World Water Forum College Grant Program
2007 Grant Proposals

College	USC (1) ~ Engineers w/o Borders
Faculty	Mansour Rahimi, Ph.D.
Project	Honduras H2O: Corral de Piedras

POTABLE WATER FOR INDIGENOUS LENCAS

VILLAGE OF CORRAL DE PIEDRAS, HONDURAS

Prepared by:

UNIVERSITY OF SOUTHERN CALIFORNIA

ENGINEERS WITHOUT BORDERS

www.usc-ewb.org

Project Start Date: October 8, 2007

Request for Grant Proposal
Metropolitan Water District of Southern California December 14, 2007

TABLE OF CONTENTS

A. COLLEGE INFORMATION

College	University of Southern California
Address	Chair of Viterbi Admission and Student Affairs 3710 S. McClintock, RTH 110
City, State, Zip Code	Los Angeles, CA 90089-2900
Website	www.viterbi.usc.edu www.ewb-usc.org
Make check payable to:	Engineers Without Borders

B. APPLICANT INFORMATION

Applicant	First Time—Global Project

C. STUDENT PROJECT MANAGER

Student Project Manager	Jacquelin Reed
Undergraduate or Graduate	Undergraduate
Department	Civil and Environmental Engineering
School Address	17 Saint James Place Apt# LOWER Los Angeles, CA 90007
Telephone	
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D. FACULTY PROJECT MANAGER

Faculty Project Manager	Mansour Rahimi, PhD
Department	Epstein Department of Industrial and Systems Engineering
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Telephone	(213) 740-4016
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E. ORGANIZATIONAL BACKGROUND

a. University

The University of Southern California (USC) Viterbi School of Engineering has approximately 1,800 undergraduates, and offers more than thirty combined degree options, some of them unique to USC. Approximately 3,800 graduate students pursue degrees in over 25 fields. The USC graduate program in engineering is consistently ranked in the top 10 in the U.S. News and World Report rankings.

The Viterbi School of Engineering's vision and mission is to lead the fundamental technological transformation of the engineering profession. It is known that rising economies worldwide are putting increasing pressures on natural resources, human capital, wages and the environment, which is why engineering schools must prepare tomorrow's engineers to meet these profound changes. At Viterbi, outstanding faculty, superb students, rich programs, loyal alumni and friends, and an unparalleled array of national research centers in critical technologies are relentlessly pursuing this objective. The school aims to operate globally and across the disciplines- thanks to its location and its home. The University of Southern California is a testament to the dramatic advances that can be made through innovative interdisciplinary work and inventive partnerships that span the globe.

b. University Chapter of Engineers Without Borders

The University of Southern California Chapter of Engineers Without Borders (EWB-USC) is an entirely student managed organization. Founded in 2006, EWB-USC is the Viterbi School of Engineering's only humanitarian organization. The chapter's close-knit, dedicated member base is composed of students hailing from a wide variety of disciplines ranging from biomedical to environmental engineering. All members of EWB-USC are volunteers who share a common passion for making a difference in the lives of the poor and enhancing engineering education at the University of Southern California.

EWB-USC partners with developing communities to improve their quality of life through the implementation of environmentally sustainable, equitable, and economical engineering projects while developing socially and environmentally conscious engineering students. This organization offers the opportunity to enhance many attributes critical to successful engineering practice, including teamwork, problem solving, and creativity. Furthermore, EWB-USC allows undergraduate engineers to utilize and expand their engineering skills for a meaningful, moral purpose.

c. Current projects

During spring break 2007, a small group of members from EWB-USC traveled to La Estanzuela in La Paz, Honduras to complete an evaluation of the community's current water situation. Working with an in country Peace Corps volunteer, the team conducted water tests, took measurements and worked with the community to design a water distribution and purification system that would fit their needs.

Over three hundred people live in La Estanzuela, and their current access to water consists of contaminated, visibly yellow water (available at a flow rate of less than 2 gallons/minute for the entire village in the dry season) from a nearby river that is contaminated by cattle, horses, and people swimming and doing laundry. Currently, the residents of La Estanzuela must waste time carrying water from the river to their homes, instead of working.

The challenge in pumping water from the nearest river is the lack of electricity in the area. Current plans call for the use of a water ram pump to utilize the energy of a waterfall to move the water over 100 meters in elevation and 1.4 kilometers in distance to a storage tank nearby the village. The water will then be purified using sustainable and environmentally friendly treatment methods. The project ultimate goal is to provide accessible potable water to the people of La Estanzueala, educate them about the technology behind the system and enable them to take responsibility for the maintenance of their water system upon its inception.

Implementation of this project will begin in summer 2008. The village has arranged to provide the required labor and the materials they can afford. EWB-USC and the project partners are supplying technical and financial support.

F. PROJECT DESCRIPTION

a. Purpose

The purpose of this project is to provide a sustainable, economical and clean water source to the rural village of Corral de Piedras, Honduras, by pumping water from a nearby source. The first phase of this project will provide water to the houses in the village. The second phase will be to deliver treated drinking water (chlorinated). The provision of this simple commodity, a necessity for life, will prevent disease and significantly raise the quality of life for the residents of the village.

Typical construction methods for water pipelines in the Corral de Piedras area thus far have been unable to provide a sustainable and reliable solution to the community's water demand. Current methods involve laying PVC piping above ground; while this solution is cheap and easy to implement, sun and environmental exposure degrades the pipeline, which results in frequent leaks and damage. This project will provide the technical expertise to design and construct a lasting solution for Corral de Piedras' water needs. EWB-USC will also provide the community with the knowledge and resources to maintain the pipeline in the years to come. As well, EWB-USC's Health and Community Outreach Committee will increase awareness of the dangers of drinking non-potable water, and will stress the importance of following proper water and wastewater management techniques.

b. Background

Corral de Piedras is a remote, indigenous Lenca community in Honduras of approximately 300 residents that does not have accessible nor clean water. The residents of Corral de Piedras must travel one kilometer to collect water. Valuable productive time is needlessly spent carrying water from the source to the residence. Furthermore, the lack of potable water causes countless gastro-intestinal sicknesses (Cholera, Dysentery, Acute

Diarrhea, etc). Women and children who have spent long hours carrying potentially contaminated water will be able to spend their time in more productive endeavors, thus raising their quality of life and their standard of living.

By designing and implementing a sustainable water system for Corral de Piedras, the team's efforts will have a huge impact by decreasing water-related illnesses and improving the overall economic well-being of the community. Most importantly, the team will work *with* the community, not *for* them. The villagers of Corral de Piedras will help build the pipeline, provide the majority of the unskilled labor, learn how to use the water system, and be responsible for the long-term project success.

c. Impact

People Directly Affected: 70 families living in the community.
People Indirectly Affected: Anyone downstream from the water source.

d. Milestones

Date	**Milestone**	**Description**
March 13 – 23, 2008	Assessment	Take necessary measurements, test water quality, take health surveys of community and build a relationship with the community.
April 1– November 30, 2008	Design	Prepare a set of plans for the design of the water system with the data gathered.
January 3 – 13, 2009	Implementation	Begin construction of designed system.

e. Site Assessment Trip

i. Purpose

Students from EWB-USC will travel to Honduras in March 2008 with the ultimate goal of providing potable and accessible water to the community of Corral de Piedras. In order to design a feasible and sustainable system the team must first visit the community, develop a relationship with its leaders, assess the landscape and conduct water quality tests. Similar to La Estanzuela, the water source is a river roughly one kilometer away from the community. Thus, the water must be fed to a storage tank, chlorinated and then distributed.

ii. Data to be collected

- Flow of the source: A weir will be built during the assessment trip in order to measure the water volume. Eric Harrison, an on-site Peace Corp volunteer and partner will monitor the volume. The data will provide an approximate measure of seasonal flow variation to determine sustainability.

- Community input: Interviews will take place among the villagers in order to better understand the seasonal water flows and ultimately help the team manage the information obtained and design a sustainable system (e.g. How does the current source conditions compare to previous years? What is the watershed like? Is the pumping location in a feasible location? Is it in a flood area?).

- Topographical information: Global Positioning System (GPS) technology will be used to gather this data. This will lead to determining the relative elevation between the water source and the village, elevation changes, notable obstacles, and terrain types. Also, both digital images and videos will be used to record the viewed conditions. The topographical information will be helpful in determining potential pump and tank locations, as well as a potential pipeline path.

- Quality of the existing water supply and of the proposed water source: Through the partnership with the on-site Peace Corp volunteer, water testing equipment will be lent to the team. Since accurate chemical and bacterial testing requires analysis within 1-2 days, in-country sources will be used. There is an existing bacterial testing lab in the municipality of Marcala (20 minute drive from Corral de Piedras), and a more advanced lab in the city of Comayagüela (2 hour drive from Corral de Piedras).

- Existing soil: Soils samples will be analyzed to ensure that the metal pipes to be used in the higher pressure areas near the pump will not be exposed to excessive corrosion.

- Wastewater pathway: The area near the village will be analyzed to determine the best way of directing the added wastewater due to the implementation of this project. This will be done mainly visually (i.e. photos) and by discussing it with the inhabitants.

iii. Data Collection Sites

The GPS coordinates will be collected along the river and buildings in Corral de Piedras. The rest of the data will be collected directly from the water source and land in between, paying special attention to contaminated areas where women wash clothes, and the areas where villagers are currently obtaining water.

iv. Project Sustainability

Aside from understanding the local community current hygiene and sanitation methods, the team will ensure that the community's Water Board has a plan for funding repairs, managing the system and its continued use, and have proper, training on system troubleshooting in case of damage.

v. Potential Impacts to the Physical Environment

- Pumping water to the village will decrease the stream flow: While it is assumed that the amount of water removed will be negligible compared to the stream flow, investigative actions are warranted. The weir will be left in place in order to be monitored by the on-site Peace Corps volunteer, and observations will be made

during subsequent trips to the area. Through observation, discussion with village leaders, and analysis of governmental regulations, it will be determined whether there are any reasons why this would not be acceptable.

- In providing more water to the villagers, an increase in wastewater, by effect, will be generated: A system will be implemented to manage this flow, which will be monitored in the future by the local Peace Corps volunteer and by observations during subsequent trips.

- Possibility of future erosion in the dug areas where the pipelines will be laid: This will also be monitored by the local Peace Corps volunteer and by observations during subsequent trips.

vi. Completed Training and Technical Capabilities

Completed:
- Appropriate ethnographic methods
- Drafting (AutoCAD)
- PVC (polyvinyl chloride) pipe assembly
- Water and waste water treatment design (two environmental engineering undergraduate team members)
- Concrete Mixing (four civil engineering undergraduate team members)
- Hydraulics

Expected:
- Surveying – training begins in January 2008
- GPS – training begins in January 2008

Continuous:
- Spanish language lessons
- Safety and basic first aid skills

vii. Metrics

The technical adequacy and success of this project will be determined by comparing the amount of potable water available and the time spent in collecting water, both before and after the new system is implemented. The quantitative health success of this project will be evaluated by comparing the water quality of stream and filtered water after implementation, and by performing community health surveys in Spanish before and after implementation.

viii. Economics

The economic affects of this project on the community will be coordinated through the community's Water Board, which will collect water payments, maintain, and administer the system.

ix. Health

The project team will conduct a baseline health assessment during this trip. The community's health affects will be measured by monitoring the occurrence of gastro-intestinal sicknesses (Cholera, Dysentery, Acute Diarrhea, etc.), before and after implementation of the project.

The health assessment will be conducted through personal interviews of the community, and follow up interviews performed by students on subsequent trips in the Marcala region. Efforts will be made in employing a schoolteacher or community doctor to perform regular health surveys to determine the health benefit of providing potable water to this community.

x. Community Involvement and Education

The community will collaborate with the design team to establish locations of critical components. After the assessment trip, contact will be continuous between the team and the Community Leader, as well as the President and Vice President of the community's Water Board. The Peace Corps volunteer has offered to act as a correspondent for the team, and to hold community meetings to facilitate planning and management of the project.

At all times, the community's input and preference will be taken into consideration while discussing future plans such as wastewater and potential sanitation disposal.

During the project implementation, the community will offer local materials such as sand, gravel, rocks, and wood. Transportation of all materials will also be provided. The community will also offer all non-qualified labor associated with construction, and will have plumbers trained to maintain the system.

Verbal and pictorial instruction and education on the operation, management and maintenance of their system will be provided. Existing team members are fluent in Spanish, and several have basic conversation skills.

G. PROJECT MANAGEMENT TEAM

Name	Title	Address	E-mail	Phone
Jacquelin Reed	**Project Leader**	17 Saint James Place Apt Lower, Los Angeles, CA 90007	jacquedr@usc.edu	(949) 436-1983
Paul VanWieren	**Project Leader**	920 W 37th Place, Room 1301A Los Angeles, CA 90007	vanwiere@usc.edu	(616) 550-2271
Gayla Fecher	**Mentor**	1200 E Fairhaven Ave Apt 46 Santa Ana, CA 92705	gayla.fecher@gmail.com	(213) 210-1124
Mansour Rahimi, PhD	**Faculty Advisor**	3715 McClintock Avenue (Gerontology Building), Room 202-B Los Angeles, CA 90089-0193	mrahimi@usc.edu	(213) 740-4016
Jaquelin Reed	**Health and Outreach**	17 Saint James Place Apt Lower Los Angeles, CA 90007	jacquedr@usc.edu	(949) 436-1983
Viry Martino	**Funding**	870 West Adams Blvd. #18, Los Angeles, CA 90007	vmartino@usc.edu	(619) 207-3668
Taylor Munz	**Planning and Logistics**	520 Avocado, Corona del Mar, CA 92625	taylor.munz@usc.edu	(949) 395-2484
Amr Ghanem	**Design**	642 W 28th Apt10 Los Angeles, CA 90007	aghanem@usc.edu	(925) 640-5894
Eric Harrison	**Peace Corps Engineer**	Marcala, La Paz Honduras, Central America	ericjohnharrison@hotmail.com	504+ 9886-4672

H.

1. FUNDING

Description	Amount	Notes
Grant funds requested from MWD	$10,000.00	Used for equipment bought in Honduras only.

ADDITIONAL SOURCES OF FUNDING

Description	Amount	Notes
USC Viterbi School of Engineering	$2,500.00	Issued 11/30/07
Knightsbridge International	$0.00	$15,000 worth in-kind donation for medical supplies to be brought to Honduras.
Corporate Sponsorships	$0.00	None as of 12/12/07. Sent marketing package out to 40 companies 11/29/07.
Rotary	$0.00	None as of 12/12/07. Presentations scheduled for January 2008.
Eric Harrison, In-country Peace Corps Engineer.	$0.00	Volunteer time.

Project Total	**$46,100**	

2. PROJECT COSTS

Line Item	Amount	Description
Concrete water tank	$6,000	
Pipe	$12,000	Mainly PVC, and steel used in shorter higher-pressure areas.
Mechanical pump	$4,000	
Tools & Miscellaneous	$5,000	
Chlorination System	$1,000	
+10% Safety Margin	$2,800	
Travel (Assessment)	$5,100	Includes airfare, lodging, transportation, and food for 6 people.
Travel (Implementation)	$10,200	Includes airfare, lodging, transportation, and food for 12 people.
Total	**$46,100**	

I. 1. SIGNATURE BLOCK

	Name	Signature	Date
Faculty Project Manager	Mansour Rahimi		12/13/2007
Student Project Manager	Jacquelin Reed Paul VanWieren		12/12/2007 12-12-2007
Member Agency Representative	Dr. Jean-Pierre Bardet *American Society of Civil Engineers*		Dec 12, 2007

USC
UNIVERSITY
OF SOUTHERN
CALIFORNIA

Viterbi School of Engineering

Sonny Astani Department of Civil and Environmental Engineering

Jean-Pierre Bardet
Professor and Chair

12 December 2007

Jacquelin Reed

Engineers Without Borders
University of Southern California
C/O Viterbi Admission and Student Affairs
3710 S. McClintock RTH 110
Los Angeles, CA 90089-2900

Dear Jacquelin,

I am writing in support of the grant application entitled, Potable Water for Indigenous Lencas: Village of Corral de Piedras, Honduras University of Southern California Engineers Without Borders Project. The project appears to be well conceptualized and in line with the interests of American Society of Civil Engineers. In writing this letter, I pledge the full support and necessary resources in helping you to realize your stated objectives. With the support that you have coordinated with the university, different corporate and rotary partners, there is every reason to believe that your project is structured for success. Your efforts to work with two remote Honduran communities shows strong signs of dedication to providing for a certain region, where successive phases of the projects will include sanitation and solar power as funding permits.

Best wishes for a successful grant. I look forward to lending my support to what portends to be a valuable engineering project, and addresses the critical concerns related to meeting the needs of rural communities in Honduras specifically Corral de Piedras.

Sincerely,

Jean-Pierre Bardet
Professor and Chair

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Water for People
Friends of the United Nations
www.bewaterwise.com

APPLICATION

A.

College	University of Southern California, School of Architecture
Address	Watt Hall, Suite 204
City, State, Zip Code	Los Angeles, CA, 90089-0291
Website	http://arch.usc.edu/
Make Check Payable To:	USC School of Architecture

Note: All checks will be made payable to the community college or university of the grantee.

B.

Applicant	
First Time – Local Project	
First Time – Global Project	X
Existing Project – Local Focus	
Existing Project – Global Focus	

C.

Student Project Manager	Guang Xu
Undergraduate or Graduate	Graduate
Department	Architecture
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Mobile Phone	
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Home Address (optional)	

D.

Faculty Project Manager	Mark Gangi, AIA LEED AP
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Telephone	(213) 740-2723
Mobile Phone	(818) 523-5129
Email Address	mark@gangiarchitects.com
Home Address (optional)	

E.

The University of Southern California School of Architecture was founded in 1919. The School provides a five-year undergraduate program in architecture culminating in the Bachelors of Architecture Degree. It offers Masters degrees in Architecture, Landscape Architecture, Historic Preservation and Building Science along with graduate Certificates in each of the four disciplines. Faculty-guided graduate research is performed in the School's Robert H. Timme Architectural Research Center.

Current enrollment in the undergraduate program is 538 students and 102 students in the graduate program. Current graduate and undergraduate curriculum include study-abroad programs in France, Italy, Malaysia and China. The make up of the student body is international and is representative of cultural and ethnic diversity. Prominent alumni of the School include Pritzker Prize Laureates, Frank O. Gehry and Thom Mayne.

The School manages two historic properties—The 1908 Gamble House/USC in Pasadena, California by Greene & Greene and the 1924 Samuel and Harriet Freeman House by Frank Lloyd Wright--through its outreach program. These operate as public and scholarly centers for education in architecture and historic preservation.

Academic programming in the School's graduate programs includes sponsored studios and research for sustainable development of cities and villages in countries with emerging economies. Through recent study-abroad programs in Asia, student projects included the restoration of villages in Malaysia struck by the 2004 tsunami, the design for a village school in Cambodia and the master plan for a health and wellness community in Hainan, China among others. The recently established Creative Humanitarian Initiative (CHI) provides an academic framework for enactment of sustainable design and materials for underserved towns and villages globally. The purpose of the program is to apply advanced multi-disciplinary research into the social and cultural dynamics of a region and to design appropriate urban and architectural solutions.

The University of Southern California is a private research and educational institution. Support for the USC School of Architecture is provided by corporations, individuals, foundations, non-profit organizations and governmental agencies

F. PROJECT DESCRIPTION (3 – 5 PAGES)

Provide examples where this proposed project enhances at least one of the following factors in providing applicability to a developing region:

- Addresses an immediate water supply and/or quality concern
- Adaptability within a developing region's cultural, political and economic conditions
- Creates a strategic communication outreach plan to implement conservation education and change