerald, Rosa, Assistant Professor of Physics, 1995
B.S., National University of Engineering (Peru); M.S., Ph.D., University of California at Riverside

Golding, Peter, CPE, Associate Professor of Mechanical and Industrial Engineering, 1987
B.S., Ph.D., Monash University

Goodell, Philip Charles, Associate Professor of Geological Sciences, 1975
B.S., Yale University; M.S., Ph.D., Harvard University

Harris, Arthur Horne, Professor of Biological Sciences, 1965
B.S., M.A., Ph.D., University of New Mexico

Langford, Richard P., Assistant Professor of Geological Sciences, 1997
B.A., Colorado College; M.A., Indiana University; Ph.D., University of Utah

LeMone, David Vondenberg, Professor of Geological Sciences, 1964
B.S., New Mexico Institute of Mining and Technology; M.S., University of Arizona; Ph.D., Michigan State University

Lieb, Carl S., Associate Professor of Biological Sciences, 1981
B.S., M.S., Texas A&M University; Ph.D., University of California at Los Angeles

Marsh, James, Senior Lecturer in Physics, 1989
B.S., Central Oklahoma State University; M.S. Oklahoma State University; Ph.D., University of Michigan

Murr, Lawrence E., P.E., Professor of Metallurgical and Materials Engineering, 1989
B.Sc., Albright College; B.S., M.S., Ph.D., Pennsylvania State University

Nazarian, Soheil, P.E., Associate Professor of Civil Engineering, 1988
B.S., University of Tehran, Iran; M.S., Tufts University; Ph.D., The University of Texas at Austin

Pannell, Keith Howard, Professor of Chemistry, 1970
B.Sc., M.Sc., University College, Durham University; Ph.D., University of Toronto

Quintana, Rolando, P.E., Assistant Professor of Industrial Engineering, 1992
B.S., M.S., The University of Texas at El Paso; Ph.D., New Mexico State University

Salvador, James M., Assistant Professor of Chemistry, 1992
B.S., University of Texas at El Paso; Ph.D., New Mexico State University

Schmidt, Jr., Robert Howard, Professor of Geological Sciences, 1969
B.S., M.S., Oregon State University; Ph.D., University of California at Los Angeles

Schulze-Makuch, Dirk, Assistant Professor of Geological Sciences, 1998
B.S., M.S., Justus-Liebig University of Giessen; Ph.D. University of Wisconsin-Milwaukee

Singh, Vijay P., Professor of Electrical Engineering, 1983
B.S.E.E., Indian Institute of Technology; M.S., Ph.D., University of Minnesota

Soden, Dennis, L., Professor of Political Science, 1996
B.A., University of California at Riverside; M.A., University of Southern California; Ph.D., Washington State University

Starks, Scott A., P.E., Professor of Electrical Engineering, 1989
B.S.E.E., University of Houston, Ph.D., Rice University

Swift, Jr., Andrew H. P., P.E., Professor of Mechanical Engineering, 1983
B.S., B.S.M.E., Union College; M.S., Sc.D., Washington University

Walsh, Elizabeth J., Assistant Professor of Biological Sciences, 1994
B.S., Ph.D., University of Nevada at Las Vegas

Washburn, Barbara Shayne, Assistant Professor of Biological Sciences, 1996
B.S., New York University; M.S., Ph.D., University of California at Davis

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Appendix 5

<u>Selected list of</u>
Publications
Presentations
Posters
Theses and Dissertations
Project Reports

Publications

Amaya, M.A., Ackall, G., Pingitore, Jr., N.E., Quiroga, M. and Terrazas-Ponce, B. "Childhood Lead Poisoning on the US-Mexico Border: A Case Study in Environmental Health, Nursing Lead Poisoning." Public Health Nursing, Vol 14, No 6, 1997.

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Bader, J.L., Goodell, P.C., Gonzalez, G., Ali, A.S. and Pillai, S.D. "Aerobic Bioreduction of Hexavalent Chromium by Indigenous Soil Microorganisms in Batch Studies." Applied and Environmental Microbiology, in press, 1999.

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Bader, J.L., Goodell, P.C., Gonzalez, G. and Pillai, S.D., "Bioreduction of Chromium in Contaminated Soils and Potential Application to the Bioremediation of Cr(VI) Contaminated Sites." EOS Supplement, Vol. 75 (44), p. 208, 1994.

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Cady, C.F. and Soden, D.L. "The Legal Institutional Analysis Model and Water Policy Making in a Bi-National Setting." In: Cross Currents in Water Policy,

Younos, T. and Spoenberg, T. (eds.), University Council on Water Resources, Carbondale, IL, 1998.

Chianelli, R.R. and Yácaman, M.J. “The Structure and Potential Role of Atmospheric Nanoparticles in Photocatalytic and Thermal Production of Atmospheric Pollutants.” Journal of Hazardous Substance Research, Vol 1, page 1, 1998.

Craig, S.R., Washburn, B.S. and Gatlin III, D.M. “Effects of Dietary Lipids on Morphometric Parameters and Liver Function in Juvenile Red Drum, *Sciaenops ocellatus*.” Fish Physiol. Biochem, under revision, 1999.

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Creel, R. and Gray, R. “Regional Geographic Information System.” In: An Economic Development Strategy for the Sustainable Use of Water in the Paso del Norte Region.Vol. II, Technical Studies, pp. 89-97. Lowery, N.A. and Hamlyn, E. (eds.). Center for Environmental Resource Management, UTEP, 1998.

DuMars, C.T. “Legal Rules for Allocation of the Water Resource in the El Paso/Juarez/Southern New Mexico Region.” In: An Economic Development Strategy for the Sustainable Use of Water in the Paso del Norte Region.Vol. II, Technical Studies, pp. 21-28. Lowery, N.A. and Hamlyn, E. (eds.). Center for Environmental Resource Management, UTEP, 1998.

Eiceman, G.A., Hill, H.H. and Gardea-Torresdey, J. “Gas Chromatography.” Analytical Chemisty,70 (321R-339R), 1998.

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Enriquez, A., Peterson, J.A. and Pingitore, Jr., N.E. "Research and Interpretation of the Camino Real from Taos, New Mexico, to Parral and Chihuahua, Chihuahua." In: NASA University Research Centers, Technical Advances in Aeronautics, Space Sciences and Technology, Earth Systems Sciences, Global Hydrology, and Education, Coleman, T.L., White, B. and Goodman, S., (eds.), pp. 927-932, 1998.

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Gardea-Torresdey, J.L., Arenas, J.L., Webb, R., Francisco, N.M.C. and Tiemann, K.J. "Ability of Immobilized Cyanobacteria to Remove Metal Ions from Solution and Demonstration of Metallothionin Genes in Various Strains." Journal of Hazardous Substance Research, 3 (1-18), 1997.

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Gardea-Torresdey, J.L., Tiemann, K.J., Gonzalez, J.H.,Henning, J.A. and Townsend, M.S., ”Ability of Silica-Immobilized *Medicago sativa* (Alfalfa) to Remove Copper Ions from Solution.” Journal of Hazardous Materials, 1995.

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LeMone, D.V. and Jacobi, L.R. “The Problem of Less Than Class A Radioactive Wastes.” Waste Management 98, American Nuclear Society, International Atomic Energy Agency, and University Arizona, Session 33-5. In: Status of Disposal Facility Developments for Low-Level Waste, Post, R.G. (ed.). Published on CD-ROM, 1998.

Li, W.W. “U.S. Environmental Protection Agency, Risk Assessment for the Waste Technologies Industries (WTI) Hazardous Waste Incineration Facility, East Liverpool, Ohio.” Volume VII: Accident Analysis: Selection and Assessment of Potential Release Scenarios, Principal author. EPA-905-R97-002g, May, 1997.

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Liebman, A. “Agua Potable En Las Colonias De La Frontera Entre Los Estados Unidos Y Mexico.” La Jornada Ecologica, December, 1998.

Liebman, A. “Trickle-up Activism: Agua Para Beber Tackles Neighborhood Water Quality Problems One Family at a Time.” Borderlines, Vol. 6, no. 3, April, 1998.

Liebman, A. and Galván, A. Agua Para Beber: Un Video de Entrenamiento. El Paso, TX: Center for Environmental Resource Management, 1995.

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Liebman, A., Galván, A. and Saenz. Agua que no Has de Tratar Mejor Dejala Correr. El Paso, TX: Center for Environmental Resource Management, 1996.

Lowery, N.A. and Hamlyn, E. (eds.) An Economic Development Strategy for the Sustainable Use of Water in the Paso del Norte Region.Vol. I and II. Center for Environmental Resource Management, UTEP, 1998.

McGuckin, J.T. and Stumpf, D.M. "The Value of Water." In: An Economic Development Strategy for the Sustainable Use of Water in the Paso del Norte Region.Vol. II, Technical Studies, pp. 29-39. Lowery, N.A. and Hamlyn, E. (eds.). Center for Environmental Resource Management, UTEP, 1998.

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Mroz, R.C., Morales, L.L. and VanDerslice, J. "Health and Hygiene in the *Colonias*: Water and Disease." Family and Community Health, April, 1996.

Peterson, J.A. and Vila, P. "The Social Perception of Environmental Problems in Ciudad Juárez/El Paso: A dissonant chorus in many languages." Book Chapter, In: Border Ethnographies: The Limits of Border Theory, Vila, P.,(vol. ed.), University of Minnesota Press, 1998.

Redlinger, T., O'Rourke, K. and VanDerslice, J. "Seroepidemiology and Vaccination Program for Hepatitis A Among High Risk School Children in a Texas-Mexico Border Community." (Submitted to American Journal of Public Health).

Tarquin, A.J. "Residential Water use and Assessment." In: An Economic Development Strategy for the Sustainable Use of Water in the Paso del Norte Region.Vol. II, Technical Studies, pp. 40-44. Lowery, N.A. and Hamlyn, E. (eds.). Center for Environmental Resource Management, UTEP, 1998.

Tellez, G.T., Nirmalakhandon, R. and Gardea-Torresdey, J.L. "Biological Removal of Petroleum Hydrocarbons from High Saline Oilfield Produced Waters: Field Demonstration. Water, Science, and Technology." Submitted and in review, 1998.

Tiemann, K.J., Gardea-Torresdey, J.L., Gamez, G., Kenneth, D., Renner, M.W. and Furenlid, L.R. "Use of X-ray Absorption Spectroscopy and Esterification to Investigate the Nickel(II) and Chromium(III) Ligands in Alfalfa Biomass." Environmental Science & Technology, 33 (150-154), 1999.

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del Norte Region.Vol. II, Technical Studies, pp. 45-67. Lowery, N.A. and Hamlyn, E. (eds.). Center for Environmental Resource Management, UTEP, 1998.

VanDerslice, J. and Simons, V. “Methods for Maintaining Confidentiality of Health Data during Geocoding” (in preparation, to be submitted to Epidemiology).

VanDerslice, J., Liebman, A. and Byrd, T. “Community-University Partnerships Addressing Environmental Issues along the US-Mexico Border.” Asi Es La Vida, Life, Death, and In Between on the US/Mexico Border, Loustaunau, M.O. and Westport, M.S.B: (eds.) Greenwood Publishing Group, 1998 (in press).

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Short Courses

Dodge, R.L. (Workshop Leader) “Applied Radar Processing and Interpretation.” (2 days) Offered at the ERIM Conference on Applied Geologic Remote Sensing, 1999.

Dodge, R.L. (Workshop Leader) “Introduction to Remote Sensing for Mineral Exploration (2days) Offered at the University of Toronto, 1999.

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