

THE UNIVERSITY OF ARIZONA®



Water & Environmental Sustainability Program

REVISED BUSINESS PLAN

FY2008 – FY2011

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ARIZONA UNIVERSITY SYSTEM
TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF)

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Executive Summary

Arizona's natural resources, most critically its water supplies, are crucial to the state's economy and to the health and well-being of its residents. The most pressing environmental issues of our time are especially apparent in arid and semi-arid regions of the globe where population growth is most rapid and life-supporting resources are most limited. As the leading university in the world with expertise in water, as well as being in the forefront with regard to interdisciplinary work in the environmental and earth sciences The University of Arizona is uniquely positioned to use its strengths to support university, industry, and government collaborations in research, technology, education, and outreach to resolve water and environmental resource challenges. The mission of the WESP is to provide science-based technical, economic, legal, and policy expertise necessary for water and environmental sustainability in Arizona and other semi-arid regions facing increasing demands on natural resources and the uncertainties of environmental change. It is anticipated that the knowledge and techniques generated will have state, national, and world-wide applications that will stimulate the economy and produce far-reaching societal benefits.

This business plan for WESP is aligned with the intent of the Proposition 301 Technology and Research Initiative Fund (TRIF) which is to enhance educational opportunities for students in areas critical to local economic development through new education and research programs and new university-industry partnerships. Two programs, the Water Sustainability Program (WSP) and the Translational Environmental Research initiative (TER) under the banner of WESP, from FY08 forward will integrate their strengths in academia, research, and water and environmental technology to create several outcomes. These include (a) internationally recognized research and technology transfer initiatives; (b) a thriving industry cluster, which includes both private sector and public sector entities, supported by a skilled workforce that is educated at The University of Arizona; (c) practical education for grades K-12 to create general awareness of issues, problems, and career-related training; and (d) stronger relationships across disciplines within The University of Arizona which will result in research innovations to create new public and private sector initiatives. These efforts build on the extensive expertise among over 300 UA faculty and staff in 10 colleges and 60 departments and support UA efforts to be a national and global leader in research and technology development.

WESP will build on the success and the accomplishments of the first six years of the WSP coordinated by the four founding centers: NSF Center for Sustainability of semi-Arid Hydrology and Riparian Areas (SAHRA); NSF Water Quality Center (WQC); SRC/Sematech Engineering Research Center for Environmentally Benign Semiconductor Manufacturing (ERC); and the Water Resources Research Center (WRRRC). The addition of the NIEHS Superfund Basic Research Program in mid-FY2008 as a fifth center of WSP, will complement and expand the efforts of WSP. The new Translational Environmental Research (TER) initiative established in 2007 as an

extension to the Institute for the Study of Planet Earth (ISPE) combines with WSP to form WESP thereby expanding the environmental and earth science focus.

The base components of the two programs, WSP and TER, encompass (a) a broad, internally competitive research grants program; (b) strategic faculty recruitment; (c) targeted research initiatives; (d) student fellowships and internships; (e) education and outreach programs; and (f) center-directed initiatives and center activities support. WSP and TER together plan to attract 12 new, world class faculty over the next four year period. This recruitment effort is viewed as a primary factor in providing quality education, attracting top students and securing new research grant funding in the areas of water science, water management and water policy and in environmental and earth sciences more broadly. As part of this initiative, capital investment in state-of-the-art facilities and infrastructure will provide added incentive for recruitment and enhance the competitiveness of WSP and TER to attract external funding. Interdisciplinary research will also be strengthened through support of proposals to develop multi-partner, federally funded programs as part of the recruitment and research component. Directed initiatives will focus on the provision of seed funding to faculty (or groups of faculty) whose research and education agendas are specifically designed to meet the needs of stakeholders, managers, and policy makers and to secure substantial external funding from federal and state agencies and the private sector.

The WESP and the individual programs of WSP and TER at The University of Arizona will assist in making Arizona's water and environmental resources sustainable into the future, a key underpinning of Arizona's economic development and critical components to enhancing our quality of life.

1. Core Vision/Project Description

The vision of the Water and Environmental Sustainability Program (WESP) is the development of world leadership in interdisciplinary, cutting-edge research and innovations in hydrology, water resources, environmental and earth sciences and in applying results to resolve resource challenges at the state, national, and international levels. WESP is well positioned to meet in this vision through integration of the Water Sustainability Program (WSP) and the Translational Environmental Research initiative (TER) at The University of Arizona (UA). UA has extensive and internationally recognized expertise in water resources, earth science and environmental research, education, and outreach. UA is a leader in water sustainability, water quality, water in high technology manufacturing, and water management and policy through the four coordinating centers of the Water Sustainability Program (WSP): NSF Center for Sustainability of semi-Arid Hydrology and Riparian Areas (SAHRA); NSF Water Quality Center (WQC); SRC/Sematech Engineering Research Center for Environmentally Benign Semiconductor Manufacturing (ERC); and the Water Resources Research Center (WRRC). The addition of the UA NIEHS Superfund Basic Research Program (SBRP) in FY2009 as a fifth center of WSP will further strengthen and broaden water quality research, education and outreach capabilities. The Translational Environmental Research (TER) program is founded in the Institute for the Study of Planet Earth (ISPE) and will extend the mission of ISPE. Recent successes in obtaining a National Ecological Observation Network site at UA, establishment of the national headquarters of the National Phenology Network, and acquisition of the Biosphere 2 facilities enhance UA's strengths not only in environmental studies, but also in producing science specifically useful to Arizonans.

This business plan aligns with the intent of the 2000 Proposition 301 Technology and Research Initiative Fund (TRIF) to enhance educational opportunities for students in areas critical to local economic development through new education and research programs, and new university-industry partnerships.

1.1 Brief overview of the areas being addressed by the WESP

Development of sustainable technologies, processes, products and services is one of the fastest growing areas of the economy. Public awareness of the need to develop a better understanding of how to grow and prosper under conditions of high social and natural variability and change is generating unprecedented demand for new knowledge and tools. WESP aims to foster development and transfer of useful and usable scientific knowledge and technologies to Arizonans to meet this demand. Innovations produced through WESP will enhance Arizona's economic and social standing across the US and around the world as one of the major sources of water and environmental knowledge and technologies. Specific focal areas of WSP and TER are described below.

Water Sustainability Program (WSP)

The following areas of focus, which all relate to the state's water management and policy, and are essential to Arizona's economy, environment, and the well being of its residents include:

- **Surface water resources** have been affected and continue to be jeopardized by drought and climate fluctuations. Recent fires in Arizona have harmed tourism, recreation, and forest products industries in ways that will take decades to recover. Burned watersheds, stripped of vegetation cover, are susceptible to soil erosion and have reduced infiltration capacity making streams and reservoirs much more vulnerable to flash floods and silting. There is evidence that the Southwest may be in a decades-long period of drought. This is already impacting multiple sectors including the energy sector and high-tech industries.
- **Groundwater levels** continue to decline in many heavily populated areas of the state, despite intensive water management. Large areas of rural Arizona lack reliable groundwater supplies and tools to better manage water resources. Decline of groundwater levels can lead to increased energy costs, decreased water quality and salt water intrusion, uncertainty of future supplies, and subsidence problems.
- **Water quality** issues require our ongoing attention. Salinity, chemical and biological pollutants, including pharmaceuticals and pathogens, from both natural and human sources impair numerous water sources and pose a potential threat to public health and the environment. Enormous efforts are required for monitoring, treatment and remediation of potable water sources. In addition, 51 Superfund sites have been identified in the state for remediation of hazardous substance contamination that can impact water quality. Safeguarding water distribution lines against water intrusion has become a priority issue for homeland security and utilities within the public sector.
- **Water reuse** is essential as water resources in the state become more severely constrained, and the need for full, effective and safe "reuse" of treated wastewater becomes increasingly important to augment water supplies. Development of technologies and guidelines for safe use of treated effluent for irrigation and other uses must address the issue of public health and food safety.
- **Water demands** are increasing as the state sustains unprecedented population growth. Arizona's cotton, copper and cattle sectors are being complemented by new businesses built on computer chips, climate and communications, creating new water demands and quality concerns. Settlement of Indian water rights claims could potentially lead to significant increases in irrigated agriculture. Ecological water needs, critical for habitat and species conservation, is another competing demand.

- **Climate variability and change** are key drivers of Arizona's water supply, affecting all economic activities in the state as well as the health of our environment. Although there is uncertainty on how climate change will affect precipitation in the Southwest, there is strong consensus that the current warming trend will continue. This, along with the likelihood of long-term drought and the growth in municipal demand for water in the future, means we will have more significant water management challenges ahead. At a finer resolution, urban heat island effects are well-documented in the metropolitan Phoenix area, and are beginning to appear in Tucson. Such local conditions may impact precipitation patterns as well as increase water demand thus requiring studies of climate change at multiple scales.

Translational Environmental Research (TER) Initiative

TER is an extension of UA's Institute for the Study of Planet Earth, to enhance the flow of knowledge and technology useful for addressing environmental problems within Arizona and beyond. Seven thematic areas have been identified each designed to foster translation of knowledge and technologies to the private sector.

- **Engineering for a Sustainable Environment:** A novel paradigm in innovative engineering-based approaches combining arrays of expertise to understand better the natural and social environments of the future and to stimulate entrepreneurship.
- **Environmental Informatics and Decision Support:** A highly innovative thematic area designed to foster use of earth science and environmental information technologies to modernize university research infrastructure, improve societal capacity to comply with environmental regulations through access to more and better data, and improve decision processes more generally.
- **Economics, Law, Policy, and the Environment:** A first of its kind program to produce interdisciplinary research focused on the use and conservation of environmental resources, valuation of climate impacts, and dissemination and use of environmental knowledge.
- **Environmental Entrepreneurship:** A new initiative aimed at integrating the nationally renowned strengths of UA's Eller College entrepreneurship programs into improving understanding and capacity to move scientific knowledge and technologies into the private-sector.
- **Biogeochemistry and Ecosystem Dynamics:** An important theme area focused on synergizing knowledge across the Earth Sciences and Life Sciences programs at UA, and in the process generating return on investment through

enhancing capacity to manage for hazards threatening our life-sustaining resources.

- **Climate and Hydrometeorology:** An interdisciplinary effort that focuses on improving our ability to predict future climate change in Arizona and the surrounding region and, in so doing, develop UA as the go-to source of information about semi-arid and mountain-area climate dynamics and predictions.
- **Environment and Health:** This theme area aims to facilitate interdisciplinary inquiry into health issues that require expertise in environmental science, social science, law, and public health and, ultimately, to provide knowledge and technologies useful for addressing pressing challenges in this realm.

1.2 Mission, goals and vision

Mission: The mission of the WESP is to provide science-based technical, economic, legal, and policy expertise necessary for water and environmental sustainability in Arizona and other semi-arid regions facing increasing demands on natural resources and the uncertainties of environmental change.

Goals: To strengthen research, outreach, and education efforts in the water resource and environmental arena at The University of Arizona to help ensure a sustainable, high-quality basis for economic development and enhanced quality of life for all of Arizona.

Vision: WESP's vision is to be a world leader in interdisciplinary, cutting-edge water resources and environmental research and in translating results to resolve water resource and environmental challenges at the state, national, and international level.

2. Operational Strategies

2.1 Development and Production

2.1.1 Development Status

Water Sustainability Program

Over the first six years of operation, substantial progress has been made to effectively advance research, education and outreach efforts focused on water issues in Arizona. Stepped increases in funding have allowed WSP to develop an appropriate blend of program components that have led to new and strengthened collaborations within the university community; partnerships with private and public entities; and enhanced educational opportunities for students. The UA has expanded its visibility in the arena of water sustainability and interdisciplinary activities such as water policy and management. Outcomes are being realized in new water sustainability and water quality technologies development and new and expanded education and outreach programs and materials. Over the next four years, emphasis will be given to faculty recruitment and research and strategic, center directed initiatives.

Translational Environmental Research Initiative

The primary focus of TER is generating the best possible return on investment for Arizona through supporting programs that increase the supply of scientific knowledge that has direct applications for addressing challenges to the resilience of the state's natural and social systems. TER is in the early phase of development but primary means of achieving objectives will be the strategic hiring of new faculty in targeted areas and support of innovative earth science/environmental programs.

2.1.2 Production Process

The University of Arizona is recognized as the leading university in the world with respect to expertise in water as well as in interdisciplinary earth science and environmental studies. It is the goal of WESP to continue to build on UA's strengths by expanding and coordinating related programs at The University of Arizona so they can more efficiently and effectively address the water and other environmental issues facing the state of Arizona and that support Arizona's economic development.

WESP leverages its strengths in academia, research, and local environmental technology industries to generate positive outcomes, including:

- Internationally recognized research and technology transfer initiatives
- Stronger relationships across disciplines within The University of Arizona that produce research innovations, leading to creation of new business initiatives.
- A thriving industry cluster, which includes both private sector and public center entities, supported by a skilled workforce that is educated at The University of Arizona and related programs
- Practical education for grades K-12 to create general awareness of issues, problems, and career-related training

These efforts build on the extensive expertise among more than 300 UA faculty and staff in 10 colleges and 60 departments and support UA efforts to be a national and global leader in research and technology development.

Water Sustainability Program

The coordinating water centers of WSP are integral to the production process. The centers form hubs of expertise, research innovation, education and outreach, and fund distribution across campus. They are denoted below:

Sustainability of semi-Arid Hydrology and Riparian Areas (SAHRA)

SAHRA's mission is to identify critical stakeholder-relevant knowledge gaps and conduct basin-focused multidisciplinary research to fill them; and to convey what is known and what is being learned to improve water management and policy.

Water Quality Center (WQC)

The mission of the WQC is to conduct research that evaluates physical, chemical, and microbial processes that affect the quality of surface and subsurface waters utilized for potable supplies.

Engineering Research Center for Environmentally Benign Semiconductor Manufacturing (ERC)

The ERC is a multi-university effort lead by The University of Arizona to create the science, technology, and educational methods to lead the semiconductor industry to a new era of environmentally benign manufacturing.

Water Resources Research Center (WRRC)

The University of Arizona's Water Resources Research Center (WRRC) promotes understanding of critical state and regional water management and policy issues through research, community outreach and public education.

Superfund Basic Research Program (SBRP)

The addition of SBRP mid-2008 as a fifth center in WSP will expand the study and remediation of hazardous wastes in Arizona's ground water. The addition will formalize the existing synergies in water quality research and shared vision and delivery of education and outreach components that WSP and SBRP have already established.

Translational Environmental Research Initiative

The TER Initiative goals focus on support for a series of innovative environmental and earth sciences programs, including:

Economics, Law and Environment: A TRIF-funded contribution will be provided to the program to assist it in creating a central "go-to" location for the public to obtain information about these topics. The goal will be to make this program self-sustaining.

Valuation of Climate Impacts: TRIF funds will be used for limited-time support towards economic valuation of climate impacts.

Environmental Entrepreneurship Initiative: TRIF funding will contribute to developing this highly unique educational program. Given the novel nature of this initiative, planning is still underway.

Engineering for a Sustainable Environment Initiative: A cluster faculty hiring initiative is envisioned in partnership with several colleges across campus. The goal is to create a uniquely powerful combination of engineers, policy scientists, environmental prediction scientists, and entrepreneurship expertise.

Environmental Informatics/Decision Support Initiative: TRIF funding will be contributed annually to a new cross-campus program designed to plug all the richness of environmental science on campus into a new generation of decision-support capabilities for stakeholders in the public domain. The goal is also to support the hiring of new faculty in this area.

Climate and Hydrometeorology: The UA has been building in this area but still needs to attract new faculty in the area of climate dynamics and hydrometeorology, particularly as they relate to the semi-arid Southwest.

Environmental Health Initiative: TRIF funding will contribute to attract new faculty members who specialize in applications-based environmental health research. The goal will be to bridge the main and health sciences campuses.

Support Infrastructure: TRIF funding will support development, in year 1, of a comprehensive environmental clearinghouse database, as well as the development of a strong TRIF TER web interface. TRIF TER will also support the creation of a new Deputy Director of Translational Science and Outreach to coordinate activities in these broad areas.

Partnerships

The outcomes of WSP and TER could not be realized without the interdisciplinary effort across campus and the collaboration with external agencies that bring expertise and financial support to programs and enable transfer and application of research, education and outreach programs to the real-world. The tables below list established internal and external partners.

University of Arizona Partners

<u>College</u>	<u>Department/Unit</u>
Agriculture & Life Sciences	Agricultural & Biosystems Engineering Agricultural & Resource Economics Agricultural Education Agricultural Centers Arboretum Affairs Cooperative Extension Entomology Environmental Research Laboratory National Phenology Network Office Native American Programs Office of Arid Lands Studies Plant Sciences School of Natural Resources Soil, Water & Environmental Science Veterinary Science and Microbiology Water Quality Center Water Resources Research Center
Architecture & Landscape Architecture	Architecture Drachman Institute for Land & Regional Studies Landscape Architecture Water Casa
Eller College of Management	Economics Public Administration & Policy
Education	Educational Psychology
Engineering	Center for Environmentally Benign Semiconductor Mfg Chemical & Environmental Engineering Civil Engineering & Engineering Mechanics Hydrology & Water Resources Materials Science & Engineering Mining & Geological Engineering Sustainability of semi-Arid Hydrology & Riparian Areas Systems & Industrial Engineering
Law	Law & Public Policy
Medicine	Cell Biology and Anatomy Clinical Pathology Pharmacology Physiology

Optical Sciences	Optical Sciences
Pharmacy	Pharmacology & Toxicology Superfund Basic Research Program
Public Health	Environmental & Community Health Epidemiology & Biostatistics Health Promotion Sciences Network for Information & Counseling
Science	Atmospheric Sciences Biochemistry & Molecular Biophysics Biosphere 2 Chemistry Ecology & Evolutionary Biology Geosciences Laboratory of Tree-Ring Research Mathematics Planetary Sciences
Social & Behavioral Sciences	Anthropology Bureau of Applied Research in Anthropology Center for Latin American Studies Geography, Regional Development & Planning History Political Science Social & Behavioral Sciences Research Institute
Additional Units	Arizona Research Labs – Institute for the Study of Planet Earth and Climate Assessment for the Southwest Center for Ethnohistorical Research Facilities Management Flandrau Science Center Udall Center for Studies in Public Policy

External Partners

3M	National Institute of Environmental Health Sciences
Access Business Group	National Oceanic and Atmospheric Administration
Amphion International	National Phenology Network
Arizona Dept of Agriculture	National Science Foundation
Arizona Dept of Environmental Quality	Natural Resources Conservation Service
Arizona Dept of Health Services	Northern Arizona Council of Governments
Arizona Dept of Water Resources	Northern Arizona University
Arizona Dept of Game & Fish	Northwest Biosolids Management
Arizona Division of Emergency Management	The Nature Conservancy
Arizona Iceberg Lettuce Research Council	Orange County Sanitation District
Arizona League of Women Voters	Pall Corporation
Arizona Municipal Water Users Assoc	Phelps Dodge Corporation
Arizona State Parks – Kartchner Caverns	Philadelphia Water Dept
Arizona State University	Phoenix Zoo
Arizona Structural Pest Control Commission	Pima Association of Governments
Arizona Water Institute	Pima County
Audubon Society	Rain Bird Corporation
Avra Gro Systems	Raytheon Corporation
Badger Meter Inc	Resolution Copper Company
BASF	Salt River Project
Brita Products	Sandia National Laboratories
Brown and Caldwell	Sematech
Carollo Engineers	Semiconductor Research Corporation
Central Arizona Project	Southern Arizona Water Users Assoc
City of Flagstaff	Synagro Technologies
City of Peoria	Texas Instruments
City of Phoenix	Tohono Chul Park
City of Safford	Tonto National Forest
City of Tempe	Town of Marana
City of Tucson	Town of Oro Valley
Cochise County	UA Agency for International Development
Coconino Dept of Health	US Army Corps of Engineers
Conacyt	US Bureau of Land Management
Errol L. Montgomery & Associates	US Bureau of Reclamation
Farmers Investment Company	US Dept of Agriculture
Gila Resources	US Dept of Energy
Gila Valley NRCD	US Dept of Defence
Gila Valley Watershed Partnership	US Dept of Health and Human Services
HDR Engineering	US Dept of the Interior
Hydro Geo Chem Inc	US Environmental Protection Agency
Intel	US Geological Survey
Jim Click Automotive Team	US National Weather Service
Los Alamos National Laboratory	Upper San Pedro Partnership
Los Angeles County Sanitation District	Water Education Foundation
Metropolitan Water Improvement District	Water Quality Association
Motorola	Westland Resources
National Cancer Institute	
National Drought Mitigation Center	

2.1.3 Cost of development
See Pro Forma (Section 4)

2.1.4 Labor requirements

University faculty, staff and the student population provide a highly-trained and capable labor pool. The many departments, centers and institutes are home to a great deal of water resource, environmental and earth sciences, engineering and translation expertise.

2.2 Marketing and Promotion

2.2.1 Strategy

The primary strategy to be used for marketing to students and faculty will involve highlighting the quality of research and education available in water resources, engineering, and environmental and earth sciences at The University of Arizona. The UA is a recognized leader in these fields, offering technical and practical training as well as solid intellectual foundations needed for successful development of careers and research initiatives in related fields. Recruitment of world-class faculty will bring national and international prominence to the university and its environmental programs in turn attract outstanding students. It should be emphasized that UA's ability to recruit both the best students and faculty is a proven asset in the areas relevant to WESP.

Marketing and promotion of these programs to the larger community involves interaction with municipal, county, state, and federal agencies; the private sector; and NGOs. Participation of representatives from these sectors, in advisory and sponsorship roles, will continue to be actively encouraged and solicited.

The UA's position as Arizona's only land grant university provides unique opportunities in the state to coordinate science, education, and outreach. Arizona Cooperative Extension, based in the UA College of Agriculture and Life Sciences, works closely with many WESP faculty and programs and provides access to its established network of offices in each of the fifteen counties and on Indian Reservations. Arizona Cooperative Extension constitutes a valuable channel for establishing interactions and knowledge transfer between the university and the citizens of the state, and provides important services with regard to mobilizing such knowledge to improve the quality of life and prosperity of the state and its residents. UA has a tradition of working directly with stakeholders throughout the state of Arizona, as well as nationally and internationally. This collaboration is conducted through formal institutions such as Arizona Cooperative Extension as well as through individual projects, programs, departments and centers. Cross border opportunities for broader dissemination of education and outreach programs in the region will be possible with the working relationship Superfund has developed with Mexico.

2.2.2 Method of promotion

Water Sustainability Program

Creation and branding of WSP products and services that include brochures, displays, demonstrations, workshops, lectures, water bottles, conference sessions, special events, books, booklets, CDs, DVDs, kiosks, published papers, fact sheets, web sites and communications, have all increased visibility of the WSP and will continue to expand. The WSP web site (www.uawater.arizona.edu) and brochure offer easy access to program information, and the *ArizonaWater* site (www.arizonawater.org) provides searchable databases of expertise, water centers, agencies and organizations, as well as research programs and degree programs related to water at the three state universities.

Translational Environmental Research Initiative

Programs will be promoted through the UA Institute for the Study of Planet Earth website (<http://www.ispe.arizona.edu>), and through printed materials such as brochures, newsletters, reports, etc. Promotion will also occur through participation in conferences, meetings, and events involving businesses, entrepreneurs, and the public.

2.2.3 Advertising and promotion plans

Existing venues supporting advertising, public relations, and promotion will continue to be used. A mix of new and improved electronic and print educational materials tailored to diverse audiences, from the general public, K-12 students, educators, professionals to decision makers will be under development. An example is the newly developed Southwest Climate Change Web Portal, which will provide a wide array of information about climate change and its impacts in Arizona and beyond — information that is specifically designed to be useful for decision-making. Promotion of water and environmental education and outreach in Maricopa County, which represents 60 percent of the state's population, will be expanded in 2008 onward.

Various forms of community outreach will also be pursued through workshops, seminars, educational activities, and participation in public events. A comprehensive effort will be initiated to encourage more UA faculty to bring their knowledge and research to the public.

2.3 Project Management

2.3.1 Description of the organizational setup to support the initiative

The WESP director reports to Dr. Leslie Tolbert, the UA Vice President for Research, Graduate Studies and Economic Development. Dr. Tolbert and the VPR's office are responsible for oversight of the TRIF investment on campus and approval of budget and program metrics. The directors of WSP and TER report to the WESP director however each manages their respective programs independently. Joint briefings with program management and staff will be used to foster collaborative efforts within the combined areas of expertise.

Water Sustainability Program

WSP is managed by a director and the Executive Committee, comprised of water center directors. The water centers serve as the principal centers for faculty and staff research, outreach, education and fund distribution at the UA in the water area. Directors are as follows: Sharon Megdal, Water Resources Research Center (WRRC) that receives federal grant support through the United States Geological Survey; Ian Pepper, NSF Water Quality Center (WQC); Farhang Shadman, SRC/Sematech Engineering Research Center for Environmentally Benign Semiconductor Manufacturing (ERC); and Jim Shuttleworth, NSF Center for Sustainability of semi-Arid Hydrology and Riparian Areas (SAHRA). The addition of the UA NIEHS Superfund Basic Research Program (SBRP), will add Raina Maier, to the Executive Committee.

Translational Environmental Research Initiative

The TER program is managed by TER director, Dr. Jonathan Overpeck, who is also director of the Institute for the Study of Planet Earth, TER deputy director for research, Barbara Morehouse and deputy director for outreach, Gregg Garfin.

2.3.2 Advisory Committees

WSP and TER are supported by their respective advisory committees, representing lead municipal, state and federal and private sector agencies and academic constituents engaged in water and environmental endeavors.

Water Sustainability Program

The WSP Director receives input from the External Advisory Committee and the Academic Advisory Committee. The External Advisory Committee is the primary entity for business and external oversight and is comprised of industry and government agency officials. The Academic Advisory Committee is comprised of UA Deans or their representatives of Colleges engaged in water related research. These two committees are charged with providing periodic feedback and review of the initiative, including input on areas of research, possible funding partners, advice on strengthening the program, and mechanisms for information dissemination to the public. Members of the two committees are listed below.

WSP External Advisory Committee

Thomas Buschatzke, Water Advisor, City of Phoenix

Joan Card, Water Quality Division Director, Arizona Department of Environmental Quality

Prabhu Dayal, Chair, Environmental Technology Industry Cluster & CEO, C Trade

Leonard Drago, Senior Environmental Engineer, Intel

Vladimir Drobny, Development Manager, Texas Instruments

Carol Erwin, Area Manager, Bureau of Reclamation

John Hoffmann, Director, Arizona Water Science Center, USGS

David Modeer, Director, Tucson Water

Karen Smith, Deputy Director, Arizona Department of Water Resources

John Sullivan, Associate General Manager, Salt River Project

Sid Wilson Jr., General Manager, Central Arizona Project

Academic Advisory Committee

Sharon Megdal, Director, WSP and Director, WRRRC

Jeffrey Burgess, College of Public Health

Toni Massaro, Dean, College of Law

Beth Mitchneck, Associate Dean, College of Social and Behavioral Science

Tom Peterson, Dean, College of Engineering

Joaquin Ruiz, Dean, College of Science

Translational Environmental Research Initiative

The TER initiative is overseen by the TER Faculty Advisory Committee, drawn from the roster of TER affiliated faculty members and a TER External Advisory Board made up of non-UA scientists and representatives of the public and private sectors. The Faculty Advisory Committee has been established and the External Advisory Board is in the process of being finalized.

Faculty Advisory Committee

David Adelman, Professor, College of Law

David Breshears, Professor, School of Natural Resources

Charles Hutchinson, Professor and Director, Office of Arid Land Studies

John Paul Jones, Professor and Head, Geography and Regional Development

Jonathan Overpeck, Professor and Director, Institute for the Study of Planet Earth

Glenn Schrader, Professor and Head, Chemical and Environmental Engineering

James Shuttleworth, Professor and Director, Sustainability of Semi-Arid Hydrology and Riparian Areas (SAHRA)

External Advisory Board

Richard Brusca, Executive Program Director, Arizona-Sonora Desert Museum

Patrick Cummins, Program Director for Air Quality, The Western Governor's Association

Diana Liverman, Professor and Director, Environmental Change Institute, Oxford University Center for the Environment

David Modeer, Director, Tucson Water

Robert Webb, Chief, Climate Analysis Branch, NOAA Earth System Research Laboratory

2.4 Sustainability

2.4.1 Anticipated funding sources for ongoing support

There are many ways in which WESP is creating opportunities to attract additional funding support from external agencies:

Faculty Hires: Funding to attract new faculty will be used for limited-term assistance with personnel and start-up costs; subsequent funding will be the responsibility of the home department/college(s). The track record and ability to bring in external grant funding is a key consideration for selecting new faculty.

Seed Grants: Short-term seed grants, provided to faculty on a competitive basis, play an important role in launching new projects and developing proposals for large-scale interdisciplinary initiatives that in turn attract significant external funding support.

Infrastructure Improvements: One-time investments in infrastructure enhance the ability of UA to attract top faculty and students and enhance the position UA to compete for federal dollars.

Industry Affiliates: Centers with close ties to manufacturing and technology-driven agencies have cultivated industry memberships. Contributions from these entities provide a significant match to specific projects and programs.

New Programs: Funds are used to support and encourage the development of new innovative concepts and proposals for projects and programs at UA that have the potential to attract and compete for major federal grant funding from agencies such as NSF, NOAA, NRC and NIEHS.

Analytical Lab: The addition of the Superfund Program brings a newly established, state-of-the-art laboratory facility to the portfolio of WESP. This facility will significantly advance the capability of UA to perform integrated studies of emerging and low-level contaminants in water beyond current analytical capabilities available anywhere in the Southwest. This will be a shared facility open to the three state universities and other state and regional entities, with the goal of becoming self-supporting. The facility will give UA a competitive edge in the ability to attract state and federal funding for water quality research.

3. Goals/Metrics/Outcomes

3.1 Specific and realistic goals that are clearly measurable

During the first six years of WSP, performance metrics were revised and additions made to chart TRIF accomplishments as funding stepped up and new program components were added. The merger of WSP and TER into one reporting unit has created opportunities to simplify metrics to standards that are common to both initiatives and focus on combined strengths.

3.1.1 Return on investment (ROI)

The Return on Investment measure has three components. Sponsored awards represent most of the grants channeled on campus from all levels of government but primarily federal agencies. Funds from the private sector and NGO's are also included. Gifts and other sources are smaller contributions from various entities. Patent royalty income, is not expected to provide a significant return in the short term but may in the future. The total awards divided by expenditures provide the ROI ratios projected for FY 2008 – FY 2011 in section 4.1.

3.1.2 Technology transfer

Technology transfer will be assessed through the number of licenses and options, and patent applications as indicators of new technologies under development for real-world application.

3.1.3 Workforce contributions

Contributions to workforce development are based on four metrics pertaining to students: graduate students enrolled in interdisciplinary programs in earth science and environmental studies and those in the new Water Policy Certificate Program; and three other metrics enumerating students receiving support from WSP as undergraduate trainees, including those employed in research and activities, internships and fellowships; graduate trainees, including those employed in research and activities, graduate assistantships, internships and fellowships; and postdoctoral trainees. New faculty hires are a fifth metric in this category. New world class faculty hires attract top students and provide funding and opportunities for students to gain experience and insight into future careers in water and environmental fields.

3.1.4 Curriculum Innovations

Metrics for curriculum innovations include the number of newly revised courses offered at the undergraduate or graduate level. It is anticipated that there will be one new course offered per year.

3.1.5 Outreach and Education

Metrics in this category combine numbers across all educational programs and settings, both formal and non-formal, supported by WESP. Teachers/educators trained; K-12 students benefiting; workshops, seminars and conferences supported; and communities assisted are the basis for tracking education and outreach activities in the state. Assisting communities in the management of their water and natural resources and coping with environmental change more generally are central to WESP outreach efforts.

3.2 Timeline for achievement of goals

The projected goals for WESP as measured through the performance metrics are assessed on an annual basis. The following table shows projections for FY 2008 – FY 2011.

THE UNIVERSITY OF ARIZONA
TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF)
FY 2008 – FY 2011 Projected Performance Measures/Deliverables
Water & Environmental Sustainability Program

PERFORMANCE MEASURES	FY 08 Projected	FY 09 Projected	FY 10 Projected	FY 11 Projected
RETURN ON INVESTMENT				
Sponsored Awards (\$M)	15.2	11.8	12.8	13.8
Gifts and Other Sources (\$)	85,000	90,000	95,000	100,000
TECHNOLOGY TRANSFER				
Licenses & Options	1	2	4	6
Patent Applications	2	2	2	2
WORKFORCE CONTRIBUTIONS				
Graduate Students Enrolled	38	38	38	48
Undergraduate Trainees	43	43	46	46
Graduate Trainees	95	95	98	98
Postdoctoral Trainees	7	7	7	7
New Faculty Hires	2	2	2	2
CURRICULUM INNOVATIONS				
Number of Newly Revised Courses Offered	1	1	1	1
OUTREACH & EDUCATION				
Teachers/Educators trained	979	1008	1035	1070
K-12 Students Benefiting	30,600	31,700	32,800	33,900
Workshops, Seminars & Conferences Supported	6	6	6	6
Communities Assisted	10	10	10	10

4. Pro Forma Financials

4.1 Funding request: resources and planned expenditures

THE UNIVERSITY OF ARIZONA
TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF)
FY 2002 – FY 2011 Budget
Water & Environmental Sustainability Program

	FY 02 Actual	FY 03 Actual	FY 04 Actual	FY 05 Actual	FY 06 Actual	FY 07 Actual	FY 08 Revised Budget	FY 09 Revised Budget	FY 10 Revised Budget	FY 11 Revised Budget
REVENUE										
Carry Forward	\$ -	\$ 442,080	\$ 95,320	\$ 437,798	\$ 595,950	\$ 689,983	\$1,861,545	\$ -	\$ -	\$ -
New TRIF Revenue	\$ 474,283	\$ 480,352	\$2,009,566	\$2,460,948	\$3,907,500	\$4,645,467	\$4,202,311	\$4,388,426	\$4,563,963	\$4,746,521
TOTAL REVENUE	\$ 474,283	\$ 922,432	\$2,104,886	\$2,898,746	\$4,503,450	\$5,335,450	\$6,063,856	\$4,388,426	\$4,563,963	\$4,746,521
EXPENDITURES										
Personal Services	\$ 28,757	\$ 502,244	\$1,135,364	\$1,585,695	\$1,917,386	\$2,447,059	\$5,417,072	\$3,881,143	\$3,991,602	\$4,169,695
All Other Operating Expenses	\$ 3,446	\$ 324,868	\$ 531,724	\$ 717,101	\$1,336,400	\$1,026,846	\$ 501,164	\$ 507,283	\$ 572,361	\$ 576,826
Capital	\$ -	\$ -	\$ -	\$ -	\$ 559,681	\$ -	\$ 145,620	\$ -	\$ -	\$ -
TOTAL EXPENDITURES	\$ 32,203	\$827,112	\$1,667,088	\$2,302,796	\$3,813,467	\$3,473,905	\$6,063,856	\$4,388,426	\$4,563,963	\$4,746,521
Return on Investment	-	2.2:1	1.2:1	1.5:1	0.9:1	3.0:1	2.5:1	2.7:1	2.8:1	2.9:1